UEE20 VS UEE11

Advanced Diploma in Electrical Engineering

UEE62220= UEE62211 (EE011) or EE07 + Matching Tasks/Activities/Gap Training

UEE11 UEE62211		UEE20 UEE62220	
UEENEEE080A	Apply industry and community standards to engineering activities	UEECD0003	Apply industry and community standards to engineering activities
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	UEECD0004	Apply material science to solving electrotechnology engineering problems
UEENEEE082A	Apply physics to solving electrotechnology engineering problems	UEECD0005	Apply physics to solving electrotechnology engineering problems
UEENEEE124A	Compile and produce an energy sector detailed report	UEECD0010	Compile and produce an energy sector detailed report
UEENEEE015B	Develop design briefs for electrotechnology projects	UEECD0014	Develop design briefs for electrotechnology projects
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	UEECD0017	Establish and follow a competency development plan in an electrotechnology engineering discipline
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	UEECD0024	Implement and monitor energy sector WHS policies and procedures
UEENEEE137A	Document and apply	UEECD0026	Manage risk in

	measures to control OHS risks associated with electrotechnology work		electrotechnology activities
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits	UEECD0036	Provide engineering solutions for problems in complex multiple path circuits
UEENEEE126A	Provide solutions to basic engineering computational problems	UEECD0039	Provide solutions to basic engineering computational problems*
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	UEECD0056	Apply methods to maintain currency of industry
UEENEEE071B	Write specifications for electrical engineering projects	UEECD0059	Write specifications for electrical engineering projects
UEENEED104A	Use engineering applications software on personal computers	UEECS0033	Use engineering applications software on personal computers
UEENEEG169A	Manage large electrical projects	UEEEL0015	Manage large electrical projects
UEENEEG170A	Plan large electrical projects	UEEEL0058	Plan large electrical projects
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	UEEEL0062	Provide engineering solutions to problems in complex polyphase power circuits
UEENEEK132A	Develop strategies to address environmental and sustainability issues	UEERE0013	Develop strategies to address environmental and sustainability issues in the

in the energy sector	energy sector
UEENEEK135A Design grid connected photovoltaic power supply systems	UEERE0016 Install, configure and commission LV grid-connected photovoltaic power systems*
UETTDRIS67 Solve problems in energy supply network equipment*	UETTDRIS67 Solve problems in energy supply network equipment*
UETTDRIS68 Solve problems in energy supply network protection equipment and systems	UETTDRIS68 Solve problems in energy supply network protection equipment and systems
UETTDRIS69 Diagnose and rectify faults in energy supply apparatus	UETTDRIS69 Diagnose and rectify faults in energy supply apparatus
UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems*	UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems*
UEENEEG145A Develop engineering solutions for induction machine and control problems	UEEEL0043 Develop engineering solutions for induction machine and control problems*
UETTDRIS73 Develop engineering solutions for energy supply power transformer problems*	UETTDRIS73 Develop engineering solutions for energy supply power transformer problems*
UETTDRIS74 Develop engineering solutions for energy supply system protection problems	UETTDRIS74 Develop engineering solutions for energy supply system protection problems
UEENEEG144A Develop engineering solutions for d.c. machine and control problems	UEEIC0017 Diagnose and rectify faults in d.c. motor drive systems*
UEENEEG145A Develop engineering solutions for induction machine and control problems	UEEIC0016 Diagnose and rectify faults in a.c. motor drive systems*
UEENEEG145A Develop engineering solutions for induction machine and control problems	UEEEL0043 Develop engineering solutions for induction machine and control

	problems*
UEE07 **UEENEEH025B Provide solutions to single phase electronic power control problems**	UEEIC0040 Solve problems in polyphase electronic power control circuits*
UEE07 **UEENEEH026B Provide solutions to polyphase electronic power control problems**	UEEIC0042 Solve problems in single phase electronic power control 60
UEENEEK151A Develop effective engineering strategies for energy reduction in buildings	UEERE0012 Develop effective engineering strategies for energy reduction in buildings*
UEE07 **UEENEEI006B Solve problems in process controllers, transmitters and converters**	UEEIC0005 Configure and maintain industrial control system networks*

Advanced Diploma in Engineering Technology-Electrical

UEE11 UEE62111		UEE20 UEE62120	
UEENEEE080A	Apply industry and community standards to engineering activities	UEECD0003	Apply industry and community standards to engineering activities
UEENEEE081A	Apply material science to solving electrotechnology engineering problems	UEECD0004	Apply material science to solving electrotechnology engineering problems
UEENEEE082A	Apply physics to solving electrotechnology	UEECD0005	Apply physics to solving electrotechnology

	engineering problems		engineering problems
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	UEECD0007	Apply work health and safety regulations, codes and practices in the workplace
UEENEEE124A	Compile and produce an energy sector detailed report	UEECD0010	Compile and produce an energy sector detailed report
UEENEEE015B	Develop design briefs for electrotechnology projects	UEECD0014	Develop design briefs for electrotechnology projects
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	UEECD0016	Document and apply measures to control WHS risks associated with electrotechnology work*
UEENEEE083A	Establish and follow a competency development plan in an electrotechnology engineering discipline	UEECD0017	Establish and follow a competency development plan in an electrotechnology engineering discipline
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components	UEECD0019	Fabricate, assemble and dismantle utilities industry components
UEENEEE105A	Fix and secure electrotechnology equipment	UEECD0020	Fix and secure electrotechnology equipment*
UEENEEE117A	Implement and monitor energy sector OHS policies and procedures	UEECD0024	Implement and monitor energy sector WHS policies and procedures
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work	UEECD0026	Manage risk in electrotechnology activities
UEENEEE125A	Provide engineering	UEECD0036	Provide engineering

	solutions for problems in complex multiple path circuits		solutions for problems in complex multiple path circuits
UEENEEE126A	Provide solutions to basic engineering computational problems	UEECD0039	Provide solutions to basic engineering computational problems*
UEENEEE104A	Solve problems in d.c. circuits	UEECD0043	Solve problems in direct current circuits*
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications	UEECD0051	Use drawings, diagrams, schedules, standards, codes and specifications*
UEENEEE071B	Write specifications for electrical engineering projects	UEECD0059	Write specifications for electrical engineering projects
UEENEED104A	Use engineering applications software on personal computers	UEECS0033	Use engineering applications software on personal computers
UEENEEG063A	Arrange circuits, control and protection for general electrical installations	UEEEL0003	Arrange circuits, control and protection for electrical installations*
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	UEEEL0008	Evaluate and modify low voltage heating equipment and controls*
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	UEEEL0009	Evaluate and modify low voltage lighting circuits, equipment and controls*
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits	UEEEL0010	Evaluate and modify low voltage socket outlets circuits*
UEENEEG169A	Manage large electrical	UEEEL0015	Manage large electrical

	projects		projects*
UEENEEG107A	Select wiring systems and cables for low voltage general electrical installations	UEEEL0018	Select wiring systems and select cables for low voltage electrical installations*
UEENEEG144A Develop engineering solutions for d.c. machine and control problems		UEEEL0019	Solve problems in direct current (d.c.) machines*
UEENEEG102A	Solve problems in low voltage a.c. circuits	UEEEL0020	Solve problems in low voltage a.c. circuits*
UEENEEG101A	Solve problems in electromagnetic devices and related circuits	UEEEL0021	Solve problems in magnetic and electromagnetic devices*
UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits	UEEEL0023	Terminate cables, cords and accessories for low voltage circuits*
UEENEEG006A	Solve problems in single and three phase low voltage machines	UEEEL0024	Test and connect alternating current (a.c.) rotating machines*
UEENEEG006A	Solve problems in single and three phase low voltage machines	UEEEL0025	Test and connect transformers*
UEENEEG170A	Plan large electrical projects	UEEEL0058	Plan large electrical projects*
UEENEEG149A	Provide engineering solutions to problems in complex polyphase power circuits	UEEEL0062	Provide engineering solutions to problems in complex polyphase power circuits*
UEENEEK132A	Develop strategies to address environmental and sustainability issues in the energy sector	UEERE0013	Develop strategies to address environmental and sustainability issues in the energy sector
UEENEEK135A Design grid connected		UEERE0016	Install, configure and

photovoltaic power supply systems	commission LV grid-connected photovoltaic power systems*
UETTDRIS67 Solve problems in energy supply network equipment*	UETTDRIS67 Solve problems in energy supply network equipment*
UETTDRIS68 Solve problems in energy supply network protection equipment and systems	UETTDRIS68 Solve problems in energy supply network protection equipment and systems
UETTDRIS69 Diagnose and rectify faults in energy supply apparatus	UETTDRIS69 Diagnose and rectify faults in energy supply apparatus
UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems*	UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems*
UEENEEG145A Develop engineering solutions for induction machine and control problems	UEEEL0043 Develop engineering solutions for induction machine and control problems*
UETTDRIS73 Develop engineering solutions for energy supply power transformer problems*	UETTDRIS73 Develop engineering solutions for energy supply power transformer problems*
UETTDRIS74 Develop engineering solutions for energy supply system protection problems	UETTDRIS74 Develop engineering solutions for energy supply system protection problems
UEENEEG144A Develop engineering solutions for d.c. machine and control problems	UEEIC0017 Diagnose and rectify faults in d.c. motor drive systems*
UEENEEG145A Develop engineering solutions for induction machine and control problems	UEEIC0016 Diagnose and rectify faults in a.c. motor drive systems*
UEENEEG145A Develop engineering solutions for induction machine and control problems	UEEEL0043 Develop engineering solutions for induction machine and control problems*
UEE07	UEEIC0040 Solve problems in polyphase

UEENEEH025B Provide solutions to single phase electronic power control problems		electronic power control circuits*	
UEE07 **UEENEEH026B Provide solutions to polyphase electronic power control problems**	UEEIC0042	Solve problems in single phase electronic power control	60
UEENEEK151A Develop effective engineering strategies for energy reduction in buildings	UEERE0012	Develop effective engineering strategies for energy reduction in buildings*	
UEE07 **UEENEEI006B Solve problems in process controllers, transmitters and converters**	UEEIC0005	Configure and maintain industrial control system networks*	

CIII Electro-techology-Electrician

UEE20

UEE20 UEE30820 Certificate III in Electrotechnology Electrician Date this document was generated: 6 October 2020 Approved Page 108 of 4588	UEE11	Remark
HLTAID001 Provide cardiopulmonary resuscitation	HLTAID001 Provide cardiopulmonary resuscitation 10	Equivalent

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace	UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace	Equivalent
UEECD0016 Document and apply measures to control WHS risks associated with electrotechnology work*	UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work	Equivalent
UEECD0019 Fabricate, assemble and dismantle utilities industry components*	UEENEEE102A Fabricate, assemble and dismantle utilities industry components	Equivalent
UEECD0020 Fix and secure electrotechnology equipment*	UEENEEE105A Fix and secure electrotechnology equipment	
UEECD0044 Solve problems in multiple path circuits*	New unit (Divided from E104A)	UEENEEE104A
UEECD0046 Solve problems in single path circuits*	New unit (Divided from E104A)	
UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications*	UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications	Equivalent
UEECO0023 Participate in electrical work and competency development activities	UEENEEC020B Participate in electrical work and competency development activities	Equivalent
UEEEL0003 Arrange circuits, control and protection for electrical installations*	UEENEEG063A Arrange circuits, control and protection for general electrical installations	Equivalent
UEEEL0005 Develop and connect electrical control circuits*	UEENEEG109A Develop and connect electrical control circuits	Equivalent

UEEEL0008 Evaluate and modify low voltage heating equipment and controls*	New unit (Divided from G033A)+Some Parts from G108A	UEENEEG033A
UEEEL0009 Evaluate and modify low voltage lighting circuits, equipment and controls*	New unit (Divided from G033A)+ Some parts from G108A	
EEEL0010 Evaluate and modify low voltage socket outlets circuits*	New unit (Divided from G033A)+ Some parts from G108A	
UEEEL0012 Install low voltage wiring, appliances, switchgear and associated accessories*	New unit UEENEEG103+UEENEEG104A	UEENEEG103+UEENEEG104A
UEEEL0014 Isolate, test and troubleshoot low voltage electrical circuits	New unit UEENEEG108A+Some parts of G105A	G108A+Gap Training
UEEEL0018 Select wiring systems and select cables for low voltage electrical installations	UEENEEG107A Select wiring systems and cables for low voltage general electrical installations	Equivalent
UEEEL0019 Solve problems in direct current (d.c.) machines	New unit (Similar to DC Machine part of G101 and G144A)	UEENEEG101A
UEEEL0021 Solve problems in magnetic and electromagnetic devices	New unit Similar to some parts of G101A	
UEEEL0020 Solve problems in low voltage a.c. circuit	UEENEEG102A Solve problems in low voltage a.c. circuits	Equivalent
UEEEL0023 Terminate cables, cords and accessories for low voltage circuits*	UEENEEG106A Terminate cables, cords and accessories for low voltage circuits	Equivalent

UEEEL0024 Test and connect alternating current (a.c.) rotating machines*	New unit (Similar to some parts of G006A)(Motor) KS02-EG006A Alternating current rotating machines	UEENEEG006A
UEEEL0025 Test and connect transformers*	New unit (Similar to some parts of G006A)(Transformer) KS01-EG006A Single and three-phase transformers	
UEEEL0039 Design, install and verify compliance and functionality of general electrical installations*	Not equivalent to G105A Updated aspects are included	NOT EQUIVALENT See competencies comparison.
UEEEL0047 Identify, shut down and restart systems with alternate supplies*	New Unit Some components from K148+Some from G105A	NEW UNIT
UEERE0001 Apply environmentally and sustainable procedures in the energy sector	UEENEEK142A Apply environmentally and sustainable procedures in the energy sector	Equivalent
UETTDRRF06 Perform rescue from a live LV panel*	Imported unit from UET Training Package Some components from G105A especially Rescue	NEW UNIT

UEECD0044 Solve problems in multiple path circuits*

UEECD0044 Solve problems in multiple path circuits	UEENEED104A
Knowledge Evidence Evidence required to demonstrate	T3 Ohm's Law encompassing:

competence in this unit must be relevant to and satisfy all of Assessment Requirements for UEECD0044 Solve problems in multiple path circuits Date this document was generated: 6 October 2020 Approved Page 807 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards the requirements of the elements, performance criteria and range of conditions and include knowledge of: □ factors affecting resistance, including: □ four factors that affect the resistance of a conductor (type of material, length, cross-sectional area and temperature) □ affect the change in the type of material (resistivity) has on the resistance of a conductor □ affect the change in 'length' has on the resistance of a conductor □ affect the change in 'cross-sectional area'	□ basic d.c. single path circuit. □ voltage and currents levels in a basic d.c. single path circuit. □ effects of an open-circuit, a closed-circuit and a short-circuit on a basic d.c. single path relationship between voltage and current from measured values in a simple circuit □ determining voltage, current and resistance in a circuit given any two of these quantities □ graphical relationships of voltage, current and resistance □ relationship between voltage, current and resistance T7 Resistors encompassing: □ features of fixed and variable resistor types and typical applications □ identification of fixed and variable resistors □ various types of fixed resistors used in the Electro technology Industry. e.g. wire-wound, carbon film, tapped resistors.

has on the resistance of a conductor □ effects of temperature change on the resistance of various conducting materials □ effects of resistance on the current-carrying capacity and voltage drop in cables □ techniques for calculation of the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature □ using digital and analogue ohmmeter to measure the change in resistance of different types of conductive materials (copper, aluminium, nichrome and tungsten) when those materials undergo a change in type of material length, cross-sectional area and temperature □ series/parallel circuits including: □ schematic diagram of a single source d.c. series/parallel circuit □ identification of the major components of a series/parallel circuit (power supply,	□ various types of variable resistors used in the Electro technology Industry e.g. adjustable resistors: potentiometer and rheostat; light dependent resistor (LDR); voltage dependent resistor (VDR) and temperature dependent resistor (NTC, PTC). □ characteristics of temperature, voltage and light dependent resistors and typical applications of each □ power ratings of a resistor. □ power loss (heat) occurring in a conductor. UEENEEE104A Solve problems in d.c. circuits Date this document was generated: 20 June 2017 Approved Page 2837 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ resistance of a colour coded resistor from colour code tables and confirm the value by measurement. □ measurement of resistance of a range of

protection device, switch and loads) □ applications where series/parallel circuits are used in the electrotechnology industry □ characteristics of a series/parallel circuit (load connection, current paths, voltage drops, power dissipation, and effects of an open circuit in a series/parallel circuit) □ relationship between voltages, currents and resistances in a bridge network □ calculation of the total: □ resistance of a series/parallel circuit □ current of a series/parallel circuit □ voltage and the individual voltage drops of a series/parallel circuit □ techniques for setting up and connecting a single source d.c. series/parallel circuit □ resistance, voltage and current measurements in a single source d.c. series/parallel circuit □ the voltage, current, resistances or power dissipated from measured values of any two of	variable' resistors under varying conditions of light, voltage, temperature conditions. □ specifying a resistor for a particular application. T8 Series circuits encompassing: □ circuit diagram of a single-source d.c. 'series' circuit. □ Identification of the major components of a 'series' circuit: power supply; loads; connecting leads and switch □ applications where 'series' circuits are used in the Electro technology industry. □ characteristics of a 'series' circuit - connection of loads, current path, voltage drops, power dissipation and affects of an open circuit in a 'series' circuit. □ the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities □ relationship between voltage drops and resistance in a simple voltage divider network.

these quantities □ parallel circuits including: □ schematic diagram of a single source d.c. parallel circuit □ identification of the major components of a parallel circuit (power supply, protection device, switch and loads) □ applications where parallel circuits are used in the electrotechnology industry □ characteristics of a parallel circuit (load connection, current paths, voltage drops, power dissipation, and effects of an open circuit in a parallel circuit) □ relationship between currents entering a junction and currents leaving a junction □ relationship between branch currents and resistances in a two-branch current divider Assessment Requirements for UEECD0044 Solve problems in multiple path circuits Date this document was generated: 6 October 2020 Approved Page 808 of 4588	□ setting up and connecting a single-source series dc circuit □ measurement of resistance, voltage and current values in a single source series circuit □ effect of an open-circuit on a series connected circuit T9 Parallel circuits encompassing: □ schematic diagram of a single-source d.c. 'parallel' circuit. □ major components of a 'parallel' circuit (power supply, loads, connecting leads and switch) □ applications where 'parallel' circuits are used in the Electrotechnology industry. □ characteristics of a 'parallel' circuit. (load connection, current paths, voltage drops, power dissipation, affects of an open circuit in a 'parallel' circuit). □ relationship between currents entering a junction and currents leaving a junction □ relationship between branch currents and resistances in a two branch current divider

© Commonwealth of Australia, 2020 Australian Industry Standards network □ methods to calculate total: □ resistance of a parallel circuit □ current of a parallel circuit □ voltage and the individual voltage drops of a parallel circuit □ techniques for setting up and connecting a single source d.c. parallel circuit □ resistance, voltage and current measurements in a single source parallel circuit □ voltage, current, resistance or power dissipated from measured values of any of these quantities □ output current and voltage levels of connecting cells in parallel □ meters in a circuit, including: □ types, operating characteristics and purpose of instruments/meters used to measure	network. □ calculation of the total resistance of a ‘parallel’ circuit. □ calculation of the total current of a ‘parallel’ circuit. □ Calculation of the total voltage and the individual voltage drops of a ‘parallel’ circuit. □ setting up and connecting a single-source d.c. parallel circuit □ resistance, voltage and current measurements in a single-source parallel circuit □ voltage, current, resistance or power dissipated from measured values of any of these quantities □ output current and voltage levels of connecting cells in parallel. schematic diagram of a single-source d.c. ‘series/parallel’ circuit. □ major components of a ‘series/parallel’ circuit (power supply, loads, connecting leads and switch)

voltage, current, resistance and insulation resistance □ advantages and disadvantages of different instruments/meters commonly used in the field □ hazards involved in using electrical instruments/meters and relevant safety control measures □ techniques to correctly connect and accurately read instruments/meters used in the field and common errors that may occur when connecting and reading meters □ consequences of incorrect connection of instruments/meters into a circuit □ techniques for calculation of resistance values using voltmeter and ammeter reading □ resistance measurement, including: □ types, operating characteristics, purpose and storage of instruments to measure resistance (including insulation resistance) □ functions of various analogue and digital	□ applications where 'series/parallel' circuits are used in the Electrotechnology industry. □ characteristics of a 'series/parallel' circuit. (load connection, current paths, voltage drops, power dissipation, affects of an open circuit in a 'series/parallel' circuit). □ relationship between voltages, currents and resistances in a bridge network. □ calculation of the total resistance of a 'series/parallel' circuit. □ calculation of the total current of a 'series/parallel' circuit. □ calculation of the total voltage and the individual voltage drops of a 'series/parallel' circuit. □ setting up and connecting a single-source d.c. series/ parallel circuit □ resistance, voltage and current measurements in a single-source d.c. series / parallel circuit □ the voltage, current, resistances or power

insulation resistance testers □ reasons why the supply must be isolated prior to using the insulation resistance tester □ where and why the continuity test and insulation resistance test would be used in an electrical installation □ the voltage ranges of an insulation resistance tester and where each range may be used □ AS/NZS 3000 requirements for resistance measurement/testing □ purpose and method to carry out a calibration check on an resistance tester □ techniques for measurement of: □ low values of resistance using a resistance tester continuity functions □ high values of resistance using a resistance tester insulation resistance function □ resistance using volt-ammeter methods □ capacitors and capacitance including: □ techniques for identification of various types of capacitors commonly used in the electrotechnology industry	dissipated from measured values of any two of these quantities T11 Factors affecting resistance encompassing: □ four factors that affect the resistance of a conductor (type of material, length, cross-sectional area and temperature) □ affect the change in the type of material (resistivity) has on the resistance of a conductor. □ affect the change in 'length' has on the resistance of a conductor. □ affect the change in 'cross-sectional area' has on the resistance of a conductor. □ effects of temperature change on the resistance of various conducting materials □ effects of resistance on the current-carrying capacity and voltage drop in cables. □ calculation of the resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature

circuit symbol of various types of capacitors: standard, variable, trimmer and polarised terms and units for capacitance and electric charge behaviour of a series d.c. circuit containing resistance and capacitance components. - charge and discharge curves Assessment Requirements for UEECD0044 Solve problems in multiple path circuits Date this document was generated: 6 October 2020 Approved Page 809 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards techniques for calculation of quantities from given information: capacitance, charge and voltage techniques for calculation one time constant as well as the time taken to fully charge and discharge a given capacitor	using digital and analogue ohmmeter to measure the change in resistance of different types of conductive materials (copper, aluminium, nichrome, tungsten) when those materials undergo a change in type of material length, cross-sectional area and temperature. T12 Effects of meters in a circuit encompassing: selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application. measuring resistance using direct, volt-ammeter and bridge methods. instruments used in the field to measure voltage, current, resistance and insulation resistance and the typical circumstances in which they are used. hazards involved in using electrical instruments and the safety control measures that should be taken. operating characteristics of analogue and

techniques for connection of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit capacitors in series and parallel, including: hazards involved in working with capacitance effects and the safety control measures that should be taken safe handling and the correct methods of discharging various size capacitors dangers of a charged capacitor and the consequences of discharging a capacitor through a person effects of capacitors connected in parallel by calculating their equivalent capacitance effects on the total capacitance of capacitors connected in series by calculating their equivalent capacitance techniques for connecting capacitors in series and/or parallel configurations to	digital meters. UEENEEE104A Solve problems in d.c. circuits Date this document was generated: 20 June 2017 Approved Page 2839 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE correct techniques to read the scale of an analogue meters and how to reduce the 'parallax' error. types of voltmeters used in the Electrotechnology industry – bench type, clamp meter, Multimeter, etc. purpose and characteristics (internal resistance, range, loading effect and accuracy) of a voltmeter. types of voltage indicator testers. e.g. LED, neon, solenoid, volt-stick, series tester, etc. and explain the purpose of each voltage indicator tester.

achieve various capacitance values □ common faults in capacitors □ techniques for testing of capacitors to determine serviceability □ application of capacitors in the electrotechnology industry	□ operation of various voltage indicator testers. □ advantages and disadvantages of each voltage indicator tester. □ various types of ammeters used in the Electrotechnology industry – bench, clamp meter, multimeter, etc. □ purpose of an ammeter and the correct connection (series) of an ammeter into a circuit. □ reasons why the internal resistance of an ammeter must be extremely low and the dangers and consequences of connecting an ammeter in parallel and/or wrong polarity. □ selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application □ connecting an analogue/digital voltmeter into a circuit ensuring the polarities are correct and take various voltage readings. □ loading effect of various voltmeters when measuring voltage across various loads.

	□ using voltage indicator testers to detect the presence of various voltage levels. □ connecting analogue/digital ammeter into a circuit ensuring the polarities are correct and take various current readings. T13 Resistance measurement encompassing: □ Identification of instruments used in the field to measure resistance (including insulation resistance) and the typical circumstances in which they are used. □ the purpose of an Insulation Resistance (IR) Tester. □ the parts and functions of various analogue and digital IR Tester (selector range switch, zero ohms adjustment, battery check function, scale and connecting leads). □ reasons why the supply must be isolated prior to using the IR tester. □ where and why the continuity test would be used in an electrical installation. □ where and why the insulation resistance test would be used in an electrical installation.

	the voltage ranges of an IR tester and where each range may be used. e.g. 250 V d.c, 500 V d.c and 1000 V d.c AS/NZS3000 Wiring Rules requirements – continuity test and insulation resistance (IR) test. purpose of regular IR tester calibration. the correct methods of storing the IR tester after use carry out a calibration check on a IR Tester UEENEEE104A Solve problems in d.c. circuits Date this document was generated: 20 June 2017 Approved Page 2840 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE measurement of low values of resistance using an IR tester continuity functions. measurement of high values of resistance using an IR tester insulation resistance

	function. • volt-ammeter (short shunt and long shunt) methods of measuring resistance. • calculation of resistance values using voltmeter and ammeter reading (long and short shunt connections) • measurement of resistance using volt-ammeter methods T14 Capacitors and Capacitance encompassing: • basic construction of standard capacitor, highlighting the: plates, dielectric and connecting leads • different types of dielectric material and each dielectric's relative permittivity. • identification of various types of capacitors commonly used in the Electrotechnology industry (fixed value capacitors -stacked plate, rolled, electrolytic, ceramic, mica and Variable value capacitors – tuning and trimmer) • circuit symbol of various types of

	capacitors: standard; variable, trimmer and polarised • terms: Capacitance (C), Electric charge (Q) and Energy (W) • unit of: Capacitance (Farad), Electric charge (Coulomb) and Energy (Joule) • factors affecting capacitance (the effective area of the plates, the distance between the plates and the type of dielectric) and explain how these factors are present in all circuits to some extent. • how a capacitor is charged in a d.c. circuit. • behaviour of a series d.c. circuit containing resistance and capacitance components. - charge and discharge curves • the term ‘Time Constant’ and its relationship to the charging and discharging of a capacitor. • calculation of quantities from given information: Capacitance (Q = VC); Energy

	(W =½CV2); Voltage (V = Q/C) □ calculation one time constant as well as the time taken to fully charge and discharge a given capacitor. (τ = RC) □ connection of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit T15 Capacitors in Series and Parallel encompassing: □ hazards involved in working with capacitance effects and the safety control measures that should be taken. □ safe handling and the correct methods of discharging various size capacitors □ dangers of a charged capacitor and the consequences of discharging a capacitor through a person □ factors which determine the capacitance of a capacitor and explain how these factors are present in all circuits to some extent. □ effects of capacitors connected in parallel

	by calculating their equivalent capacitance. UEENEEE104A Solve problems in d.c. circuits Date this document was generated: 20 June 2017 Approved Page 2841 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ effects on the total capacitance of capacitors connected in series by calculating their equivalent capacitance. □ Connecting capacitors in series and/or parallel configurations to achieve various capacitance values. □ common faults in capacitors. □ testing of capacitors to determine serviceability. □ application of capacitors in the Electrotechnology industry.

UEECD0046 Solve problems in single path circuits	UEENEEE104A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include Assessment Requirements for UEECD0046 Solve problems in single path circuits Date this document was generated: 6 October 2020 Approved Page 821 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards knowledge of: □ electrical concepts, including: □ static and current electricity □ production of electricity by renewable and non-renewable energy sources □ transportation of electricity from the	KS01-EE104A Direct current circuits Evidence shall show an understanding of electrical fundamentals and direct current multiple path circuits to an extent indicated by the following aspects: T1 Basic electrical concepts encompassing: □ electrotechnology industry □ static and current electricity □ production of electricity by renewable and non renewable energy sources □ transportation of electricity from the source to the load via the transmission and distribution systems □ utilisation of electricity by the various loads □ basic calculations involving quantity of electricity, velocity and speed with relationship to the generation and transportation of electricity.

source to the load via the transmission and distribution systems • utilisation of electricity by the various loads • basic calculations involving quantity of electricity • electrical circuits, including: • symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram • purpose of each component in the circuit • effects of an open circuit, a closed circuit and a short circuit • multiple and sub-multiple units • Ohm's Law including: • direct current (d.c.) single path circuit • voltage and currents levels in a basic d.c. single path circuit • effects of an: • open circuit • a closed circuit and a short circuit on a basic d.c. single path	T2 Basic electrical circuit encompassing: • symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram • purpose of each component in the circuit • effects of an open-circuit, a closed-circuit and a short-circuit • multiple and sub-multiple units T3 Ohm's Law encompassing: • basic d.c. single path circuit. • voltage and currents levels in a basic d.c. single path circuit. • effects of an open-circuit, a closed-circuit and a short-circuit on a basic d.c. single path relationship between voltage and current from measured values in a simple circuit • determining voltage, current and resistance in a circuit given any two of these quantities • graphical relationships of voltage, current and resistance

□ relationship between voltage and current from measured values in a simple circuit □ determining voltage, current and resistance in a circuit given any two of these quantities □ graphical relationships of voltage, current and resistance □ relationship between voltage, current and resistance □ electrical power, including: □ relationship between force, power, work and energy □ power dissipated in circuit from voltage, current and resistance values □ power ratings of devices □ methods for measuring electrical power in a d.c. circuit □ effects of power rating of various resistors □ effects of electrical current, including: □ physiological effects of current □ principles by which an electric current can produce heat, light, motion and a chemical reaction	□ relationship between voltage, current and resistance UEENEEE104A Solve problems in d.c. circuits Date this document was generated: 20 June 2017 Approved Page 2836 of 10651 REQUIRED SKILLS AND KNOWLEDGE T4 Electrical power encompassing: □ relationship between force, power, work and energy □ power dissipated in circuit from voltage, current and resistance values □ power ratings of devices □ measurement electrical power in a d.c. circuit □ effects of power rating of various resistors T5 Effects of electrical current encompassing: □ physiological effects of current and the fundamental principles (listed in AS/NZS 3000) for protection against the this effect

□ typical uses of the effects of current □ mechanisms by which metals corrode □ fundamental principles listed in AS/NZS 3000 for protection against the damaging effects of current □ electromotive force (EMF) sources and conversion of electrical energy, including: □ input/output (I/O), efficiency and losses of electrical systems and machines Assessment Requirements for UEECD0046 Solve problems in single path circuits Date this document was generated: 6 October 2020 Approved Page 822 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ principles of generating an EMF, including: □ when a mechanical force is applied to a crystal □ when moving a conductor in a magnetic field □ by the application of light falling on the	□ basic principles by which electric current can result in the production of heat; the production of magnetic fields; a chemical reaction □ typical uses of the effects of current □ mechanisms by which metals corrode □ fundamental principles (listed in AS/NZS3000) for protection against the damaging effects of current T6 EMF sources energy sources and conversion electrical energy encompassing: □ basic principles of producing a emf from the interaction of a moving conductor in a magnetic field. □ basic principles of producing an emf from the heating of one junction of a thermocouple. □ basic principles of producing a emf by the application of sun light falling on the surface of photovoltaic cells □ basic principles of generating a emf when a mechanical force is applied to a crystal

surface of photovoltaic (PV) cells □ from the heating of one junction of a thermocouple □ principles of producing an electrical current from primary, secondary and fuel cells □ resistors, including: □ types and applications of fixed and variable resistors used in the electrotechnology industry □ identification of fixed and variable resistors □ characteristics of temperature, voltage and light dependent resistors and typical applications of each □ power ratings of a resistor □ power loss (heat) occurring in a conductor □ resistor colour code tables □ specifying a resistor for a particular application □ series circuits, including: □ circuit diagram of a single source single	(piezo electric effect) □ principles of producing a electrical current from primary, secondary and fuel cells □ input, output, efficiency or losses of electrical systems and machines □ effect of losses in electrical wiring and machines □ principle of conservation of energy T7 Resistors encompassing: □ features of fixed and variable resistor types and typical applications □ identification of fixed and variable resistors □ various types of fixed resistors used in the Electro technology Industry. e.g. wire-wound, carbon film, tapped resistors. □ various types of variable resistors used in the Electro technology Industry e.g. adjustable resistors: potentiometer and rheostat; light dependent resistor (LDR); voltage dependent resistor (VDR) and temperature dependent resistor (NTC, PTC). □ characteristics of temperature, voltage and

path circuit □ identification of the major components of a series circuit: power supply, protection device, switch and loads □ applications where series circuits are used in the electrotechnology industry □ characteristics of a series circuit - connection of loads, current path, voltage drops, power dissipation and effects of an open circuit in a series circuit □ the voltage, current, resistances or power dissipated from measured or given values of any two of these quantities □ relationship between voltage drops and resistance in a simple voltage divider network □ techniques for setting up and connecting a single source single path circuit □ methods for measurement of resistance, voltage and current values in a single source single path circuit	light dependent resistors and typical applications of each □ power ratings of a resistor. □ power loss (heat) occurring in a conductor. UEENEEE104A Solve problems in d.c. circuits Date this document was generated: 20 June 2017 Approved Page 2837 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ resistance of a colour coded resistor from colour code tables and confirm the value by measurement. □ measurement of resistance of a range of variable' resistors under varying conditions of light, voltage, temperature conditions. □ specifying a resistor for a particular application. T8 Series circuits encompassing: □ circuit diagram of a single-source d.c.

effect of an open circuit on a series connected circuit.	‘series’ circuit.
	  Identification of the major components of a ‘series’ circuit: power supply; loads;
	connecting leads and switch
	  applications where ‘series’ circuits are used in the Electro technology industry.
	  characteristics of a ‘series’ circuit - connection of loads, current path, voltage drops,
	power dissipation and affects of an open circuit in a ‘series’ circuit.
	  the voltage, current, resistances or power dissipated from measured or given values
	of any two of these quantities
	  relationship between voltage drops and resistance in a simple voltage divider
	network.
	  setting up and connecting a single-source series dc circuit
	  measurement of resistance, voltage and current values in a single source series
	circuit
	  effect of an open-circuit on a series

	connected circuit

‘UEEEL0008 Evaluate and modify low voltage heating equipment and

controls*

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UEEEL0008 Evaluate and modify low voltage heating equipment and controls*	UEENEEG033A+UEENEEG108A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: electrical heating control devices, including: Assessment Requirements for UEEEL0008 Evaluate and modify low voltage heating equipment and controls Date this document was generated: 6 October 2020	T4 Electrical heating control devices encompassing: methods of manual heat control. methods of automatic heat control. types and application for common thermostats. operation of common thermostats. sensitivity and differential of thermostats. testing of a thermostat (including differential and correct operation) applications of simmerstats (infinite controls). operation of a simmerstat. electronic heat control (phase control and

Approved Page 1906 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ methods of manual heat control □ methods of automatic heat control □ types and application for common thermostats □ operation of common thermostats, thermal cut-outs and pressure relief valves, flow switches and checking sacrificial anodes □ sensitivity and differential of thermostats □ techniques for testing a thermostat, including differential and correct operation □ applications and operation of simmerstats □ electronic heat control □ fixed electrical heating appliances, including: □ terminology: heat energy, temperature, specific heat capacity, thermal conductivity and thermal stability □ methods to test the heat energy in a simple heating process □ methods of heat transfer	zero voltage switching). T5 Fixed electrical heating appliances encompassing: □ Terms: heat energy, temperature, specific heat capacity, thermal conductivity and thermal stability. □ determining the heat energy in joules and kWh in a simple heating process. □ methods of heat transfer. □ Determining the heat energy input and output of a heating process. □ connections to a two phase stove. □ operation of reverse cycle air conditioning. T6 Electrical water heater operation encompassing: □ types of water heaters (instantaneous and storage) and their methods of control. □ intrinsic safety (pressure relief and thermal cut-out). □ testing of over temperature cut-out point of a thermostat. □ switchboard requirements to supply a controlled load water heater.

▯ connections to a two phase stove ▯ operation of reverse cycle air conditioning ▯ electrical water heater operation, including: ▯ types of water heaters (instantaneous and storage) and their methods of control ▯ intrinsic safety (pressure relief and thermal cut-out) ▯ techniques for testing of over temperature cut-out of a thermostat ▯ switchboard requirements to supply a controlled load water heater ▯ internal circuit of a twin element water heater and supply connections ▯ solar heating system and its integration into an electrical installation ▯ heat pump ▯ faults in heating equipment and controls, including: ▯ circuit diagrams of common heating equipment and controls ▯ single phase and three phase element resistance values ▯ techniques for testing single and three phase	▯ internal circuit of a twin element water heater, and supply connections. ▯ tariffs employed by local supply authorities. ▯ solar heating system and its integration into an installation. UEENEEG108A T2 Troubleshooting water heater and appliance circuits/equipment encompassing: ▯ circuit diagrams of common single phase and three phase hot water systems ▯ single phase and three phase element resistance values (determined from measurement and calculation from power and voltage ratings) ▯ testing single and three phase elements for correct insulation resistance and continuity ▯ element replacement techniques ▯ operation of thermostats, thermal cut-outs and pressure relief valves, flow switches and checking sacrificial anodes UEENEEG108A Trouble-shoot and repair faults in low voltage electrical apparatus and circuitsDate

elements for correct insulation resistance and continuity □ equipment replacement techniques □ techniques for identifying and locating faulty components in heating equipment/controls □ common types of faults □ techniques for repairing/replacing faulty heating equipment components □ relevant job safety assessments or risk mitigation processes □ relevant manufacturer specifications □ relevant WHS/OHS legislated requirements □ relevant workplace documentation □ relevant workplace policies and procedures □ relevant industry standards.	this document was generated: 20 June 2017 Approved Page 3662 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ locating faults in common single and three phase hot water systems

UEEEL0009 Evaluate and modify low voltage lighting circuits,

equipment and controls*

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UEEEL0009 Evaluate and modify low voltage lighting circuits,	UEENEEG033A+UEENEEG108A

equipment and controls	
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: □ loop at the light method of wiring lighting circuits □ loop at the switch method of wiring lighting circuits Assessment Requirements for UEEEL0009 Evaluate and modify low voltage lighting circuits, equipment and controlsDate this document was generated: 6 October 2020 Approved Page 1913 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ installation methods of accessories and wiring for a lighting circuit incorporating one-way, two-way and intermediate switching of lighting	KS01-EG033A Electrical apparatus and circuits Evidence shall show an understanding of electrical apparatus and circuits to an extent indicated by the following aspects: T1 Lighting circuits – looping at the light/switch encompassing: □ the “loop at the light” method of wiring lighting circuits. □ the “loop at the switch” method of wiring lighting circuits □ wiring diagrams for the lighting circuit of an installation that incorporates one-way, two-way and two-way and intermediate switching of light points using the loop at the light/switch methods of TPS wiring. □ TPS cabling requirement for the loop at the light/switch circuit. □ installation methods of accessories and wiring for a lighting circuit incorporating one-way, two-way and two-way and intermediate switching of lighting points using the loop at the light/switch method of TPS

points using the loop at the light/switch method of TPS wiring • TPS cabling requirement for the loop at the light/switch circuit • correct operation of the installed circuits including testing for compliance with industry standards • emergency and evacuation lighting and lighting control, including: • factors and requirements of emergency and evacuation lighting concerning illumination levels, luminaire positioning and operating period • characteristics of maintained, non-maintained and sustained emergency lighting systems • arrangement of batteries in point and central bank emergency lighting supply systems • lighting control methods • principles of lighting technology, including: • basic electrical terminology • colour theory • lighting techniques	wiring. • correct operation of the install circuits including testing for correct compliance with Australian Standards. 10 Emergency and evacuation lighting and lighting control encompassing: • factors and requirements of emergency and evacuation lighting concerning illumination levels, luminaire positioning and operating period. • characteristics of maintained, non maintained and sustained emergency lighting systems. • arrangement of batteries in point and central bank emergency lighting supply systems. • lighting control methods T11 Lighting concepts and incandescent lighting encompassing: • basic concepts of lighting. • terminology, principles and standards relevant to lighting (energy efficiency as per BCA new lamp types and permitted

local Supply Authority requirements for maintaining high power factor terminology, principles and standards relevant to lighting (energy efficiency as per National Construction Code (NCC)) types of luminaires: different types of luminaires, their features and purpose operation of different types of luminaires expected lamp life, colour rendering and efficacy for typical types of different types of luminaires lighting circuits, equipment and controls used for the following applications: commercial industrial domestic lighting layout in terms of visual comfort and relevant Australian Standards Australian Standards and local requirements for lighting light-emitting diode (LED) lighting and its	replacements and their efficacy).. basic types of luminaries. operation of an incandescent lamp. types of incandescent lamps. expected lamp life, colour rendering and efficacy for typical incandescent lamps. lighting layout in terms of visual comfort and relevant Australian standards T12 Fluorescent low intensity discharge lighting encompassing: types of low intensity discharge lamps. expected lamp life, colour rendering and efficacy for typical types of low intensity discharge lamps. operation of low intensity discharge luminaires including their control equipment. Australian Standard and local requirements for low intensity discharge lighting. methods for satisfying Australian Standards and local supply authority requirements regarding low intensity discharge lighting. T13 High intensity discharge lighting

applications □ Neon, Argon and Xenon lighting and their applications □ comparison of incandescent, low intensity discharge, high intensity discharge, LED and other types of lighting □ fire protection – residential fire and smoke alarms, including: □ types of fire and smoke alarms □ regulations and standards requirements regarding residential fire and smoke alarms □ locations for residential fire and smoke alarms □ wiring methods for residential fire and smoke alarms □ operation of typical residential fire and smoke alarms □ identifying faults in luminaires and auxiliary/control equipment, including circuit and wiring diagrams of common lighting circuits, including: Assessment Requirements for UEEEL0009 Evaluate and modify low voltage lighting circuits,	encompassing: □ types of high intensity discharge lamps. UEENEEG033A Solve problems in single and three phase low voltage electrical apparatus and circuits Date this document was generated: 20 June 2017 Approved Page 3523 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ expected lamp life, colour rendering and efficacy for typical types of high intensity discharge lamps. □ operation of high intensity discharge luminaires including their control equipment. □ Australian Standard and local requirements for high intensity discharge lighting. □ methods for satisfying Australian Standards and local supply authority requirements regarding high intensity discharge lighting. □ LED lighting and its applications. □ Neon, Argon and Xenon lighting and their

equipment and controlsDate this document was generated: 6 October 2020 Approved Page 1914 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ common fault symptoms and associated causes □ common faults in luminaires and auxiliary/control equipment □ techniques for repairing/replacing faulty lighting components □ input and output parameters of equipment incorporating electronic components for; controlling/switching lighting, controlling/switching motors, energy measurement and control, rectifying and inverting electrical supplies □ hazards and safety requirements related to equipment incorporating electronic components used in electrical systems □ relevant manufacturer specifications.	applications. □ comparison of incandescent, low intensity discharge, high intensity discharge, LED and other types of lighting UEENEEG108A T4 Troubleshooting lighting circuits encompassing: □ circuit and wiring diagrams of common lighting circuits including single light controlled by a single switch, multiple lights controlled by a single switch, two and three way switching using the loop at the light method and the loop at the switch method. □ causes of wiring faults from supplied symptoms and circuit and/or wiring diagrams □ causes of faults in ELV lighting devices, include transformer (iron core or electronic), voltage drop, heat, over-voltage, poor connections, incompatible dimmers □ diagrams of a basic fluorescent light circuit including lamp, ballast and starter □ locating faults in fluorescent light circuits □ operation of a range of lighting control

	including passive infra-red (PIR), dimmers, photo electric or day-light switches and time clocks locating faults in lighting control circuits

UEEEL0010 Evaluate and modify low voltage socket outlets circuits* 20

UEEEL0010 Evaluate and modify low voltage socket outlets circuits* 20	UEENEEG033A+UEENEEG108A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: circuits for socket outlets, including: different types of socket outlets and their purpose requirements concerning the polarity of switched socket outlets techniques for checking for phase rotation for	T2 Circuits for socket outlets encompassing: the purpose of socket outlets. requirements concerning the polarity of switched socket outlets. correct cable size to supply 10 A, 15 A and 20 A socket outlets (single and three phase), for given installation conditions. number of socket outlets connected to a 16 A and 20 A circuit breaker. installation methods of a single phase socket outlet circuits. correct operation of the installed circuits including testing (dead testing only) for

three phase outlets Assessment Requirements for UEEEL0010 Evaluate and modify low voltage socket outlets circuits Date this document was generated: 6 October 2020 Approved Page 1920 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ correct cable size to supply 10 ampere (A), 15 A, 20 A and 32 A socket outlets (single and three phase) for given installation conditions □ verifying number of socket outlets connected to a 16 A and 20 A circuit breaker in accordance with industry standards □ installation methods of single phase socket outlet circuits □ correct operation of the installed circuits, including dead testing for correct in accordance with industry standards □ circuit protection and residual current device (RCD) requirements for socket outlets circuits □ use of cable support systems for pendant outlets	correct compliance with Australian Standards. T3 Final sub-circuits and segregation encompassing: □ purpose of mixed circuits. □ circuit loading for a mixed circuit. □ purpose of segregation of circuits and the AS/NZS3000 requirements. UEENEEG033A Solve problems in single and three phase low voltage electrical apparatus and circuits Date this document was generated: 20 June 2017 Approved Page 3521 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ Installation methods a single phase mixed circuits. □ correct operation of the installed circuits including testing for correct compliance with Australian Standards.

▯ socket outlets for vehicle charging ▯ final sub-circuits and segregation, including: ▯ purpose of mixed circuits ▯ circuit loading for a mixed circuit ▯ purpose of segregation of circuits and the AS/NZS 3000 requirements ▯ installation methods a single phase mixed circuit ▯ verifying correct operation of the installed circuits, including testing for correct compliance with industry standards ▯ identifying faults in socket outlets circuits including: ▯ circuit diagrams, wiring diagrams, cable schedules and specifications of socket outlets circuits ▯ common fault symptoms and associated causes ▯ common faults in socket outlets circuits ▯ techniques for locating and repairing/replacing faulty socket outlets ▯ methods to determine the cause of RCD	UEENEEG108A KS01-EG108A Electrical circuit and equipment faults and fault finding techniques Evidence shall show an understanding of electrical circuit and equipment faults and fault finding techniques to an extent indicated by the following aspects: T1 Troubleshooting concepts encompassing: ▯ need to understand the correct operation of a circuit or equipment, switching and control circuit arrangements. ▯ common faults with circuits and equipment including operator faults, incorrect connections, open-circuits, short-circuits, device faults (mechanical), supply faults. ▯ typical faults symptoms and their causes: operation of circuit protective device, appliance does not operate, single phase motor does not develop enough torque to drive the load, three phase motor does not develop enough torque to drive the load, motor overload trips

operation in a socket outlets circuits □ hazards and safety requirements related to equipment incorporating electronic components used in electrical systems □ relevant manufacturer specifications.	□ factors to consider in clarifying the nature of a fault: initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal operation □ effect to cause reasoning — assumptions of possible causes □ methods for testing assumptions: visual inspection, component isolation, test equipment, sectional testing, split-half tests □ repairing the fault and the steps needed to ensure fault doesn't re-occur □ dealing with intermittent faults (typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference). □ final testing and re commissioning T4 Troubleshooting lighting circuits encompassing: □ circuit and wiring diagrams of common lighting circuits including single light controlled by a single switch, multiple lights controlled by a single switch, two and three way switching using the loop at the light method and

	the loop at the switch method. □ causes of wiring faults from supplied symptoms and circuit and/or wiring diagrams □ causes of faults in ELV lighting devices, include transformer (iron core or electronic), voltage drop, heat, over-voltage, poor connections, incompatible dimmers □ diagrams of a basic fluorescent light circuit including lamp, ballast and starter □ locating faults in fluorescent light circuits □ operation of a range of lighting control including passive infra-red (PIR), dimmers, photo electric or day-light switches and time clocks □ locating faults in lighting control circuits T3 Troubleshooting electrical appliance circuits/equipment encompassing: □ circuit diagrams of common single phase and three phase appliances □ methods to determine the cause of an RCD operation □ identification of appliances that is causing an RCD to trip

	testing single and three phase appliances for correct insulation resistance and continuity operation of appliances controls locating faults in common single and three phase appliances repairing faulty appliances T7 Troubleshooting electrical installations encompassing: circuit diagrams, wiring diagrams, cable schedules and specifications of electrical installations causes of electrical installation faults from supplied symptoms and circuit diagrams include open and partially open circuit wiring, short and partially short circuit wiring, low insulation resistance, incorrect polarity, transposition of conductors, RCD tripping. locating faults in electrical installations repairing faulty electrical installation circuits components and wiring.

UEEEL0012 Install low voltage wiring, appliances, switchgear and

associated accessories*

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UEEEL0012 Install low voltage wiring, appliances, switchgear and associated accessories	UEENEEG103+UEENEEG104A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: □ standards, codes and requirements applicable to the installation of wiring systems and electrical equipment, including: □ cables and methods of mechanical protection and support □ techniques for protection against and from other services □ identifying prohibited cable locations □ identifying systems with alternate supplies □ building codes affecting the installation of cables and current-using carrying equipment and accessories in buildings, structures and premises, including limitation on penetration of structural elements, maintenance of fire	UEENEEG103A KS01-EG103A Installation of wiring systems Evidence shall show an understanding of the installation of wiring systems that comply with standards to an extent indicated by the following aspects: T1 Standards, codes and requirements applicable to the installation of wiring systems encompassing: □ Cables and methods of mechanical protection and support □ Protection against and from other services. □ Prohibited cable locations □ Building codes affecting the installation of cables in buildings, structures and premises (limitation on penetration of structural elements, maintenance of fire protection integrity, and wiring above suspected ceilings) □ Issues affecting electrical installations in

protection integrity, requirements for emergency/safety services and wiring above suspected ceilings □ issues affecting electrical installations in heritage buildings and premises (limitation on penetration of structural and finished elements, accessing cable routes, types and colour of exposed accessories) □ techniques for protection against thermal effects □ required and permitted locations of current-using equipment and accessories □ control, switching, overcurrent and residual current device (RCD) protection □ equipotential bonding in accordance with AS/NZS 3000 and local supply authority requirements □ sizing of wiring enclosures based on space factor recommendations of AS/NZS 3000 Wiring Rules □ techniques for installing cables and wiring systems, including: □ typical cable routes through buildings,	heritage buildings and premises (limitation on penetration of structural and finished elements, accessing cable routes, types and colour of exposed accessories). T2 Use of other installation standards called up by the Wiring Rules for special situations encompassing: □ standards that apply to Electromedical treatment areas. □ additional requirements for construction and demolition sites. □ Relocatable installations and their site supply □ additional requirements for caravan park. □ additional requirements for marinas and pleasure craft at low voltage. □ additional requirements for shows and carnivals. T3 Hazardous areas encompassing: □ Conditions that apply in an areas that require them to be classified as a 'Hazardous area'. □ Responsibility for classifying a hazardous area

structures and premises - application of wiring accessories - drawing-in, placing and fixing of cables - cable and conductor terminations - methods of maintaining fire rating integrity - techniques for inspecting and testing installed and terminated cables to ensure they comply with continuity and insulation resistance and are safe to connect to the supply - connection of electrical equipment and terminal configuration for connection of phase, neutral and protective earthing conductors for the following types of equipment: - heating - lighting and smoke detectors - motors - transformers Assessment Requirements for UEEEL0012 Install low voltage wiring, appliances, switchgear and associated accessories Date this document was generated: 6 October 2020 Approved Page 1936 of 4588	- Awareness of standards called up by the Wiring Rules for selection of equipment and installations in Hazardous areas. (AS/NZS 3000 requirements for hazardous areas). T4 Requirement for the installation of cables and accessories in damp situations and UEENEEG103A Install low voltage wiring and accessories Date this document was generated: 20 June 2017 Approved Page 3590 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE ELV installations encompassing: - restricted zones around baths, showers, fixed water containers, pools, sauna heaters and fountains/water features for given installations. - selecting equipment suitable for installation in given damp situations. - voltage range that defines extra-low voltage. - 'Separated extra-low voltage (SELV) system' and a 'Protected extra-low voltage (PELV) system".

© Commonwealth of Australia, 2020 Australian Industry Standards - switchgear and accessories pendant socket outlets - appliances. - termination of subcircuit cabling at switchboards and connection to components including: - correct interconnection between switchgear, protection devices and links' - correct preparation for fitting and connection of local supply authority equipment - use of adequately sized cables - correct marking of equipment - clear identification of circuit neutral conductors - correct polarity - safe removal of equipment and termination of unused cable - varied and additional standards and requirements for special situations, including: - patient treatment areas - marinas and boats at LV	- AS/NZS 3000 requirements for selecting extra-low voltage systems and devices for a range of installations and conditions. T5 Aerial cabling encompassing: - Describe the types of aerial cabling. - State the AS/NZS 3000 and local supply authority requirements for aerial cabling. - Termination of aerial cables in accordance with AS/NZS 3000 and local requirements. - installation of consumers mains for connection via overhead consumers terminals in accordance with AS/NZS 3000 and local requirements. - Testing of installed cables compliance with Australian Standards T6 Underground cabling encompassing: - Describe permissible underground cabling systems. - Identify other underground services. - State the AS/NZS 3000 and local supply authority requirements for underground cabling. - List the advantages and disadvantages of

▯ transportable structures and vehicles and their site supplies ▯ shows and carnivals ▯ systems with alternate supplies ▯ methods for the installation, modification and testing of electrical installations and equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation including: ▯ supply requirements ▯ switchboards for the purpose of construction and demolition ▯ protection of circuits ▯ construction wiring ▯ lighting ▯ socket outlets ▯ circuits for lifts ▯ calibration of instruments ▯ inspection and testing methods ▯ initial and periodic inspection and testing ▯ identifying hazardous areas, including:	underground wiring systems ▯ selection of underground consumers mains in accordance with AS/NZS 3000 and local requirements T7 Techniques for installing cables and wiring systems encompassing: ▯ Typical cable routes through buildings, structures and premises. ▯ Application of wiring accessories ▯ Drawing-in, placing and fixing of cables ▯ Cable and conductor terminations ▯ Maintaining fire rating integrity. ▯ Inspecting and testing installed and terminated cables to ensure they comply with continuity and insulation resistance and are safe to connect to the supply. UEENEEG104A KS01-EG104A Installation of appliances, switchgear and accessories Evidence shall show an understanding of the installation of appliances (current-using

▯ additional training required to work competently with electrical equipment for hazardous areas ▯ nature of areas classified as a hazardous area ▯ responsibility for classifying a hazardous area ▯ awareness of standards called up by the Wiring Rules for selection, installation, inspection and maintenance of electrical equipment and installations in hazardous areas AS/NZS 3000 requirements for hazardous areas ▯ requirements for the installation of cables and accessories in damp situations and extra-low voltage (ELV) installations, including: ▯ restricted zones around baths, showers, fixed water containers, pools, sauna heaters and fountains/water features for given installations Assessment Requirements for UEEEL0012 Install low voltage wiring, appliances, switchgear and associated accessories Date this document was generated: 6 October 2020 Approved Page 1937 of 4588 © Commonwealth of Australia, 2020 Australian	equipment) and accessories to an extent indicated by the following aspects: T1 Installation standards, codes and requirements applicable to installing electrical equipment encompassing. ▯ Protection against thermal effects ▯ Connection of electrical equipment (appliances, switchgear and accessories include switchgear and controlgear, switchboards, socket-outlets, lighting equipment and accessories, lamps and luminaires, smoke and fire detectors, cooking appliances, appliances producing hot water or steam, room heaters, electric heating cables for floors and ceilings, space heating, duct heaters, electricity converters, motors, transformers, capacitors, and batteries). ▯ Required and permitted locations current-using equipment and accessories ▯ Control, switching and over current and RCD protection T2 Terminal configuration for connection of phase, neutral and protective earthing

Industry Standards □ techniques for selecting equipment suitable for installation in given damp situations □ voltage range that defines ELV □ use of RCDs for damp situations □ separated extra-low voltage (SELV) system and a protected extra-low voltage (PELV) system □ AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements for selecting ELV systems and devices for a range of installations and conditions □ equipotential bonding in showers, bathrooms, swimming and spa pools □ installation of aerial conductors and underground wiring including: □ AS/NZS 3000 requirements □ types and application of aerial conductors □ aerial span limitations and required clearances □ selection of aerial supporting poles/post and struts for a given application	conductors for each type of equipment. T3 Building codes affecting the installation of current-using equipment and accessories in buildings, structures and premises encompassing: □ maintenance of fire protection integrity, requirements for emergency services (safety services) and the like. T4 Issues affecting electrical installations in heritage buildings and premises encompassing: □ limitation on types and colour of exposed accessories

use and requirements of catenary support systems acceptable cable types and protection for underground wiring categories underground wiring depth and protection underground wiring clearances from other services techniques for termination of aerial cables techniques for testing of installed cables in compliance with Australian Standards install unprotected consumer's mains to reduce the risk of short-circuit to a minimum hazards and safety requirements related to equipment incorporating electronic components used in electrical systems.	

UEEEL0014 Isolate, test and troubleshoot low voltage electrical 60

circuits*

UEEEL0014 Isolate, test and troubleshoot low voltage electrical 60 circuits*	UEENEEG108A+Some parts of G105A

Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: • safety procedures for working on electrical systems, circuits and equipment • safe working practices as a normal part of carrying out electrical installation work • tools and equipment needed to conduct electrical installation compliance inspection and testing • legislation and regulations that require circuits and equipment to be inspected and tested to ensure they are safe • the person/bodies responsible for the various aspects of ensuring electrical installations are	UEENEEG108A KS01-EG108A Electrical circuit and equipment faults and fault finding techniques Evidence shall show an understanding of electrical circuit and equipment faults and fault finding techniques to an extent indicated by the following aspects: T1 Troubleshooting concepts encompassing: • need to understand the correct operation of a circuit or equipment, switching and control circuit arrangements. • common faults with circuits and equipment including operator faults, incorrect connections, open-circuits, short-circuits, device faults (mechanical), supply faults. • typical faults symptoms and their causes: operation of circuit protective device, appliance does not operate, single phase motor does not develop enough torque to

safe □ results of periodic inspection and tests that show construction site wiring and equipment is safe to use □ results of periodic inspection and tests that show electrical equipment are safe to use □ visual inspection of the electrical installation for compliance with regulatory requirements, including: □ protection requirements □ general condition □ mains/submains □ switchboards □ wiring systems □ equipment and accessories □ earthing □ regulatory requirements related to compliance testing, including: □ insulation resistance of mains, sub-mains and final sub-circuits	drive the load, three phase motor does not develop enough torque to drive the load, motor overload trips □ factors to consider in clarifying the nature of a fault: initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal operation □ effect to cause reasoning — assumptions of possible causes □ methods for testing assumptions: visual inspection, component isolation, test equipment, sectional testing, split-half tests □ repairing the fault and the steps needed to ensure fault doesn’t re-occur □ dealing with intermittent faults (typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference). □ final testing and re commissioning T3 Troubleshooting electrical appliance

□ earth continuity of the main earthing conductor, protective earthing conductors, combined protective earthing and neutral (PEN) conductors, and bonding conductors □ polarity of active, neutral and earth conductors including phase sequence and rotation □ correct connections of active, neutral and protective earthing conductors are tested to ensure no short circuits between conductors, no transposition of conductors that could result in the earthing system or exposed conductive parts becoming energised, and no interconnection of conductors between different circuits □ earth fault-loop impedance in both 'supply available' and 'no supply available' scenarios □ correct installation of RCDs, verification of their function, and verification of isolation of all switched poles □ testing requirements where multiple/alternate supplies are present,	circuits/equipment encompassing: □ circuit diagrams of common single phase and three phase appliances □ methods to determine the cause of an RCD operation □ identification of appliances that is causing an RCD to trip □ testing single and three phase appliances for correct insulation resistance and continuity □ operation of appliances controls □ locating faults in common single and three phase appliances □ repairing faulty appliances T4 Troubleshooting lighting circuits encompassing: □ circuit and wiring diagrams of common lighting circuits including single light controlled by a single switch, multiple lights controlled by a single switch, two and three way switching using the loop at the light method and the loop at the switch method.

including anti-islanding □ AS/NZS 3000 requirements for dealing with unused conductors and equipment □ importance of the MEN link when a fault occurs. □ likely consequences of the absence of the MEN link or high impendence in the PEN conductor when a fault occurs Assessment Requirements for UEEEL0014 Isolate, test and troubleshoot low voltage electrical circuits Date this document was generated: 6 October 2020 Approved Page 1956 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ requirements for installation of an MEN link in an installation and an outbuilding □ safety implications of high impedance or open circuit neutral faults □ ensure active/s and neutral for the same circuit are clearly identified with their circuit	□ causes of wiring faults from supplied symptoms and circuit and/or wiring diagrams □ causes of faults in ELV lighting devices, include transformer (iron core or electronic), voltage drop, heat, over-voltage, poor connections, incompatible dimmers □ diagrams of a basic fluorescent light circuit including lamp, ballast and starter □ locating faults in fluorescent light circuits □ operation of a range of lighting control including passive infra-red (PIR), dimmers, photo electric or day-light switches and time clocks □ locating faults in lighting control circuits + ADDITIONAL G105A T5 Fundamental safety principles of the AS/NZS 3000 Part 1 (Section 1) and deemed to comply solution given in Part 2 encompassing:

protection device □ tests that show all circuits and equipment operate as intended □ results of tests conducted on an installation to comply with requirements and ensure the installation is safe □ documentation of periodic testing and inspection of electrical equipment, including tagging requirements in accordance with AS/NZS 3760 □ techniques and procedures for the effective safe isolation of any equipment, including: □ preparation of a SWMS or JSA for effective safe isolation □ safe methods for identifying source of supply to be isolated, including alternate supplies □ switching-off, lock-out and tagging procedures □ safe methods for confirming effective and safe isolation of all energy sources	□ Definition of terms □ Fundamental safety principles of protection against direct and indirect contact with live parts; thermal effects; overcurrent; earth faults; abnormal voltages; spread of fire; mechanical injury and external influences. □ Fundamental principles of installation design; selection and installation of equipment; means of compliance (including alterations, additions and repairs) and verification of compliance. T7 Ability to apply AS/NZ 3000 requirements for protective and functional earthing encompassing: □ Purpose of protective and functional earthing. □ Parts of the protective earthing systems. □ Earthing arrangements, earthing of equipment and equipotential bonding.

□ industry standards related to isolation □ techniques and procedures for testing and verification of alternate supplies, including: □ purpose of tests, testing methods and equipment □ use of continuity and voltage testing meters □ direct current (d.c.) polarity, including switching and protection equipment □ earthing arrangements □ troubleshooting concepts, including: □ need to understand the correct operation of a circuit or equipment, switching and control circuit arrangements □ common faults with circuits and equipment, including: □ operator faults □ incorrect connections □ open circuits □ short circuits □ device faults (mechanical)	□ Methods of determining the maximum fault loop impedance for a circuit. □ Selection of protective conductor and active conductor sizes for each circuit to ensure earth-fault loop impedance is sufficiently low to operate the circuit protective device. T8 MEN system and its application encompassing: □ The roles of the protective earthing (PE) and neutral (N) conductors in an a consumer's installation and their relationship to the protective earth neutral (PEN) conductor in the electricity distributor's system or sub-main to an outbuilding. □ The importance of the MEN link when a fault occurs. □ The likely consequences of the absence of the MEN link or high impendence in the PEN conductor when a fault occurs. □ The requirements for installation of an MEN link in an installation and an outbuilding.

□ equipment/component failure □ supply faults □ insulation failure □ unsafe conditions □ earth leakage □ typical fault symptoms and their causes, including: □ operation of circuit protective device □ appliance does not operate □ factors to consider in clarifying the nature of a fault, including: □ initial fault report □ confirmation of symptoms of the fault □ comparison of symptoms with normal operation Assessment Requirements for UEEEL0014 Isolate, test and troubleshoot low voltage electrical circuits Date this document was generated: 6 October 2020 Approved Page 1957 of 4588 © Commonwealth of Australia, 2020	T10 Ability to apply AS/NZ 3000 requirements for protection of circuit against overcurrent and abnormal voltages encompassing: □ Minimum fault levels specified by electricity distributors □ Methods and arrangement for protection against short-circuit currents and overload currents. □ Coordination of overload and short-circuit protection devices. □ Coordination between conductors and overload protection devices. □ Causes of over and undervoltage. □ Device and requirements for protection against over and undervoltage. T11 Additional protection by use of RCDs and use of extra-low voltage for basic and fault protection encompassing: □ Limitation of an RCD to protect against contact with live parts □ AS/NZS 3000 requirements for use of RCDs.

Australian Industry Standards □ methods for testing ,including: □ visual inspection □ component isolation □ test equipment □ sectional testing □ dealing with intermittent faults (vibration, shock, changes in temperature and electromagnetic interference) □ final testing and re commissioning □ hazards and safety requirements related to equipment incorporating electronic components used in electrical systems.	□ Conditions for use of extra-low voltage to provide for basic and fault protection □ AS/NZS 3000 requirements for installation of SELV and PELV systems T14 Ability to apply AS/NZS 3000 requirements for control and protection of installations encompassing: □ Devices for functions of isolation; emergency; Mechanical maintenance and functional control. □ Method for assessing prospective short circuit current. □ Devices and arrangement for protection against overload and short-circuit current. □ Additional protection by RCD □ Protection against switchboard internal arc faults. T15 Ability to apply AS/NZS 3000 requirements for the installation of electrical equipment in given damp situations encompassing: □ Limitation of installation of equipment in

	classified zones. □ Selection and location of equipment suitable for installation in given classified zones. □ Additional protection by RCD. □ Equipotential bonding in showers and bathrooms and swimming and spa pools. T16 Ability to install, modify and test electrical equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation encompassing: □ Supply and installation requirements. □ Protection of circuits. □ Initial and periodic inspection and testing □ Portable tool safety testing and tagging system in accordance with AS/NZS 3760. T17 Knowledge of AS/NZS 3000 requirements for the installation of aerial conductors and underground wiring encompassing: □ Types and application of aerial conductors □ Aerial span limitations and required

	clearances Selection of aerial supporting poles/post and struts for a given application. Use and requirements of catenary support systems Acceptable cable types and protection for underground wiring categories. Underground wiring depth layer and protection Underground wiring clearances from other services T18 Knowledge of AS/NZS 3000 requirements for electrical installations in hazardous areas encompassing: Types of areas classified as a hazardous area Standards to which the selection, installation and maintenance of electrical equipment shall comply. Additional training required to work competently with electrical equipment for

	hazardous areas T19 Ability to verify compliance of an electrical installation in accordance with AS/NZS 3000 encompassing: □ Visual inspection to determine whether the installation complies with requirements set out in Section 2 to 7 of AS/NZS 3000 and relevant specific installation standards. □ Mandatory tests following guidance given in AS/NZS 3017 T20 Ability to perform effective safe isolation of any equipment encompassing: □ Preparation of a 'safe work method statement' (SWMS) or Job Safety Analysis (JSA) for effective safe isolation. □ Safe methods for identifying source of supply to be isolated. □ Switching-off, lock-out and tagging procedures. □ Safe methods for confirming effective and safe isolation T21 Ability to apply AS/NZS 3000

	requirements to install and terminate thermoplastic insulated cables; elastomer sheathed cables; XLPE sheathed cables; and high temperature cables; armoured cables; and neutral screened cables in a wide range of applications. T22 Ability to perform the circuit tests required for electrical cables in a range of installations and final sub-circuit encompassing: Following safe testing procedures. Tests to show if the earth continuity and earth-fault loop impedance are sufficiently low. Testing to show if insulation resistance is sufficiently high. Testing to show if the polarity and circuit connections are correct. T23 Ability to install final sub-circuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and electricity distributor’s requirements.

	T24 Ability to apply AS/NZS 3000 and electricity distributor's requirements for the installation and connect consumers mains encompassing: • Installing of underground and overhead consumers mains • Terminating consumers mains at pillars, pits mains connection boxes and consumers switchboard. • Install unprotected consumers mains to reduce the risk of short-circuit current to a minimum. • Installing bonding conductors where required.

UEEEL0047 Identify, shut down and restart systems with alternate supplies	UEENEEK148A for Grid Connected Supply System + G105A for Testing
Knowledge Evidence	UEENEEK148A

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: □ working safely with alternate supplies, including identifying hazards and controlling risks in compliance with regulatory and enterprise requirements □ main types, arrangements and configurations of alternative supplies (generating system), including renewable and non-renewable generating systems □ fundamental requirements, including: □ connection methods of alternative supplies □ local supply authority requirements □ characteristics and operation of uninterruptable power supplies (UPS) □ direct current (d.c.) polarity requirements,	REQUIRED SKILLS AND KNOWLEDGE T1 PV array installation requirements encompassing: □ OH&S requirements and methods for working on roofs. □ common methods of roof construction (rafters and tile battens) and methods to ensure integrity of waterproofing. □ common types of roof mounted and free-standing PV array frame construction and methods of tilt angle adjustment. □ fixing methods for different roof types. □ array mounting methods for north orientation roof sections and non-north facing roof sections. □ aesthetic considerations in choosing an appropriate array location and type of mounting. □ the mounting and fixing methods for at least one type of commercially available building integrated

including switching, correct rating of d.c. switches and protection devices □ importance of replacing components like-for-like □ inverter principles, including operation and interaction with the installation, anti-islanding and islanding requirements and testing requirements □ identification and labelling requirements and their purpose □ arrangement for connecting an alternative supply to an installation, including automatic and manual changeover switches, multiple main switches and switchboard wiring □ earthing arrangements, including equipotential bonding, and earthing methods and requirements for stand-alone systems and generators □ safe isolation of the generator/energy source, including: □ anti-islanding	PV product. T2 Electrical PV array installation requirements encompassing: □ methods used in wiring and connecting PV arrays as per the Australian Standards AS 4509 and AS5033 □ considerations involved in wiring of series connected PV modules in order to minimise power losses due to shading. □ PV array wiring diagram including the placement of blocking and bypass diodes. □ considerations involved in choosing the location of associated system equipment including regulators, d.c. control board, inverters and inverters for grid connected systems. □ cable route from PV array/s to inverters so as to minimise the route length. T3 System installation and maintenance

□ auto changeover/auto start □ backup – external power supply (EPS)/UPS mode or backup mode □ earth fault alarm □ voltage rise □ voltage parameters AS/NZS 4777 Grid connection of energy systems via inverters □ no loads □ deenergising charging sources such as solar charge controllers, and battery chargers □ AS/NZ 4836 Safe working on or near low-voltage electrical installations and equipment □ labelling and identification of alternate supply systems □ battery storage systems, including regulatory and manufacturer requirements □ relevant industry standards to which the selection, installation and control equipment of each type of system must comply, including: Assessment Requirements for UEEEL0047 Identify, shut down and restart systems with	encompassing: □ installation work on a PV power system in accordance with relevant standards and OH&S guidelines. □ correct isolation and shutdown procedures prior to carrying out maintenance tasks. □ routine maintenance tasks on PV arrays. □ required vegetation control to remove or reduce shading or soiling on a PV array T4 Inverters encompassing: □ types of inverters used in grid connected systems. □ AS symbol for a low voltage inverter □ the basic function of an inverter. □ simple block diagram of a typical inverter used in grid UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems Date this document was generated: 20

alternate suppliesDate this document was generated: 6 October 2020 Approved Page 2213 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) relating to the requirements for electricity generation systems installation and electricity converters □ AS/NZS 4777(series) Grid connection of energy systems via inverters □ AS/NZS 5033 Installation and safety requirements for photovoltaic (PV) arrays □ AS/NZS 3010 Electrical installations - generating sets □ AS/NZS 4509 (series) Stand-alone power systems □ AS 3011 Electrical installations - Secondary batteries installed in buildings □ AS/NZS 5139 Electrical installations -	June 2017 Approved Page 8313 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE connected system T5 Inverter operation encompassing: □ the basic principle of operation of a single phase inverter (using switch analogue) □ the operation of an inverter bridge and half-bridge configuration. □ operation of a FET inverter □ connection of a grid inverter and measurement of the inverter parameters for various loads T6 Inverter characteristics encompassing: □ the characteristics which distinguish inverters suitable for grid connected photovoltaic array application from standard

Safety of battery systems for use with power conversion equipment □ site and regulatory documentation requirements.	inverters. □ using waveform diagrams, the function of PWM techniques in square wave, modified square wave and synthesised sine wave inverters □ output voltage waveforms for square wave, modified square wave and synthesized sine wave inverters showing typical voltages and periodic times □ the six (6) essential inverter specifications T7 PV grid connected system operation encompassing: □ block diagram of a PV grid connected system. □ operation of grid interactive PV systems including synchronisation, safety feature, power flow control, passive and active anti-islanding, and metered energy for systems. □ schematic diagrams of common grid

	connected inverter circuit configurations including metering arrangements, isolation and connection with respect to RCDs in accordance with AS 4777.1. T8 Installation of grid connected inverters encompassing: □ major installation requirements for all system components which will ensure correct operation, long life, safety and ease of maintenance consistent with AS 4509, AS 4086.2, AS/NZS 3000 and relevant OH&S guidelines UEENEEK148A Install, configure and commission LV grid connected photovoltaic power systems Date this document was generated: 20 June 2017 Approved Page 8314 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards

	REQUIRED SKILLS AND KNOWLEDGE □ selection of a suitable location for the PV array, inverter and other components, at a given installation site in accordance with AS2676.2 and AS3011.2, and the considerations given in AS4509 and AS4086.2. □ typical installation configurations for grid connection of energy systems via inverters □ the function and operation of a "grid protection device" as specified in AS4777 □ array wiring plan for series connected modules to minimise power loss due to shading at a particular site. □ installation requirements for a grid connected system. □ labelling and signage requirements for switchboards supplied with power from grid connected inverters, as set out in AS

	4777.1. □ the additional requirements for UPS systems as specified in AS4777.1. □ installation of a PV grid connected system T9 System commissioning and maintenance encompassing: □ the isolation procedures required for grid connected inverters. □ relevant commissioning procedures including start-up and shut-down procedures for grid connected inverter systems in accordance with AS 4509. □ testing a grid connected inverter system for correct operation. □ location and rectification of an electrical fault within a PV array/inverter and wiring. □ maintenance schedule for a grid connected PV power system. □ performing commissioning work on a PV power system in

	accordance with AS 4509, AS 4086.2, AS/NZS 3000 and AS 3010. UEENEEG105A T13 Ability to select cables for final sub-circuits that comply with requirements of AS/NZS 3000 and AS/NZS 3008.1 encompassing: □ Maximum demand of final sub-circuits. □ Types of cables available. □ Installation methods and external influences effecting cable current-carrying capacity □ Effect of earth-fault loop impedance and voltage drop limitations on circuit route UEENEEG105A Verify compliance and functionality of low voltage general electrical installations Date this document was generated: 20 June 2017 Approved Page 3620 of 10651 © Commonwealth of Australia, 2017

	Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE length. □ Short-circuit performance considerations. T14 Ability to apply AS/NZS 3000 requirements for control and protection of installations encompassing: □ Devices for functions of isolation; emergency; Mechanical maintenance and functional control. □ Method for assessing prospective short circuit current. □ Devices and arrangement for protection against overload and short-circuit current. □ Additional protection by RCD □ Protection against switchboard internal arc faults. T16 Ability to install, modify and test electrical equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation encompassing:

	□ Supply and installation requirements. □ Protection of circuits. □ Initial and periodic inspection and testing □ Portable tool safety testing and tagging system in accordance with AS/NZS 3760 T20 Ability to perform effective safe isolation of any equipment encompassing: □ Preparation of a 'safe work method statement' (SWMS) or Job Safety Analysis (JSA) for effective safe isolation. □ Safe methods for identifying source of supply to be isolated. □ Switching-off, lock-out and tagging procedures. □ Safe methods for confirming effective and safe isolation T22 Ability to perform the circuit tests required for electrical cables in a range of installations and final sub-circuit encompassing: □ Following safe testing procedures. □ Tests to show if the earth continuity and

	earth-fault loop impedance are sufficiently low. • Testing to show if insulation resistance is sufficiently high. • Testing to show if the polarity and circuit connections are correct. T23 Ability to install final sub-circuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and electricity distributor's requirements. T24 Ability to apply AS/NZS 3000 and electricity distributor's requirements for the installation and connect consumers mains encompassing: • Installing of underground and overhead consumers mains • Terminating consumers mains at pillars, pits mains connection boxes and consumers switchboard. • Install unprotected consumers mains to reduce the risk of short-circuit current to a minimum.

	Installing bonding conductors where required. T25 Ability to read, sketch and interpret electrical diagrams encompassing: Purpose and characteristics of schematic, block and wiring diagrams, plans and schedules. Conventions used in documenting electrical information Read and interpret schematic, block and wiring diagrams, plans and schedules Sketch electrical diagrams using conventional symbols

UETTDRRF06 Perform rescue from a live LV panel* 20

UETTDRRF06 Perform rescue from a live LV panel*	UEENEEG105A Some components
Elements and Performance Criteria ELEMENTS PERFORMANCE CRITERIA Elements describe the essential outcomes. Performance criteria describe the performance needed to demonstrate	T26 Knowledge and understanding occupational safety and health encompassing: UEENEEG105A Verify compliance and functionality of low voltage general electrical installations Date this document was

achievement of the element. 1 Prepare to perform rescue procedures from live LV panel 1.1 Instruction in hazards and risk control measures for specific work functions and work areas are identified and obtained 1.2 Electricity isolation point is identified and labelled, where appropriate 1.3 Tools and emergency equipment are checked for safety, functionality and placed in an accessible location to facilitate response and rescue according to established procedures 2 Carry out rescue from live LV panel 2.1 Workplace procedures and work instructions for controlling risk are followed 2.2 Workplace procedures for accessing and isolating the LV panel and removing the victim, where necessary, from contact with live apparatus are followed 2.3 Workplace procedures for applying cardiopulmonary resuscitation (CPR), if required at the site, and gaining access to treatment by a medical professional,	generated: 20 June 2017 Approved Page 3622 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ Basics of Occupational Safety and Health regulations □ Legal responsibilities for employers and employees □ Employers' and employees' own "duty of care". □ Safety committees and their role T27 Knowledge and understanding of the requirements for personal safety in the workplace encompassing: □ Purpose and use of Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA). □ Purpose and process of reporting OHS incidents. □ Safety procedures for working with

if necessary, are followed 2.4 The worksite is secured and entry controlled until appropriate authorities inspect and release the site 3 Complete the LV panel rescue procedure 3.1 Processes for reporting accidents and/or incidents to authorised personnel are confirmed in accordance with established procedures	electrical circuits and equipment. □ Procedures for safe and effective isolation of electrical supply. □ Regulations for the supervision of apprentices and trainees. T28 Process in rescuing a person in contact with live electrical conductors or equipment and the primary importance of the safety of the rescuer. T29 Application of emergency first aid requirements for an electric shock victim encompassing: □ Calling for help. □ Applying cardiopulmonary resuscitation (CPR). □ Selection and use of fire extinguishers to control electrical fire at accident site. T30 Dangers of high voltage equipment and distribution systems encompassing: □ Step and touch and induced voltages. □ Sources of induced voltage and stored energy □ Creepage and clearance requirements.

	□ Application of safe working procedures in the vicinity of HV equipment.

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0019 Solve problems in direct current (d.c.) machines	UEENEEG101A+UEENEEG144A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: □ rotating machine construction, testing and maintenance, including: □ care, maintenance and testing processes for rotating machines □ components of a d.c. machine □ difference between a generator and a motor in terms of energy conversion □ nameplate of a machine	UEENEEG101A T8 Machine principles encompassing: □ basic operating principle of a generator. □ applying Fleming's right hand rule for generators. □ basic operating principle of a motor. □ applying Fleming's left hand rule for motors. □ calculation of force and torque developed by a motor. T9 Rotating machine construction, testing and maintenance encompassing: □ components of a d.c. machine. □ difference between a generator and a motor

⍰ safety risks associated with using rotating machinery ⍰ types of faults in electric machines ⍰ generators, including: ⍰ basic operation of a d.c. generator ⍰ equivalent circuit for a d.c. generator Assessment Requirements for UEEEL0019 Solve problems in direct current (d.c.) machinesDate this document was generated: 6 October 2020 Approved Page 1992 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards ⍰ importance of residual magnetism for a self-excited generator ⍰ load characteristics of a d.c. generator ⍰ methods of excitation used for d.c. generators ⍰ open circuit characteristics of d.c. generators ⍰ prime movers, energy sources and energy flow used to generate electricity ⍰ reversing the polarity of a d.c. generator ⍰ types of d.c. generators and their applications ⍰ calculating generated and terminal voltage of	in terms of energy conversion. ⍰ nameplate of a machine. ⍰ using electrical equipment to make electrical measurements and comparison of readings with nameplate ratings. ⍰ Identification of faults in a machine from electrical measurements. ⍰ care and maintenance processes for rotating machines ⍰ safety risks associated with using rotating machinery. T10 Generators encompassing: ⍰ basic operation of a d.c generator. ⍰ calculation of generated and terminal voltage of a d.c. shunt generator UEENEEG101A Solve problems in electromagnetic devices and related circuits Date this document was generated: 20 June 2017 Approved Page 3562 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE

a d.c. shunt generator □ applying Fleming's left-hand rule for motors and right-hand rule for generators □ motors, including: □ basic operation of a motor □ circuit diagrams and characteristics of the different types of d.c. motors □ effect of back emf in d.c. motors □ equivalent circuit for the types of d.c. motors □ operation of a motor and its energy flow □ safety risks associated with using motors (including risks of series d.c. motors) □ torque as the product of the force on the conductors and the radius of the armature/rotor □ calculating force and torque developed by a motor □ types of d.c. motors and their applications □ machine efficiency, including: □ efficiency characteristic of a d.c. machine and the conditions for maximum efficiency □ losses that occur in a d.c. machine □ methods used to determine the losses in a d.c.	□ prime movers, energy sources and energy flow used to generate electricity. □ types of d.c. generators and their applications. □ methods of excitation used for d.c generators. □ equivalent circuit for a d.c. generator. □ importance of residual magnetism for a self excited generator. □ open circuit characteristics of d.c. generators. □ load characteristics of a d.c generator. □ reversing the polarity of a d.c. generator □ Connect and test a d.c generator on no-load and load □ Identify safety risks associated with using generators. T11 Motors encompassing: □ operation of a motor and its energy flow. □ effect of back e.m.f. in d.c. motors □ torque as the product of the force on the conductors and the radius of the armature/rotor. □ types of d.c. motors and their applications.

machine • calculating losses and efficiency of a d.c machine • methods used to maintain high efficiency • safety considerations for inductive loads • relevant manufacturer specifications	• circuit diagrams for the types of d.c. motors. • equivalent circuit for the types of d.c. motors. • calculation of power output of a motor. • characteristics of the different types of d.c. motors. • connection and testing a d.c. shunt motor on no-load and load • reversing the direction of rotation of a d.c. motor. • safety risks associated with using motors (include risks of series d.c. motors). T12 Machine efficiency encompassing: • losses that occur in a d.c machine. • methods used to determine the losses in a d.c. machine. • calculation of losses and efficiency of a d.c machine. • efficiency characteristic of a d.c. machine and the conditions for maximum efficiency. • application of Minimum Energy Performance standards (MEPS). • methods used to maintain high efficiency.

	UEENEEG144A T13 Maintenance of d.c. machines encompassing: routine maintenance breakdown repairs T14 types of faults encompassing: UEENEEG144A Develop engineering solutions for d.c. machine and control problems Date this document was generated: 20 June 2017 Approved Page 4005 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE brushes/brush gear problems Note: Examples are: sparking, excessive heating, excessive wear of brushes, commutator or slip rings, bad surface conditions, excessive maintenance, flexible burning, flexible corrosion, separation or grooving, blackening, copper picking, copper

	dragging, brush noise T15 adjustment of machines encompassing: correct brush position machining and finishing of commutators

UEEEL0021 Solve problems in magnetic and electromagnetic

UEEEL0021 Solve problems in magnetic and electromagnetic	UEENEEG101A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of: magnetism, including: common magnetic and non-magnetic materials magnetic field patterns of magnets magnets attraction and repulsion when brought in contact with each other	KS01-EG101A Electromagnetic devices and circuits Evidence shall show an understanding of electromagnetic devices and circuits to an extent indicated by the following aspects: T1 Magnetism encompassing: magnetic field pattern of bar and horse-shoe magnets. magnets attraction and repulsion when brought in contact with each other. common magnetic and non-magnetic materials and groupings (diamagnetic, paramagnetic and ferromagnetic materials).

practical applications of magnets principle of magnetic screening (shielding) and its applications Assessment Requirements for UEEEL0021 Solve problems in magnetic and electromagnetic devices Date this document was generated: 6 October 2020 Approved Page 2009 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards electromagnetism, including: conventions representing direction of current flow in a conductor direction of force between adjacent current-carrying conductors effect of current, length and distance apart on the force between conductors magnetic field around an electromagnet, a single conductor and two adjacent conductors carrying current magnetomotive force (mmf) and its relationship to the number of turns in a coil and the	principle of magnetic screening (shielding) and its applications. practical applications of magnets construction, operation and applications of reed switches. T2 Electromagnetism encompassing: conventions representing direction of current flow in a conductor. magnetic field pattern around a single conductor and two adjacent conductors carrying current. Using the “right hand rule” to determine the direction of magnetic field around a current carrying conductor. direction of force between adjacent current carrying conductors. effect of current, length and distance apart on the force between conductors (including forces on bus bars during fault conditions). magnetic field around an electromagnet. Using the “right hand rule” to determine the direction of magnetic field around a

current flowing in the coil □ practical applications of electromagnets □ magnetic circuit types and associated terminology □ methods used to reduce electrical losses in a magnetic circuit □ electromagnetic induction, including: □ principle of electromagnetic induction □ applications of electromagnetic induction □ Lenz's law □ inductance, including: □ applications of the different types of inductors □ industry standard symbols for inductors □ types of inductor cores □ construction of an inductor □ definition of terms: self-induction, inductance and mutual inductance, and time constants □ effect of physical parameters on the inductance of an inductor □ relationship between load voltage, current and self-induced electromagnetic force in a	current carrying coil. □ magnetomotive force (m.m.f.) and its relationship to the number of turns in a coil and the current flowing in the coil. □ practical applications of electromagnets. T3 Magnetic circuits encompassing: □ magnetic characteristic curve for various materials and identify the various regions. □ Identify the various conditions of a magnetic material from its Hysteresis loop. UEENEEG101A Solve problems in electromagnetic devices and related circuits Date this document was generated: 20 June 2017 Approved Page 3560 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE □ factors which determine losses in magnetic material. □ methods used to reduce electrical losses in a magnetic circuit. □ magnetic flux (definition, unit and symbol).

direct current (d.c.) circuit having inductance □ practical applications for the effects of self and mutual induction □ undesirable effects of self and mutual induction □ magnetic principles in measurement instruments □ magnetic devices, including: □ operation and application of: □ magnetic sensing devices □ contactors and relays □ solenoids □ magnetic methods used to extinguish the arc between opening contacts □ relevant manufacturer specifications	□ reluctance as the opposition to the establishment of magnetic flux. □ permeability (definition, symbol and unit). □ difference for magnetic and non-magnetic materials in regards to reluctance and permeability. □ calculation of m.m.f., flux or reluctance given any two values. □ flux density (definition, symbol, unit and calculation). □ magnetising force (definition, symbol, unit and calculation). □ common magnetic circuit types. □ effect of an air gap in a magnetic circuit. □ terms “magnetic leakage” and “magnetic fringing”. T4 Electromagnetic induction encompassing: □ principle of electromagnetic induction (Faraday’s law of electromagnetic induction). □ applying “Fleming’s right hand rule” to a current a carrying conductor under the influence of a magnetic field. □ calculation of induced e.m.f. in a conductor

	given the conductor length, flux density and velocity of the conductor. □ calculation of induced e.m.f. in a coil given the number of turns in a coil and the rate of change of flux. □ calculation of force on a conductor given the flux density of the magnetic field, length of the conductor and the current being carried by the conductor. □ Lenz's law □ applications of electromagnetic induction T5 Inductance encompassing: □ construction of an inductor, including a bifilar winding inductor. □ Australian Standard circuit diagram symbol for the four types of inductor. □ effect of physical parameters on the inductance of an inductor. □ common types of inductor cores. □ applications of the different types of inductors. □ definition of terms self induction, inductance

	and mutual inductance. □ calculation of value of self induced e.m.f. in a coil. □ mutual induction occurs between two coils. □ graphical relationship between load voltage, current and self induced e.m.f. in a single d.c. circuit having inductance. □ practical applications for the effects of self and mutual induction. □ undesirable effects of self and mutual induction. □ definition of term “time constant” and draw the characteristic curve as applied to a series circuit containing an inductor and a resistor. (LR circuit)Calculation of value UEENEEG101A Solve problems in electromagnetic devices and related circuits Date this document was generated: 20 June 2017 Approved Page 3561 of 10651 © Commonwealth of Australia, 2017 Australian Industry Standards REQUIRED SKILLS AND KNOWLEDGE

	of the time constant for an LR circuit given the values of the components. time constants required for the current in an LR circuit to reach its final value. determining of instantaneous values of voltage and current in an LR circuit using a universal time constant chart. T6 Measurement Instruments encompassing: moving coil, moving iron, dynamometer meter movements and clamp testers. practical applications for moving coil, moving iron and dynamometer meter movements. Calculation of resistance of shunts and multipliers to extend the range of ammeters and voltmeters. factors to be considered in selecting meters for a particular application. safety category of meters and their associated applications. steps and procedures for the safe use, care and storage of electrical instruments. T7 Magnetic devices encompassing:

	construction, operation and applications of relays. construction, operation and applications of contactors. magnetic methods used to extinguish the arc between opening contacts. construction, operation and applications of Hall Effect devices. operation and applications of magnetostriction equipment. construction, operation and application of magnetic sensing devices.

COMPETENCY

UEEEL0039		UEENEEG105A	
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	**Elements and Performance Criteria**	
		ELEMENT	**PERFORMANCE CRITERIA**
1 Prepare to design, install, inspect and test an electrical installation	**1.1** WHS/OHS control measures for the site are identified and applied	1 Prepare to inspect and test	1.1 OHS measures for the site are identified, obtained and understood.

Competency 1 of G105A	**1.2**	WHS/OHS risk control measures and workplace procedures are followed in preparation for work	an electrical installation.	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.
	1.3	Safety hazards, which have not previously been identified, are noted and risk control measures are implemented		1.3	Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4	Installation documentation and/or relevant industry standard are reviewed and applied		1.4	Documentation or deemed to comply standard on which installation is based is reviewed and understood.
	1.5	Appropriate person/s is consulted to ensure work is coordinated with others involved on the worksite		1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.
	1.6	Need to test or measure live electrical work is determined in accordance with WHS/OHS requirements and conducted in accordance with workplace safety procedures		1.6	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with established procedures and checked for correct operation and safety.
	1.7	Circuits, machines and/or plant are isolated in accordance with WHS/OHS job requirements and workplace procedures		1.7	Preparatory work is checked to ensure no damage has occurred and

		1.8	Installation of wiring, appliances, switchgear, control gear and associated accessories is planned and appropriately sequenced in consultation with relevant person/s		
		1.9	Locations of appliances, switchgear, accessories and cable routes are planned within the constraints of building structure, other services, specifications and regulatory requirements		
		1.10	Tools, equipment and testing devices needed to verify compliance are obtained in accordance with workplace procedures and checked for correct operation and safety		
		1.11	Preparatory work is checked to ensure it complies with planned specifications and no damage has occurred		
2	**Select wiring systems, cables, control and**	**2.1**	Wiring system is selected and suitable for the environments in		

			complies with requirements.
2	Visually inspect and conduct safety testing on the installation.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
		2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
		2.4	Wiring is checked for suitability for the environments in which they are installed and suitably protected from damage or overheating.
		2.5	Cable conductor sizes are confirmed as meeting current-carrying capacity requirements and voltage-drop and fault-loop impedance limitations.
		2.6	Protection methods and devices are validated as meeting co-ordination

protection for general electrical installations		which it will operate	
G063+G107	**2.2**	Cable conductor sizes are selected to meet current-carrying capacity requirements and voltage-drop and earth fault-loop impedance limitations in accordance with relevant industry standards	
	2.3	Protective devices are selected to meet the required switching and tripping currents coordination and discrimination for overload and short circuit protection in accordance with relevant industry technical standards	
	2.4	Earthing system components are selected to meet multiple earthed neutral (MEN) system in accordance with relevant industry standards	
	2.5	Residual current devices (RCDs) are selected to meet the required circuit switching and tripping currents in accordance with relevant industry technical	requirements for overload and short-circuit protection.
			2.7 Switchgear and control gear is validated as being appropriately rated and meeting functional requirements.
			2.8 Evidence that electrical equipment complies with safety requirements is cited.
			2.9 Earthing system components are checked that they are correctly located and conductors correctly sized.
			2.10 Marking on switchboards are checked for accuracy and clarity and comply with requirements.
			2.11 Mandatory tests are conducted to verify that: earthing conductor resistance is sufficiently low; insulation resistance is sufficiently high; all polarities are correct; and circuit connections are correct as per AS/NZS3000.

			standards		
		2.6	Switchgear/control gear is selected to meet current and voltage requirements and confirmed suitable for environmental conditions (ingress protection (IP) ratings) and functional requirements		
		2.7	Switchboards are arranged to accommodate control and protective devices, links, safety services and other distributor equipment in accordance with relevant industry technical standards		
3	**Install low voltage (LV) wiring and associated accessories** **G103+G104**	**3.1**	Wiring and accessories are installed and terminated to comply with technical standards and job specifications and requirements		
		3.2	Cables and conductors are terminated at accessories in accordance with manufacturer specifications and regulatory requirements		
					2.12 Testing is conducted to verify that: fault-loop impedance is sufficiently low and residual current devices operates as intended as per AS/NZS3000.
				3 Report inspection and test findings.	3.1 OHS risk control work completion measures and procedures are followed.
					3.2 Work site is cleaned and made safe in accordance with established procedures.
					3.3 Non-compliance defects are identified and reported in accordance with established procedures.
					3.4 Recommendations for rectifying defects are made in accordance with established procedures.
					3.5 Mandatory documentation is completed in accordance with established procedures.

	3.3	Ongoing compliance and safety inspection of installed wiring systems and testing of installed circuits is undertaken	
	3.4	Defects revealed through ongoing compliance and safety inspection and tests are rectified	
4 Install and connect LV appliances, switchgear and associated accessories **G063+G033**	**4.1**	Appliances, switchgear and accessories are installed to comply with technical standards and job specifications and requirements with sufficient access to affect terminations, adjustment and maintenance	
	4.2	Wiring is terminated at appliances, switchgear and accessories in accordance with manufacturer specifications and functional and regulatory requirements	
	4.3	Ongoing compliance and safety inspections of the installed appliances, switchgear and accessories are undertaken	

		4.4 Defects revealed through ongoing compliance and safety inspection are rectified	
5	**Visually inspect and conduct safety testing on electrical installation** **Competency 3 of G105A**	**5.1** Wiring is checked for suitability within the environments in which it is installed to ensure it is suitably protected from damage or overheating in accordance with relevant industry standards	
		5.2 Cable conductor sizes are compliant with current-carrying capacity, voltage-drop and fault-loop impedance limitations in accordance with relevant industry standards	
		5.3 Protection methods and devices are verified as meeting coordination requirements for overload and short-circuit protection in accordance with relevant industry standards	
		5.4 Switchgear and control gear rating is verified as being appropriate and meets functional requirements	

		in accordance with relevant industry standards	
	5.5	Electrical equipment inspection and testing evidence is cited and verified in accordance with WHS/OHS safety regulations	
	5.6	Earthing system and components are located correctly, and conductor selection sizes are verified	
	5.7	Markings on switchboards are checked for accuracy and clarity and comply with requirements	
	5.8	Mandatory tests are conducted in accordance with relevant industry standards	
	5.9	Testing is conducted to verify fault-loop impedance is sufficiently low and RCDs operate in accordance with relevant industry standards	
6 Report inspection and test findings	**6.1**	WHS/OHS risk control work completion measures and	

	procedures are followed **6.2** Worksite is cleaned and made safe in accordance with workplace procedures **6.3** Non-compliance defects are identified and reported in accordance with workplace procedures **6.4** Recommendations for rectifying defects are made in accordance with workplace procedures **6.5** Mandatory documentation is completed in accordance with workplace procedures	

Knowledge

UEEEL039	UEENEEG105A
Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of	Evidence shall show that knowledge has been acquired of safe working practices and verifying compliance and functionality of

the requirements of the elements, performance criteria and range of conditions and include knowledge of: □ electrical safety, including: □ safety workplace procedures for working on electrical systems, circuits and apparatus □ safe working practices as a normal part of carrying out electrical installation work □ isolation and lock-out workplace procedures □ tools and equipment needed to conduct electrical installation compliance inspection and testing □ relevant emergency response plan and first aid requirements □ selection and use of fire extinguishers to control an electrical fire at an accident site Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2142 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards □ WHS/OHS, including: □ legislation and regulations and the fundamental principles that apply	general electrical installations. All knowledge and skills detailed in this unit should be contextualised to current industry standards, technologies and practices. **KS01-EG105A Electrical installations — verification and testing** Evidence shall show an understanding of electrical installations testing and verification to an extent indicated by the following aspects: T1 Electrical safety encompassing: • Safety procedures for working on electrical systems, circuits and apparatus. • Safe working practices as a normal part of carrying out electrical installation work • Isolation and lockout procedures • Tools and equipment needed to conduct electrical installation compliance inspection and testing. T2 Legislated regulations encompassing: • legislation and regulations that require installations and equipment to be inspected and tested to ensure they are safe. • the person/bodies responsible for the various aspects of ensuring electrical installations are safe. • results of tests that show an electrical installation is safe for connection to the supply. • results of periodic inspection and tests that show construction

identifying potential workplace hazards procedures for undertaking safety checks working with a group to identify effective hazard control measures working with a group to modify and/or develop safe work methods techniques for the identification, control and reporting of hazardous substances/materials awareness and reporting of asbestos, silica and hazardous gases legal responsibilities for employers and employees WHS/OHS practices employers' and employees' own "duty of care" safety committees and their role development, modification and application of SWMS or JSA purpose and process of reporting WHS/OHS incidents safety procedures for working with electrical circuits and equipment procedures for safe and effective isolation of electrical supply regulations for the supervision of apprentices and trainees selection and use of fire extinguishers to control electrical fire at an accident site methods to rescue a person in contact with live electrical conductors or equipment, including: safety of the rescuer	site wiring and equipment is safe to use. • results of periodic inspection and tests that show electrical equipment are safe to use. T3 Visual inspection of installations for compliance with the Wiring Rules encompassing: • Protection requirements • General condition • Consumers mains/submains • Switchboards • Wiring systems • Equipment and accessories • Earthing T4 Testing installations encompassing: • tests to ensure: insulation resistance is adequate; earth continuity is such that it will ensure the operation of protection devices under earth fault conditions; polarity of active/s and neutral for mains, submains and final subcircuits is correct; there is no transposition of earthing and neutral conductors; fault-loop impedance is sufficiently low; RCD for correct operation and sensitivity. • functional tests to ensure active/s and neutral for the same circuit are clearly identified with their circuit protection device. • tests that show all circuits and devices operate as intended. • tests to determine the fault level at a particular point in an installation.

establishing the source voltage level rescue process 'dos' and 'don'ts' application of emergency first aid requirements for an electric shock victim, including: calling for help initiating first aid applying cardiopulmonary resuscitation (CPR) dangers of high voltage (HV) equipment and distribution systems, including: step, touch and induced voltages sources of induced voltage and stored energy creepage and clearance requirements application of safe working procedures in the vicinity of HV equipment effects of electric current, including: physiological effects of current principles by which an electric current can produce heat, light, motion and a chemical reaction single path d.c. circuits including: arrangement of energy source, protection device, switch and load in a circuit	T5 Documentation encompassing: • results of tests conducted on an installation to comply with requirements and ensure the installation is safe. • documents of the results of testing an installation as required by the local supply authority. • documents of periodic inspection and testing of construction site wiring and equipment in accordance with requirement. • documents of periodic testing and inspection of electrical equipment including tagging requirements. **KS02-EG105A Electrical installations and equipment — principles and requirements** Evidence shall show an understanding of electrical installations and equipment principles and requirements to an extent indicated by the following aspects: T1 Effects of electric current encompassing: • Physiological effects of current. • Basic principles by which an electric current can produce heat, light, motion and a chemical reaction. T2 Single path practical circuit encompassing: • Arrangement of energy source, protection device, switch and load in a circuit. • The purpose of each component in the circuit. • Consequences of an open-circuits, closed-circuits and short-circuits.

purpose of each component in the circuit consequences of open circuits, closed circuits and short circuits multiple path d.c. circuits, including: Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2143 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards circuit configurations and connection of energy source, protection device, switch and load in a circuit relationship between the parameters of voltage, current, resistance and power dissipation in the whole or any part of the circuit methods of determining circuit behaviour for variation in any of the parameters from measured and calculated values alternating voltage and current generation, phase relationships, energy in an alternating current (a.c.) circuit, including: sinusoidal voltage generation and resulting current terms: period, maximum value, peak-to-peak value, instantaneous value,	T3 Single-source multiple-path d.c. circuits encompassing: • Circuit configurations and connection. • Relationship between the parameters of voltage, current, resistance and power dissipation in the whole or any part of the circuit. • Safely measuring the parameters for the whole or any part of the circuit. • Methods of determining circuit behaviour for variation in any of the parameters from measured and calculated values. T4 Alternating voltage and current generation, phase relationships, energy in an a.c. circuit encompassing: • Sinusoidal voltage generation and resulting current. • The terms period; maximum value; peak-to-peak value; instantaneous value; average value; root-mean-square (r.m.s.) value; and frequency. • Three-phases generation. • Relationship between the phase voltages generated in a three-phase alternator and the conventions for identifying each. • Method of determining the phase sequence or phase rotation of a three-phase supply. • Methods of determining power and energy supplied by three phase circuits. T5 Fundamental safety principles of the AS/NZS 3000 Part 1 (Section 1) and deemed to comply solution given in Part 2 encompassing:

average value, root-mean-square (RMS) value and frequency □ three phase generation □ relationship between the phase voltages generated in a three phase alternator and the conventions for identifying each □ method of determining the phase sequence or phase rotation of a three phase supply □ methods of determining power and energy supplied by three phase circuits □ techniques to read, sketch and interpret electrical diagrams, including: □ conventions used in documenting electrical information □ interpreting schematic, block and wiring diagrams, plans and schedules □ sketching and marking up electrical drawings and diagrams □ safe isolation of equipment, including: □ requirements and techniques for preparation of a SWMS or JSA for effective safe isolation □ safe methods for identifying source of supply to be isolated □ switching-off, lock-out and tagging procedures □ safe methods for confirming effective and safe isolation	• Definition of terms • Fundamental safety principles of protection against direct and indirect contact with live parts; thermal effects; overcurrent; earth faults; abnormal voltages; spread of fire; mechanical injury and external influences. • Fundamental principles of installation design; selection and installation of equipment; means of compliance (including alterations, additions and repairs) and verification of compliance. T6 Electric motor selection, starting method and overload protection encompassing: • Types of motor enclosures suitable for given environmental conditions • Criteria for selecting motor starters and overload protection. • Types and connection arrangements for direct-on-line and reduced voltage starters. • Thermal, magnetic and thermistor overload protection methods. T7 Ability to apply AS/NZ 3000 requirements for protective and functional earthing encompassing: • Purpose of protective and functional earthing. • Parts of the protective earthing systems. • Earthing arrangements, earthing of equipment and equipotential bonding. • Methods of determining the maximum fault loop impedance for a circuit.

following safe testing procedures AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements for dealing with unused conductors and equipment fundamental safety principles of AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules), including: definition of terms direct contact with live parts indirect contact with live parts thermal effects of current over-current earth faults abnormal voltages spread of fire mechanical injury external influences Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2144 of 4588	• Selection of protective conductor and active conductor sizes for each circuit to ensure earth-fault loop impedance is sufficiently low to operate the circuit protective device. T8 MEN system and its application encompassing: • The roles of the protective earthing (PE) and neutral (N) conductors in an a consumer's installation and their relationship to the protective earth neutral (PEN) conductor in the electricity distributor's system or sub-main to an outbuilding. • The importance of the MEN link when a fault occurs. • The likely consequences of the absence of the MEN link or high impendence in the PEN conductor when a fault occurs. • The requirements for installation of an MEN link in an installation and an outbuilding. T9 Knowledge of the application of transformers encompassing: • Transformers used in distribution and transmission systems and large consumer installations. • Transformers used in welding machines. • Applications in appliances • Risks and safety control measures associated with connection and disconnection of instrument transformers • Safe working procedures when connecting and testing transformers. • AS/NZS 3000 requirements and restriction on the installation and use of transformers. T10 Ability to apply AS/NZ 3000 requirements for protection of

© Commonwealth of Australia, 2020 Australian Industry Standards ▯ fundamental principles of installation design; selection and installation of equipment; means of compliance (including alterations, additions and repairs), and verification of compliance ▯ protective and functional earthing, including: ▯ AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements ▯ purpose of protective and functional earthing ▯ parts of a protective earthing system ▯ earthing arrangements, earthing of equipment and equipotential bonding ▯ methods of determining the earth fault-loop impedance for a circuit ▯ alternate earthing systems only when required by local regulatory authorities (e.g. TT low voltage supply earthing system in dairy sheds in New Zealand) ▯ protective earthing conductor and active conductor sizes for each circuit to ensure earth fault-loop impedance is sufficiently low to operate the circuit protective device ▯ multiple earthed neutral (MEN) system and its application, including:	circuit against overcurrent and abnormal voltages encompassing: • Minimum fault levels specified by electricity distributors • Methods and arrangement for protection against short-circuit currents and overload currents. • Coordination of overload and short-circuit protection devices. • Coordination between conductors and overload protection devices. • Causes of over and undervoltage. • Device and requirements for protection against over and undervoltage. T11 Additional protection by use of RCDs and use of extra-low voltage for basic and fault protection encompassing: • Limitation of an RCD to protect against contact with live parts • AS/NZS 3000 requirements for use of RCDs. • Conditions for use of extra-low voltage to provide for basic and fault protection • AS/NZS 3000 requirements for installation of SELV and PELV systems T12 Ability to select cables for single and three phase mains and sub-mains for single and multiple installations that comply with requirements of AS/NZS 3000 and AS/NZS 3008.1 encompassing: • Methods of determining maximum demand. • Types of cables available. • Installation methods and external influences effecting cable current-carrying capacity

protective earthing (PE) and neutral (N) conductors in a consumer's installation and their relationship to the protective earth neutral (PEN) conductor in the electricity distributor's system or sub-main to an outbuilding importance of the MEN link when a fault occurs likely consequences of the absence of the MEN link or high impendence in the PEN conductor when a fault occurs requirements for installation of a MEN link in an installation and an outbuilding control and protection requirements for installations and equipment, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements minimum fault levels specified by electricity distributors method for assessing prospective short circuit current devices for protection against overload and short circuit current methods and arrangement for protection against short circuit currents, overload and earth leakage currents	• Voltage drop limitation • Short-circuit performance consideration. T13 Ability to select cables for final sub-circuits that comply with requirements of AS/NZS 3000 and AS/NZS 3008.1 encompassing: • Maximum demand of final sub-circuits. • Types of cables available. • Installation methods and external influences effecting cable current-carrying capacity • Effect of earth-fault loop impedance and voltage drop limitations on circuit route length. • Short-circuit performance considerations. T14 Ability to apply AS/NZS 3000 requirements for control and protection of installations encompassing: • Devices for functions of isolation; emergency; Mechanical maintenance and functional control. • Method for assessing prospective short circuit current. • Devices and arrangement for protection against overload and short-circuit current. • Additional protection by RCD • Protection against switchboard internal arc faults. T15 Ability to apply AS/NZS 3000 requirements for the installation of electrical equipment in given damp situations encompassing: • Limitation of installation of equipment in classified zones.

coordination of overload and short circuit protection devices coordination between conductors and overload protection devices causes of over-voltage and under-voltage device requirements for protection against over-voltage and under-voltage selection and installation of RCDs limitation of an RCD to protect against contact with live parts devices for functions of isolation, emergency, mechanical maintenance and functional control AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements for installation of separated extra-low voltage (SELV) and protected extra-low voltage (PELV) systems, including: purpose and configuration of PELV and SELV Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2145 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards earthing requirements and testing of SELV and PELV circuits	• Selection and location of equipment suitable for installation in given classified zones. • Additional protection by RCD. • Equipotential bonding in showers and bathrooms and swimming and spa pools. T16 Ability to install, modify and test electrical equipment for construction and demolition sites, complying with AS/NZS 3012 and applicable workplace safety legislation encompassing: • Supply and installation requirements. • Protection of circuits. • Initial and periodic inspection and testing • Portable tool safety testing and tagging system in accordance with AS/NZS 3760. T17 Knowledge of AS/NZS 3000 requirements for the installation of aerial conductors and underground wiring encompassing: • Types and application of aerial conductors • Aerial span limitations and required clearances • Selection of aerial supporting poles/post and struts for a given application. • Use and requirements of catenary support systems • Acceptable cable types and protection for underground wiring categories. • Underground wiring depth layer and protection • Underground wiring clearances from other services T18 Knowledge of AS/NZS 3000 requirements for electrical

cable selection for single and three phase mains and sub-mains for single and multiple installations including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements AS/NZS 3008.1.1 Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation condition requirements for selection of cables methods of determining maximum demand selecting cables for a given situation based on: suitability of the cable insulation installation methods and external influences affecting cable current-carrying capacity fault-loop impedance effects of harmonic current on cable current-carrying capacity installation methods and external influences affecting cable current-carrying capacity voltage-drop limitation short circuit performance consideration	installations in hazardous areas encompassing: • Types of areas classified as a hazardous area • Standards to which the selection, installation and maintenance of electrical equipment shall comply. • Additional training required to work competently with electrical equipment for hazardous areas • T19 Ability to verify compliance of an electrical installation in accordance with AS/NZS 3000 encompassing: • Visual inspection to determine whether the installation complies with requirements set out in Section 2 to 7 of AS/NZS 3000 and relevant specific installation standards. • Mandatory tests following guidance given in AS/NZS 3017 T20 Ability to perform effective safe isolation of any equipment encompassing: • Preparation of a ‘safe work method statement’ (SWMS) or Job Safety Analysis (JSA) for effective safe isolation. • Safe methods for identifying source of supply to be isolated. • Switching-off, lock-out and tagging procedures. • Safe methods for confirming effective and safe isolation T21 Ability to apply AS/NZS 3000 requirements to install and terminate thermoplastic insulated cables; elastomer sheathed cables; XLPE sheathed cables; and high temperature cables; armoured cables; and neutral screened cables in a wide range of applications. T22 Ability to perform the circuit tests required for electrical cables in a range of installations and final sub-circuit encompassing:

cable selection for final sub-circuits, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements AS/NZS 3008.1.1 Electrical installations - Selection of cables Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation condition requirements for selection of cables maximum demand on final sub-circuits selecting cables for a given situation based on: suitability of the cable insulation installation methods and external influences effecting cable current-carrying capacity effect of earth fault-loop impedance and voltage-drop limitations on circuit route length installation of electrical equipment in given damp situations, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements areas specified as damp situations limitation on the installation of equipment in classified zones	• Following safe testing procedures. • Tests to show if the earth continuity and earth-fault loop impedance are sufficiently low. • Testing to show if insulation resistance is sufficiently high. • Testing to show if the polarity and circuit connections are correct. T23 Ability to install final sub-circuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and electricity distributor's requirements. T24 Ability to apply AS/NZS 3000 and electricity distributor's requirements for the installation and connect consumers mains encompassing: • Installing of underground and overhead consumers mains • Terminating consumers mains at pillars, pits mains connection boxes and consumers switchboard. • Install unprotected consumers mains to reduce the risk of short-circuit current to a minimum. • Installing bonding conductors where required. T25 Ability to read, sketch and interpret electrical diagrams encompassing: • Purpose and characteristics of schematic, block and wiring diagrams, plans and schedules. • Conventions used in documenting electrical information • Read and interpret schematic, block and wiring diagrams, plans and schedules

selection and location of equipment suitable for installation in given classified zones use of RCD, SELV and PELV for damp situations equipotential bonding in showers and bathrooms and swimming and spa pools methods for the installation, modification and testing of electrical installations and equipment for construction and demolition sites, complying with AS/NZS 3012 Electrical installations - Construction and demolition sites and applicable workplace safety legislation, including: supply requirements switchboards for the purpose of construction and demolition Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2146 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards protection of circuits construction wiring lighting socket outlets	• Sketch electrical diagrams using conventional symbols T26 Knowledge and understanding occupational safety and health encompassing: • Basics of Occupational Safety and Health regulations • Legal responsibilities for employers and employees • Employers' and employees' own "duty of care". • Safety committees and their role T27 Knowledge and understanding of the requirements for personal safety in the workplace encompassing: • Purpose and use of Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA). • Purpose and process of reporting OHS incidents. • Safety procedures for working with electrical circuits and equipment. • Procedures for safe and effective isolation of electrical supply. • Regulations for the supervision of apprentices and trainees. T28 Process in rescuing a person in contact with live electrical conductors or equipment and the primary importance of the safety of the rescuer. T29 Application of emergency first aid requirements for an electric shock victim encompassing: • Calling for help. • Applying cardiopulmonary resuscitation (CPR). • Selection and use of fire extinguishers to control electrical fire

circuits for lifts calibration of instruments inspection and testing methods initial and periodic inspection and testing installation of aerial conductors and underground wiring, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements types and application of aerial conductors aerial span limitations and required clearances selection of aerial supporting poles/post and struts for a given application use and requirements of catenary support systems acceptable cable types and protection for underground wiring categories underground wiring depth and protection underground wiring clearances from other services electrical installations in hazardous areas, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements types of areas classified as a hazardous area standards to which the selection, installation, inspection and maintenance	at accident site. T30 Dangers of high voltage equipment and distribution systems encompassing: • Step and touch and induced voltages. • Sources of induced voltage and stored energy • Creepage and clearance requirements. • Application of safe working procedures in the vicinity of HV equipment. T31 Systematic method of commissioning and decommissioning electrical equipment and installations encompassing: • Commissioning safety procedures • Circuit voltage testing • Phase rotation checks • Functional testing • Instrument and control parameter settings • Decommissioning safety procedures. • Identification of circuits with their control and protection devices. • Impact of isolation on other parts of an installation. • Tagging, testing and earthing. • Safe removal of equipment. T32 Diagnosing and rectifying faults in electrical apparatus and associated circuits encompassing: • Faults such as open-circuit; short-circuit; incorrect

of electrical equipment shall comply □ additional training required to work competently with electrical equipment for hazardous areas □ installation and termination requirements for electrical cables, including: □ AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements □ typical cable routes through buildings, structures and premises □ application of wiring accessories □ drawing-in, placing and fixing of cables □ cable and conductor terminations □ maintaining fire rating integrity □ application of flat thermoplastic sheathed (TPS), circular TPS, steel wire armoured (SWA), fire rated and flexible cables □ requirements for the installation and connection of consumers mains, including: □ AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) and local supply authority requirements	connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure; • Apparatus such as control devices; fixed appliances/accessories; lighting; electrical machines motors and controls; socket outlets, transformers; protection and metering devices. • Circuits such as those supplying fixed appliances; lighting; socket outlets; motors and controls circuits; transformers; electronic or computer based equipment.

▯ underground and overhead consumers mains ▯ terminating consumers mains at pillars, pits, mains connection boxes and consumers Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2147 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards switchboard ▯ unprotected consumers mains to minimise the risk of short circuit current ▯ bonding conductors where required ▯ ensuring correct polarity ▯ termination of sub-circuit cabling at switchboards and connection to components, including: ▯ correct interconnection between switchgear, protection devices and links' ▯ correct preparation for fitting and connection of local supply authority equipment ▯ use of adequately sized cables ▯ correct marking of equipment ▯ clear identification of circuit neutral conductors ▯ correct polarity	

AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements and supply authority requirements to install final sub-circuit wiring into switchboards and connection to switchboard equipment location of switchboards and arrangement of switchboard equipment in installations, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements accessibility and restricted locations of switchboards identification of main switchboards construction requirements of switchboards arrangement and identification of switchboard equipment arrangement and installation of metering equipment switchboard wiring and fire-protective measures protection against switchboard internal arc faults key safety issues of transformers and AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements, including: risks and safety control measures associated with connection and	

disconnection of instrument transformers □ safe working procedures when connecting and testing transformers □ requirements and restrictions on the installation and use of transformers □ electric motor selection, starting method and overload protection, including: □ types of motor enclosures suitable for given environmental conditions □ criteria for selecting motor starters and overload protection □ types and connection arrangements for direct-on-line, reduced voltage starters and variable speed drives □ thermal, magnetic and thermistor overload protection methods □ legislated regulations, including: □ legislation and regulations that require installations and equipment to be inspected and tested to ensure they are safe □ responsible persons/bodies for ensuring electrical installations are safe Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2148 of 4588	

© Commonwealth of Australia, 2020 Australian Industry Standards results of tests that show an electrical installation is safe for connection to supply verification of compliance of an electrical installation, including: AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) requirements requirements for visual inspection to determine installation compliance with relevant specific installation standards AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) mandatory test requirements and the application of mandatory tests following guidance of AS/NZS 3017 Electrical installations - Verification guidelines mandatory testing of an electrical installation including: earth continuity, insulation resistance, polarity, sub-mains and final sub-circuits, correct circuit connections, earth fault-loop impedance and RCD operation functional tests to ensure active/s and neutral for the same circuit are clearly identified with their circuit protection device	

▯ tests that show all circuits and devices operate as intended ▯ techniques to determine fault level at a particular point in an installation ▯ documentation, including: ▯ results of tests conducted on an installation to comply with requirements and ensure the installation is safe ▯ documentation of the results of testing an installation as required by the electricity distributor ▯ documentation of periodic inspection and testing of construction site wiring and equipment in accordance with requirement ▯ documentation of periodic testing and inspection of electrical equipment, including tagging requirements ▯ systematic method of commissioning and decommissioning electrical equipment and installations, including: ▯ commissioning, including: ▯ circuit voltage testing ▯ phase rotation and polarity checks ▯ systematic loading up	

correct installation functioning instrument/control parameter checks dangers of mechanical damage to cables and equipment decommissioning, including: identification of all circuits impact on other equipment isolation tagging testing securing and earthing where required Assessment Requirements for UEEEL0039 Design, install and verify compliance and functionality of general electrical installationsDate this document was generated: 6 October 2020 Approved Page 2149 of 4588 © Commonwealth of Australia, 2020 Australian Industry Standards safe removal of equipment and termination of unused cable dangers of mechanical damage to cables and equipment diagnosing and rectifying faults in electrical apparatus and associated circuits, including: recognising symptoms of open circuit, short circuit, incorrect connections, insulation	

failure, unsafe condition, apparatus/component failure and related mechanical failure □ methods and tests to identify faults in circuits and/or equipment □ ensuring fault rectification/repair and/or equipment replacement complies with AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) and other relevant standards	