

EPC Number	EPC Title	EPC Component	Evidence
1	Demonstrate a knowledge of basic electrical and energy concepts.	Fundamentals of electrical energy, other energy forms, voltage, current and resistance.	<ul style="list-style-type: none"> • Relationship between power, work and energy • The different forms of energy • Concepts of charge, current and electromotive force (e.m.f).
2 CRITICAL	Demonstrate a knowledge of the various effects of electric current.	Physiological effects on humans, heating and other energy conversion effects and principles.	<ul style="list-style-type: none"> • Physiological effects of current. • Principles by which an electric current can produce heat, light, motion and a chemical reaction.
3	Demonstrate a knowledge of resistivity and resistors.	Ohm's law, material resistivity, resistor parameters and introduction to measuring methods.	<ul style="list-style-type: none"> • Relationship between voltage, current and resistance (Ohm's Law). • Factors affecting resistance. • Linear and non-linear resistivity. • Methods for measuring resistance.
4	Demonstrate a knowledge of the principles of various sources of electromotive force (e.m.f.).	How electrical energy is produced from various forms of energy, including batteries.	<ul style="list-style-type: none"> • Sources of electricity supply • Principles by which electricity is produced from a magnetic field coupled with motion, chemical reaction in batteries
5 CRITICAL	Explain the operation of a simple practical circuit. Determine the resistance, voltage, current and power in any part of a DC circuit using theory and actual measurement methods.	Include current path, circuit control, load, EMF source and conductors. Theoretical and practical knowledge of measuring instrument use and safe practices whilst using instruments. Include series and parallel circuit analysis.	<ul style="list-style-type: none"> • Circuit configuration and connection of energy source, protection device, switch and load in a circuit. • The purpose of each component in the circuit. • Consequences of an open-circuit, a closed-circuit and a short-circuit. • The relationship between parameters of voltage, current, resistance power dissipation in the whole or any part of the circuit. • Safe measurement of the parameters for the whole or any part of the circuit.
6	Demonstrate a knowledge of the theory and application of capacitors and inductors and their effects.	Concepts and characteristics of capacitors and inductors and their application, units of measurement, effects on V and I phase relationships, resonance and impedance	<ul style="list-style-type: none"> • The concepts of inductive and capacitive reactance, resonance and impedance. • Circuit arrangements • Phase relationship between voltage and current in resistive, inductive and capacitive reactive circuits. • The relationship between the parameters of voltage, current, impedance, and power dissipation in the whole or any part of the circuit. • Safely measuring the parameters of voltage, current and power dissipation 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.

7	Demonstrate a knowledge of permanent and electromagnetic induction and application.	Principles of EMF induced in a conductor and its application in electrical machines and devices.	<ul style="list-style-type: none"> • Field patterns around permanent magnets. • Field patterns produced by current-carrying conductors. • Self and mutual inductance • Factors affecting the characteristic of inductive components and circuits. • Electromagnetic principles applied in transformers. • Motor action in a generator and generator action in a motor. • Application of electromagnetics in control and protective devices
8 CRITICAL	Demonstrate a knowledge of alternating voltage and current generation, phase relationships, energy in an AC circuit, and actual measurement methods.	Explain sinusoidal voltage generation and resultant current flow. Define key terms, calculate and apply measuring techniques to derive required parameters. Eg power factor.	<ul style="list-style-type: none"> • Sinusoidal voltage generation and resulting current. • The terms: period, maximum value, peak-to-peak value, average value, root-mean-square (r.m.s.) value, and frequency. • Three-phase generation. • The 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.
9	Introduction to star and delta three phase AC systems and the reason why three phase is used.	Multiphase systems, and demonstrate their advantages – reduced current flow, equipment size etc.	<ul style="list-style-type: none"> • Advantages of a three phase system • Star connections and relationship between line and phase values of voltages and currents. • Delta connections and relationship between line and phase values of voltages and currents. • Balanced and unbalanced loads. • Methods of determining line and phase voltages and currents and neutral current in unbalanced loads.
10 CRITICAL	Demonstrate an understanding of the fundamental safety principles of AS/NZS 3000: Part 1. Knowledge of the hierarchy of standards. Normative / informative text.	Definitions, alterations, protection, design, selection and installation of electrical equipment for electrical safety requirements. This includes protection from direct and indirect contact with live parts.	<ul style="list-style-type: none"> • Definition of terms <p>Fundamental safety principles of protection against;</p> <ul style="list-style-type: none"> • direct contact with live parts, • indirect contact with live parts, • thermal effects of current, overcurrent, • earth faults, • abnormal voltages; • spread of fire; • mechanical injury and • external influences. <p>Fundamental principles of; installation design, selection and installation of equipment, means of compliance (including alterations, additions and repairs), and verification of compliance.</p>

11	Demonstrate a knowledge of power factor, power factor improvement principles and power measurement techniques in AC circuits in single and multiphase systems.	Consequences of low power factor, value of capacitance required for correction, measurement theory and methods to obtain real power and apparent power and VAR values.	<ul style="list-style-type: none"> • Consequences of non unity power factor and means of improving power factor. • Power measurement and methods to obtain real and apparent power values. • AS/NZS 3000 Wiring Rules requirements for installation of capacitors, including safety considerations.
12	Demonstrate the rationale and operating principles and characteristics of three phase induction motors and generators. Describe AS/NZ 3000 requirements and knowledge of local Supply Authority requirements for three phase motor installations and starters.	Design of motor circuits for operator control, isolation, automatic starting and emergency stopping. Starting methods required by the local supply authority to limit the transient current. Explain power, torque and speed relationships, and controls methods used, including variable speed drives.	<ul style="list-style-type: none"> • Concept of a rotating magnetic field • Stator and rotor construction of three phase alternators and induction motors. • Power, torque and speed relationships of three phase induction motors. • variable speed drives as a means of speed control AS/NZS 3000 Wiring Rules requirements for; <ul style="list-style-type: none"> • motor circuit operation, control and protection, isolation, automatic starting and emergency stopping. • Starting methods required to limit the transient current as specified by local requirements.
13 CRITICAL	Demonstrate a knowledge of methods of electric motor selection, starting, connection and protection.	Reduced current starting, methods of starting, typical motor lead terminations and protection (including by electronic devices) of the motor from environmental, overload, internal faults and supply variation conditions.	<ul style="list-style-type: none"> • 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.
14	Demonstrate knowledge of possible causes of malfunction of three phase induction motors and demonstrate the tests required for diagnosing faults	Common causes of malfunction – starting equipment failure, insulation deterioration, water ingress etc. Common testing methods – voltage, ampere and insulation resistance checks.	<ul style="list-style-type: none"> • Types of faults affecting motor performance. • Symptoms and likely causes of supply, stator, rotor and mechanical faults. • Safe testing methods for determining supply, stator and rotor faults affecting motor performance. • Ability to explain wiring diagrams
15	Describe the operating principles, characteristics, and suitability of typical control methods for single-phase motors and their key components.	The rotating magnetic field and components for single-phase motors, methods to achieve starting, and operating torque. Control methods used including voltage/speed reduction, reversal and impact on performance.	<ul style="list-style-type: none"> • Principles by which each type of motor produces starting and running torque. • Construction and key components of each type of motor. • Application of each type of motor to the load/torque required • Types of faults affecting motor performance. • Symptoms and likely causes of faults in single phase motors and circuits. • Safe testing methods for determining single phase motor and circuit faults.

16 CRITICAL	Demonstrate and apply in practice the requirements of AS/NZ 3000 in relation to earthing arrangements and fault loop impedance calculations. Knowledge of alternate earthing systems when required by local Regulatory Authorities.	Earthing arrangements for protective and functional purposes, earthing connections and conductor selection. Calculation of the correct cable size for an installation to achieve protective device and cable co-ordination.	<ul style="list-style-type: none"> • Purpose of protective and functional earthing. • Parts of the protective earthing systems. • Acceptable arrangements, earthing equipment and equipotential bonding. • Methods of determining the maximum earth-fault loop impedance for a circuit. • Alternate earthing systems only when required by local Regulatory Authorities Eg. TT low voltage supply earthing system in dairy sheds in New Zealand
17 CRITICAL	Demonstrate a comprehensive knowledge and understanding of the MEN system and its application, including on sub-installations. Demonstrate how to test an MEN system.	Multiple Earthed Neutral arrangement, resultant fault current path and magnitude, operation of protective devices and implication of MEN link absence during fault conditions.	<ul style="list-style-type: none"> • The roles of the 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 submain 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 impedance in the PEN conductor when a fault occurs. • The requirements for installation of an MEN link in an installation and an outbuilding.
18	Describe the basic construction, principles of operation, and typical applications of the main types of transformers.	Features and applications of different types of transformers. Single and double wound, auto, current and voltage transformers	<ul style="list-style-type: none"> • Methods of cooling and protection • Transmission and distribution transformers • Autotransformers • Instrument transformers • Turns ratio • Typical applications
19 CRITICAL	List the key safety issues of various types of transformers, including AS/NZS3000 requirements.	Distribution and transmission systems, large consumers' installations, within electrical equipment, appliances including welders. Safe working procedures when connecting and testing transformers.	<ul style="list-style-type: none"> • Requirements and restrictions on the installation and use of transformers. • Safe working procedures when connecting and testing transformers. • Risks and safety control measures associated with connection and disconnection of instrument transformers
20 CRITICAL	Demonstrate a knowledge of SELV and PELV systems, their application and testing in accordance with AS/NZS 3000	Protection against both direct and indirect contact using SELV and PELV systems.	<ul style="list-style-type: none"> • Purpose and configuration of PELV and SELV. • Earthing requirements and testing of SELV and PELV circuits

21 CRITICAL	Demonstrate the ability to select cables for mains and submains using AS/NZS 3000 and AS/NZS 3008.1 based on current carrying capacity, short circuit capacity, maximum demand and voltage drop, for single phase and three phase installations including multiple installations.	Determination of maximum demand, voltage drop, interpretation of cable supplier data tables and the impact of various installation methods. Selection of the appropriate cable installation route/method. Fault loop impedance	<ul style="list-style-type: none"> • Application of methods of determining maximum demand. Selecting cables for a given situation based on; <ul style="list-style-type: none"> • suitability of the cable insulation, • installation methods and external influences affecting cable current-carrying capacity, • voltage drop limitations, • fault loop impedance • Effects of harmonic current on cable current-carrying capacity. • Conditions where short-circuit performance may need to be considered
22 CRITICAL	Demonstrate the ability to select cables for final subcircuits using AS/NZS 3000 and AS/NZS 3008.1 based on current carrying capacity, short circuit capability, maximum demand, earth loop impedance and voltage drop.	Application of maximum demand methods to calculate current requirements and ensure voltage drop is within specification, evaluation of the installation method.	<ul style="list-style-type: none"> • Determining maximum demand of final subcircuits. Select cables for a given situation based on; <ul style="list-style-type: none"> • suitability of the cable insulation, installation methods and external influences affecting cable current-carrying capacity, voltage drop and earth-fault impedance limitations.
23 CRITICAL	Describe and apply the control and protection requirements for installations and equipment. Demonstrate the ability to select suitable equipment and switchgear for a particular installation or part of an installation using AS/NZS3000	Main board controls, sub-installation control and submain/final subcircuit controls. Assessment of the prospective short circuit current and operating current. Selection of equipment and suitable protection equipment to protect conductors and installed equipment. Inclusion of RCDs.	<ul style="list-style-type: none"> • Minimum fault levels specified by electricity network operator. • Methods and arrangement for protection against short-circuit, overload, and earth leakage currents. • Coordination of overload and short-circuit protection devices. • Coordination between conductors and overload protection device. • Causes of over and undervoltage. • Device requirements for protection against over and undervoltage. • Selection and installation of RCDs
24 CRITICAL	Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the location of switchboards and arrangement of switchboard equipment in installations. Methods for determining prospective fault current. Switchboard form types.	Suitable locations for switchboards (eg well ventilated and dry) including personal access requirements. Requirements for metering and equipment positions and the identification of the switchboard and switchboard equipment.	<ul style="list-style-type: none"> • 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.
25 CRITICAL	Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the installation of electrical equipment in damp situations and wet areas. IP rating of electrical equipment.	Damp zones and related equipment requirements. Assessment of the earthing requirements and wiring systems for damp and wet areas as per Section 7 of the AS/NZS 3000.	<ul style="list-style-type: none"> • Areas specified as damp situations • Limitation of installation of equipment in classified zones. • 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.

26 CRITICAL	Demonstrate the appropriate 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. Need for calibration of instruments.	Assessment of supply requirements, final circuit protection and socket outlet requirements.	<ul style="list-style-type: none"> • Supply requirements. • Switchboards for the purpose of construction and demolition • Protection and control circuits. • Construction wiring • Lighting • Circuits for lifts • Initial and periodic inspection and testing • Inspection and testing methods. • Calibrate instruments
27 CRITICAL	Demonstrate knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial conductors and underground wiring. Including specialist cables.	Various types of aerial conductors and their application/installation methods. Assessment of underground and aerial conductor ratings and selection process. Underground cable installation systems. Common applications of MIMS cable.	<ul style="list-style-type: none"> • Types and applications 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.
28 CRITICAL	Demonstrate a knowledge of the AS/NZS 3000 requirements for electrical installations in hazardous areas and an awareness of the standards to which it refers	Basics as set out in AS/NZS 3000. Awareness of concepts and practices in specialised standards.	<ul style="list-style-type: none"> • Nature of areas classified as a 'hazardous area' • Standards to which the selection, installation, inspection and maintenance of electrical equipment and installations shall comply. • Additional training required to work competently with electrical equipment for hazardous areas.
29	Knowledge of AS/NZS 3000 requirements for safety services and issues relevant to HV installations. Standards referenced for electrical installations related to transportable structures and vehicles, shows and carnivals, patient areas, marinas and boats, and construction/demolition sites.	AS/NZS 3000 requirements for Safety Services and HV installations. Issues and requirements for special installations covered by: AS/NZS3001 Transportable structures and vehicles and their site supplies; AS/NZS3002 Shows and carnivals; AS/NZS3003 Patient areas; AS/NZS3004.1 Electrical installations —Marinas and boats Part 1 Marina installations AS/NZS3004.1 Electrical installations —Marinas and boats Part 2 Boats installations AS/NZS3012 Electrical installations — Construction and Demolition Sites	AS/NZS 3000 requirements for Safety Services. Issues relevant to high voltage installations cited in AS/NZS 3000 Varied and additional requirements for electrical installations related to: <ul style="list-style-type: none"> • Transportable structures and vehicles and site supplies • Shows and carnivals • Patient areas • Marinas • Boats • Construction and demolition sites

30 CRITICAL	Demonstrate to AS/NZS 3000 and AS/NZS 3017 standards the electrical checks and tests required to ensure electrical installations are safe, reporting of test results typically required to satisfy regulatory requirements.	Tests to ensure the requirements of the Standards have been met. Include: visual checks, testing energised and de-energised circuits, earth continuity, insulation resistance, polarity test, fault loop impedance tests, RCD tests, documentation.	<ul style="list-style-type: none"> • Visual inspection to determine whether the installation complies with Standards. • Mandatory tests from AS/NZS3000 • Application of mandatory tests following guidance given in AS/NZS 3017 Electrical installations — Verification guidelines.
31 CRITICAL	Demonstrate the knowledge and skill to perform effective safe isolation of any equipment, including switch and lock off, circuit isolation, equipment testing and tag out procedures, including capacitor banks.	The sequential steps needed to achieve an isolated, tested and safe work area. Preparation of a written isolation procedure.	<ul style="list-style-type: none"> • 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. • AS/NZS 3000 Wiring Rules requirements for dealing with unused conductors and equipment.
32	Describe the construction, specifications, colour coding and application of various types of cords and cables.	Conductor material, stranding, colour coding, sheathing types and other construction parameters of cords and cables. Typical application examples of the various cable types and interpretation of cable manufacturers data.	<ul style="list-style-type: none"> • Cable conductor materials and their configuration • Permitted cable core colours of active and neutral conductors for installation wiring. • Colour required to identify protective earthing and equipotential bonding conductors • Conductor colours permitted for active and neutral conductors in flexible cord and equipment wiring • Relationship between AS/NZS colours and European cable identification colours • Application of cables as defined by the properties of their insulation, sheathing, armouring and/or screening.
33	Demonstrate the skill to prepare and terminate cords and cables.	Requirements for cable jointing and termination in a variety of installation situations and accessories.	<ul style="list-style-type: none"> • Types of cable and conductor termination devices selected. • Application of devices to terminate flat thermoplastic sheathed (TPS), circular thermoplastic sheathed (TPS), steel wire armoured (SWA), and flexible cables at electrical equipment enclosures. • Application of devices and methods to terminate copper and aluminium conductors at tunnel and stud/screw terminals • Cables and conductors are terminated in compliance with Standards and manufacturer's instructions.

34	Demonstrate the knowledge and skills for selection and attachment of electrical accessories, using appropriate fixing devices, tools and methods.	Various fixing devices, methods, and the tools which may be used, and the need for safety whilst performing this work. Maintain / achieve required fire rating. Safe use of hand and power tools, including power actuated fastening devices.	Types of accessories and their intended use. <ul style="list-style-type: none"> • Selection and safe application of devices for fixing to timber, metal, hollow structures, masonry and concrete. • Hazards and safety measures when working with adhesives and chemical fixing devices. • AS/NZS3000 requirements to follow instructions provided by an equipment supplier. Following established safe work methods for: <ul style="list-style-type: none"> • using hand and power tools • using powder and compressed gas operated tools
35 CRITICAL	Demonstrate the knowledge and skills to install and terminate a variety of electrical cables in a wide range of applications (including final subcircuits) to AS/NZS3000	Installation requirements for a wide range of typically used electrical cables in a variety of situations: e.g. thermoplastic, elastomer sheaths, XLPE, neutral screened, high temperature cables. Separation from other services (and fire wall penetrations).	<ul style="list-style-type: none"> • 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 thermoplastic sheathed (TPS), steel wire armoured (SWA), fire rated and flexible cables,
36	Demonstrate the knowledge and skills for the installation of wiring support systems.	Steel conduit, PVC conduit, ladder/perforated tray, trough/duct, including ratings, space, etc.	<ul style="list-style-type: none"> • Acceptable and compliant cable routes in building structures, • Consideration of de-rating of cable current-carrying capacity in accordance with AS/NZS 3008.1 for grouping of circuits, spacing of cables, and separation of cable supports. • Sizing of wiring enclosures based on space factor recommendations of AS/NZS 3000 Wiring Rules • Application of non-metallic and metallic conduit, trunking and duct enclosures and cable ladder/tray.
37 CRITICAL	Demonstrate knowledge and skills to install final subcircuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 and local supply authority requirements.	Termination of subcircuit cabling at switchboards and connection to components.	<ul style="list-style-type: none"> • Correct interconnection between switchgear, protection devices and links. • Correct preparation for fitting and connection of electricity network operator equipment • Use of adequately sized cables. • Correct marking of equipment. • Clear identification of circuit neutral conductors. • Correct polarity

38 CRITICAL	Connect consumers mains to an installation, in accordance with AS/NZS 3000 and local supply authority requirements.	Installation of consumers mains in buildings and underground. Termination at pillars, pits and mains connection boxes. Bonding of metallic meter enclosures.	<ul style="list-style-type: none"> • Installing 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 to a minimum. • Installing bonding conductors where required. • Ensure correct polarity
39	Determine and apply AS/NZS 3000 requirements for the installing, terminating and testing of catenary supported cables, pendant-type socket outlets and trailing cables.	Assessment of the requirements for installation of cables and accessories supported by catenary wire, techniques of installing trailing cables.	<ul style="list-style-type: none"> • Application of catenary support systems. • Accessories used with catenary supports systems. • Requirements for installation of pendant socket outlets.
40 CRITICAL	Demonstrate ability to read, sketch and interpret electrical diagrams and specifications.	Purpose and characteristics of schematic, block and wiring diagrams, typical symbols used.	<ul style="list-style-type: none"> • Conventions used in documenting electrical information in drawing and diagrams. • Interpreting electrical schematic, block and wiring diagrams, plans and schedules. • Sketch and marking up electrical drawings and diagrams
41	Demonstrate the knowledge and skills to design and connect switching circuits, as per AS/NZS 3000.	Lighting (2 way) control circuits. Motor control Safety interlocks	<ul style="list-style-type: none"> • Lighting and equipment control circuits. • Safety interlocking methods. • Programmable relays and integrated control systems. • Motor control and braking circuits
42 CRITICAL	Describe basic statutory occupational safety and health responsibilities for employers and employees, including supervisory requirements and employees' own "duty of care". Asbestos awareness and reporting. Hazardous gases.	Occupational Safety and Health regulations and electrical safety regulations - legal requirements, safety committees and duty of care.	<ul style="list-style-type: none"> • Object of WHS/OHS legislation and regulations and the fundamental principles that apply • Legal responsibilities for employers and employees • WHS/OHS practices.
43 CRITICAL	Demonstrate understanding of the requirements for personal safety in the workplace and application of safety practices.	Adoption of safe working practices, incident reporting process and responsibility to co-workers. Reference to safe electrical work to AS/NZS4836. Supervision requirements applying to apprentices and trainees. Use of fire extinguishers to control electrical fire at accident site.	<ul style="list-style-type: none"> • Purpose and use of Safe Work Method Statements (SWMS) or Job Safety Analysis (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 an electrical fire at accident site.
44 CRITICAL	Describe a workplace safety check, identify potential workplace hazards, and suggest measures for accident prevention.	Workplace safety inspections. Reference to guidelines issued by both electrical safety regulators and general workplace safety regulators.	<ul style="list-style-type: none"> • Identifying potential workplace hazards • Procedures for undertaking safety checks • Working with a group to identify effective hazard controls measures. • Working with a group to modify and/or develop safe work methods.

45	Demonstrate the knowledge and practices that are essential for working safely with electrical equipment and tools, for safe manual handling, working safely at heights and in confined spaces. Knowledge of testing and tagging procedures to AS/NZS 3760.	Testing and tagging procedures, common causes and prevention of electric shocks and incidents. Working at heights, manual handling, and working in confined spaces.	Requirements for testing and tagging cord connected electrical equipment. Testing and tagging procedures and documentation (AS/NZS 3760) Following established safe work methods for: <ul style="list-style-type: none"> • isolating electrical circuits and equipment • electrical testing of equipment • safe use of ladders and elevated work platforms, and working at heights • manual handling and working in confined spaces.
46 CRITICAL	Describe the method of rescuing a person in contact with live electrical conductors or equipment.	Fundamental principles of emergency procedures.	<ul style="list-style-type: none"> • Ensuring safety of the rescuer. • Establishing the source voltage level. • Rescue process 'dos' and 'don'ts'.
47 CRITICAL	Describe the emergency first aid requirements for an electric shock victim and demonstrate the knowledge and application skill of CPR.	Application and learning of CPR procedures to resuscitate and stabilise a victim.	<ul style="list-style-type: none"> • Calling for help. • Initiating first aid • Applying cardiopulmonary resuscitation (CPR).
48 CRITICAL	Demonstrate knowledge and understanding of the significant dangers of High Voltage equipment and distribution systems.	Step and touch voltages, induced voltages, creepage and clearance requirements. Stored energy and earthing requirements. The use of safe working procedures.	<ul style="list-style-type: none"> • 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.
49	Describe the types of potential operational situations that may be encountered in various areas of industry and the type of assistance that may be needed from more experienced industry personnel.	Eg1. The need to isolate and earth an item of equipment supplied at High Voltage, for repair or maintenance work. Eg 2. The need to sequentially shutdown and isolate a gas fired boiler in preparation for electrical maintenance.	<ul style="list-style-type: none"> • Authorised personnel to undertake HV switching and isolation earthing procedures. • Authorised operators to safely shut-down and start-up plant and equipment • Permission from authorised personnel to disconnect electrical supply from a circuit or installation. • Consulting with experienced operators to establish the nature of reported electrical faults in plant or equipment.
50 CRITICAL	Describe methods of commissioning and/or decommissioning electrical equipment or an installation, using a systems approach.	Commissioning: Circuit voltage testing, phase rotation checks, systematic loading up, correct installation functioning and instrumentation / control parameter checks. Decommissioning: Identification of all circuits, impact on other equipment, isolation, tagging, testing, securing and earthing where required, safe removal of equipment/conductors.	<ul style="list-style-type: none"> • Phase and polarity checking prior to energisation. • Removal of equipment and termination of unused cable. • Dangers of mechanical damage to cables and equipment

51	Describe the functioning of basic electronic circuits used in common electrical power circuit applications, including electronic logic controls, related hazards and safety requirements.	Basic theory and measurement. Common applications are motor starters, lighting dimmers, inverters, line conditioners, smoke alarms, backup supplies, etc. Hazards and safety requirements associated with static electricity discharge from components.	<ul style="list-style-type: none"> • Equipment incorporating electronic components used in electrical systems. • Input and output parameters of equipment incorporating electronic components for; controlling/switching lighting, controlling/switch motors, energy measurement and control, rectifying and inverting electrical supplies. • Following manufacturer's instructions for installation and testing of equipment incorporating electronic components
52	Describe basic control techniques for DC loads. Includes control and diagnostic methods for simple DC motor control circuits and applications.	Understanding of concepts and basic applications in modern plant systems, including motor interlocking safety issues.	<ul style="list-style-type: none"> • Operating principle and components of common d.c. motors. • Power, torque and speed relationships • Types of faults affecting motor performance. • Symptoms and likely causes of supply, field, armature and mechanical faults. • Starting and control circuits and safety interlock methods • Safe testing methods for determining supply, starting, control, field and armature faults affecting motor performance.
53	Demonstrate an understanding of the basic operation and energy efficiency of various types of luminaires, and the purpose of components and ancillary equipment, including related hazards and their safety requirements.	Lighting systems, together with their respective ancillary equipment and related hazards and safety requirements. Refer to AS/NZS 3000.	<ul style="list-style-type: none"> • Operating concepts and parameters of common lamp types and associated control gear. • Typical applications of lamp types. • AS/NZS3000 Wiring Rules requirements for the installation of lamps and luminaires and associated control gear. • Electrical distributor's requirements for maintaining a high power factor • NCC (Australia) or building code (NZ) requirements for energy efficiency.
54 CRITICAL	Demonstrate the knowledge and skills for diagnosing and rectifying faults in electrical apparatus and associated circuits.	Required for safe working practices with electrical systems and installations. All repairs must be compliant with the relevant standards. This item is crucial as all previous skills are utilised to effectively perform a fault find function.	<ul style="list-style-type: none"> • 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 Wiring Rules and other relevant Standards

55	<p>Demonstrate knowledge and application of electricity generation systems and electricity converters and the requirements of AS/NZS 3000 Wiring Rules for stand-alone and grid connected systems. Basic knowledge of battery storage systems and uninterruptible power supplies.</p>	<p>AS/NZS 3000 requirements for electricity generation systems installation and electricity converters. Referenced compliance Standards including: AS/NZS4777(series) Grid connected inverter systems, AS/NZS 5033 Photovoltaic array systems, AS/NZS 3010 Engine-driven generating sets, AS/NZS 4509 (series) Stand-alone power systems AS 3011 Battery systems</p>	<p>Types of electricity generation systems Standards to which the selection, installation and control equipment of each type of system shall comply Fundamental requirements including:</p> <ul style="list-style-type: none"> • DC polarity, including switching and protection devices • Inverter principles • Safe isolation and testing of systems. • Arrangement for connecting an alternative supply to an installation. • Earthing arrangements • Battery storage requirements • Uninterruptible power supplies
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