ELECTRICAL REGULATORY AUTHORITIES COUNCIL

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Essential Performance Capabilities - 2024							
Categories\\	Health, Safety and Electrical Risk Management		Status of Capabilities	**Essential Knowledge and Skills**: Electrical Worker must show a high level of knowledge, skill and understanding of the capability.			
	Fundamental Principles			**General Knowledge and Skills:** Electrical Worker must show a working knowledge, skill and understanding of the capability.			
	Design			**Awareness:** Electrical Worker must show a basic level of knowledge and understanding of the capability.			
	Energy Systems						
	Conductors and Circuits		Evidence Terminology	**Apply**: Integrate concepts and evidence to demonstrate a comprehensive understanding of the capability, may include a practical demonstration.			
	Switchgear and Control gear			**Define**: Give a clear and concise meaning of the capability.			
	Accessories and Equipment			**Demonstrate**: Integrate concepts to show a comprehensive understanding of a capability, must include a practical demonstration.			
	Earthing			**Describe**: Give an account of the main points of the capability in a logical sequence.			
	Motors			**Explain**: Make clear in plain language the capability and its implications.			
	Transformers			**NB**: The definitions used in AS/NZS 3000 should be used for terms that are not defined within this document.			
	Isolation and Testing		Notes	**Application of Standards**: Electrical workers must be able to **Apply** any relevant Regulatory provisions and/or Joint Standards such as (but not limited to) AS/NZS 3000 to the Essential Performance Capabilities (EPCs).			
	Hazardous and Specialist Areas			**Jurisdictional Requirements**: The EPCs may identify specific jurisdictional requirements that may be addressed through relevant training products.			
				Definition of Critical Evidence: Critical Evidence Components (as indicated in red text) must be included in a final assessment prior to the issuance of an unrestricted electrical licence, in addition to an initial assessment.			

No	Title	Description	Status	Evidence	Category	Previous EPC	Current EPC
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1 **Critical evidence components included in red text**	**Describe** Work Health and Safety (WHS)/Occupational Health and Safety (OHS) regulatory requirements.	Work Health and Safety (WHS)/Occupational Health and Safety (OHS) legislation. Duties and rights relating to health and safety. Identify and manage health and safety risks. Undertaking a workplace risk assessment.	Essential Knowledge and Skills	**Describe** the enabling Act including key principles and terms and **Explain** its purpose. **Describe** any primary regulations and Codes of Practice (if applicable to jurisdiction) and **Explain** their purpose. **Explain** the primary on-site health and safety duties and rights of employers and employees. **Explain** common on-site health and safety risks, including dangers of asbestos and crystalline silica exposure. **Describe** procedures for carrying out a workplace risk assessment. **Demonstrate** how to identify on-site health and safety risks. **Demonstrate** the ability to manage health and safety risks using the hierarchy of controls.	Health, Safety and Electrical Risk Management	42, 44	1

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2 **Critical evidence components included in red text**	**Describe** electrical regulatory requirements.	Adoption of safe work practices. Incident and accident reporting. Knowledge of specific Standards that apply to safety when carrying out electrical work including AS/NZS4836. Supervision of electrical apprentices including State or Territory legislation.	Essential Knowledge and Skills	**Describ**e the enabling Act including key principles and terms and **Explain** its purpose. **Explain** the purpose of and **Demonstrate** the use of Safe Work Method Statements (SWMS) and Risk Assessments. **Explain** the purpose and process for reporting electrical incidents. **Explain** safe work methods for working on electrical circuits and equipment including using suitable personal protective equipment (PPE) and the dangers of arc flash. **Describe** the legislative requirements of electrical apprentice supervision including obligations of employers, supervisors and apprentices.	Health, Safety and Electrical Risk Management	43	2
3	**Demonstrate** an understanding of safe work practices when working with electrical equipment and tools, including testing and tagging procedures to AS/NZS3760.	Testing and tagging procedures to AS/NZS3760. Common causes and prevention of electric shocks and incidents. Safe work methods for working at heights, manual handling and working in confined spaces.	Essential Knowledge and Skills	**Demonstrate** testing and tagging procedures and documentation for cord connected electrical equipment in accordance with AS/NZS3760 requirements. **Describe** common causes and methods of preventing electrical shocks or incidents from electrical equipment. **Describe** and **Apply** safe methods of working at heights and **Demonstrate** the safe use of ladders. **Describe** and **Demonstrate** safe methods for use of tools. **Describe** and **Demonstrate** safe manual handling techniques. **Describe** risks associated with working confined spaces.	Health, Safety and Electrical Risk Management	45	3
4 **Critical evidence components included in red text**	**Describe** and **Demonstrate** the method of rescuing a person in contact with low voltage energised electrical conductors or equipment, first aid requirements for injuries sustained from an electrical shock and resuscitation requirements.	Fundamental principles of emergency procedures. Safe rescue of person who has received an electric shock. Application of first aid and cardiopulmonary resuscitation (CPR). Use of correct fire extinguishers.	Essential Knowledge and Skills	**Describe** the procedures for ensuring safety of the rescuer. **Describe** the methods for establishing the source voltage. **Describe** the method to safely rescue a person in contact with energised electrical conductors or equipment using correct equipment and personal protective equipment (PPE). **Demonstrate** the method to safely rescue a person in contact with energised electrical conductors or equipment using correct equipment and personal protective equipment (PPE). **Descibe** appropriate first aid methods for electric shock and burns. **Demonstrate** appropriate first aid methods for electric shock and burns. **Describe** cardiopulmonary resuscitation (CPR). **Demonstrate** cardiopulmonary resuscitation (CPR). **Describe** the principles that apply to the selection and use of fire extinguishers to control an electrical fire at an accident site.	Health, Safety and Electrical Risk Management	46, 47	4
5	**Explain** basic electrical and energy concepts.	Fundamentals of electrical and other forms of energy. Voltage, current and resistance. Principles and physical effects of heating and other energy conversion processes.	General Understanding	**Explain** the relationship between power, work and energy. **Explain** the different forms of energy. **Explain** the different forms of electrical energy. **Explain** the concepts of charge, electric current and electromotive force (EMF) and the principles by which electric current can produce heat, light, motion and a chemical reaction. **Define** electrical and energy concepts of voltage, current and resistance.	Fundamental Principles	1	6
6 **Critical evidence components included in red text**	**Explain** knowledge of the various effects of electric current.	Principles of electric current and the physiological effects on humans and animals.	Essential Knowledge and Skills	**Explain** the effects of electric current. **Describe** the physiological effects of electric current on humans and animals.	Fundamental Principles	2	8

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7 **Critical evidence components included in red text**	**Explain** the operation of a simple practical direct current (d.c.) circuit and **Demonstrate** how to determine the resistance, voltage, current and power in any part of a d.c. circuit using theory and actual measurement methods.	Includes concepts of Ohm's law; material resistivity, resistor parameters and an introduction to resistor measuring methods; current path; circuit control and load; series and parallel circuit analysis; electromotive force (EMF) source and conductors; measuring voltage, current and resistance power dissipation.	Essential Knowledge and Skills	**Explain** factors affecting resistance. **Explain** linear and non-linear resistance. **Describe** methods for measuring resistance. **Describe** circuit configuration and connection of energy source, protection device, switch and load in a circuit. **Explain** the purpose of each component in the circuit. **Explain** the consequences of an open circuit, a closed circuit and a short-circuit. **Explain** and **Demonstrate** the relationship between voltage, current, resistance and power dissipation (Ohm's law) in the whole or any part of the circuit. **Explain** and **Demonstrate** methods of measurement to safely calculate the parameters for the whole or any part of a circuit.	Fundamental Principles	3, 5	9, 22
8	**Explain** the principles of various sources of electromotive force (EMF) and basic electronics and semi-conductor devices.	How electrical energy is generated and/or produced from various forms of energy including solar cells, batteries and static electricity. Basic understanding and use of semi-conductor devices.	General Understanding	**Explain** various sources of electricity. **Explain** the principles by which electricity is produced from a magnetic field coupled with motion of conductors through that field - electromagnetic induction. **Explain** the principles by which electricity is produced in batteries (including by chemical reaction), solar cells and static electricity. **Explain** basic characteristics and typical applications of semi-conductors including thyristors and thermistors.	Fundamental Principles	4	7
9 **Critical evidence components included in red text**	**Demonstrate** 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 voltage and current phase relationships, resonance and impedance.	Essential Knowledge and Skills	**Explain** the concepts of inductive and capacitive reactance, resonance and impedance. **Describe** capacitive and inductive circuit arrangements. **Explain** the phase relationship between voltage and current in resistive, inductive and capacitive reactive circuits. **Explain** the relationship between the parameters of voltage, current, impedance and power dissipation in the whole or any part of a circuit. **Describe** and **Demonstrate** how to safely measure voltage, current and power dissipation for the whole or any part of a capacitive and an inductive circuit. **Describe** and **Demonstrate** methods of determining circuit behaviour for variation in any of the parameters from measured and calculated values. **Describe** requirements for installation of capacitors in accordance with AS/NZS 3000.	Fundamental Principles	6	10

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10 **Critical evidence components included in red text**	**Explain** the operation of a simple practical alternating current (a.c.) circuit and **Apply** knowledge of alternating voltage and current generation, phase relationships, energy in an a.c. circuit and actual measurement methods.	Includes sinusoidal voltage generation and resultant current flow. Calculating and applying measuring techniques to derive required parameters such as power factor.	Essential Knowledge and Skills	**Explain** sinusoidal voltage generation and resulting current in single, two and three-phase installations. **Explain** the terms period including: maximum value, peak-to-peak value, instantaneous value, average value, root-mean-square value; and frequency. **Describe** three-phase generation. **Explain** the relationship between the phase and line voltages generated in a three-phase alternator and the conventions for identifying each. **Describe** the method of determining the phase sequence or phase rotation of a three-phase supply. **Apply** the method of determining the phase sequence or phase rotation of a three-phase supply. **Describe** and **Apply** methods of determining power and energy supplied by three-phase circuits.	Fundamental Principles	8	23
11 **Critical evidence components included in red text**	**Describe** the fundamental safety principles of AS/NZS 3000.	Includes definitions, alterations, protection, design, selection and installation of electrical equipment for electrical safety and protection from direct and indirect contact with live parts.	Essential Knowledge and Skills	**Describe** the key definitions used in AS/NZS 3000. **Explain** the fundamental safety principles of protection against direct and indirect contact with live parts. **Explain** the thermal effects of current and overcurrent. **Explain** earth faults and abnormal voltages. **Explain** methods to prevent the spread of fire. **Explain** methods to prevent mechanical injury from external influences. **Describe** fundamental principles of electrical installation design, selection and installation of equipment, means of compliance (including alterations, additions and repairs) and verification of compliance.	Fundamental Principles	10	3
12 **Critical evidence components included in red text**	**Demonstrate** ability to read, sketch and interpret electrical diagrams and specifications.	Includes the purpose and characteristics of schematic, block and wiring diagrams and typical symbol conventions.	Essential Knowledge and Skills	**Define** the conventions used in documenting electrical information in drawing and diagrams. **Demonstrate** an understanding of electrical schematic, block and wiring diagrams, plans and schedules relating to designs. **Demonstrate** ability to sketch and mark up electrical drawings and diagrams.	Design	40	44
13	**Demonstrate** the knowledge and skills to design and connect switching circuits, including via electronic logic controls and networked lighting controls to AS/NZS 3000 requirements.	Includes design and installation of lighting control circuits such as two-way control circuits and networked lighting control.	General Understanding	**Describe** how lighting and equipment control circuits will operate using line diagrams. **Demonstrate** an ability to draw programmable relays and integrated control systems using diagrams. **Describe** types of networked lighting controls and their programming requirements. **Demonstrate** the ability to install single, two-way lighting and intermediate lighting control circuits.	Design	41	45

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14 **Critical evidence components included in red text**	**Demonstrate** the ability to select cables for mains and submains following AS/NZS 3000 and AS/NZS 3008 requirements.	Includes requirements to satisfy current carrying capacity, short circuit capacity, maximum demand and voltage drop. Interpretation of cable supplier data tables and the impact of various installation methods. Selection of the appropriate cable installation route and method.	Essential Knowledge and Skills	**Describe** and **Demonstrate** methods of determining maximum demand on main and submain cables for single, three phase and multiple installations. **Describe** and **Demonstrate** the method for main and submain cable selection and installation for single and three phase installations based on: • suitability of the cable insulation • installation methods and external influences affecting cable current-carrying capacity • voltage drop limitations • fault loop impedance **Describe** the effects of harmonic current on cable current-carrying capacity. **Describe** the conditions where short-circuit performance may need to be considered. **Describe** and **Demonstrate** the earthing requirements for main and submain cables for single and three phase installations.	Design	21	18
15 **Critical evidence components included in red text**	**Demonstrate** the ability to select cables for final subcircuits following AS/NZS 3000 and AS/NZS 3008 requirements.	Includes requirements to satisfy current carrying capacity, short circuit capacity, maximum demand, earth loop impedance and voltage drop. Interpretation of cable supplier data tables and the impact of various installation methods. Selection of the appropriate cable installation route and method.	Essential Knowledge and Skills	**Describe** considerations for the up-rating and de-rating of cable current-carrying capacity for various installation methods including the spacing of cables, separation of cable supports and environmental factors in accordance with AS/NZS 3000 and AS/NZS 3008. **Describe** and **Demonstrate** methods for determining maximum demand of final subcircuits. **Describe** and **Demonstrate** the method for cable selection and installation for final subcircuits based on: • suitability of the cable insulation • installation methods and external influences affecting cable current-carrying capacity • voltage drop limitations • fault loop impedance • short circuit current **Describe** and **Demonstrate** earthing requirements.	Design	22	19
16	**Demonstrate** knowledge of permanent and electromagnetic induction and its applications.	Includes principles of electromotive force (EMF) induced in a conductor and its application in electrical machines and devices.	Awareness	**Demonstrate** field patterns around permanent magnets. **Demonstrate** field patterns produced by current-carrying conductors. **Explain** self and mutual inductance. **Explain** factors affecting the characteristic of inductive components and circuits. **Explain** electromagnetic principles applied in transformers. **Explain** motor action in a generator and generator action in a motor. **Explain** the application of electromagnetics in control and protective devices	Energy Systems	7	11

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17 **Critical evidence components included in red text**	**Describe** Star and Delta three-phase alternating current (a.c.) systems including reasons why three-phase is used and **Demonstrate** Star and Delta connections.	Includes three-phase systems, demonstrating their advantages including reduced current flow and equipment size.	Essential Knowledge and Skills	**Explain** the advantages of a three-phase system. **Describe** and **Demonstrate** Star connections and the relationship between line and phase values of voltages and currents. **Describe** and **Demonstrate** Delta connections and the relationship between line and phase values of voltages and currents. **Explain** balanced and unbalanced loads. **Describe** and **Demonstrate** methods of determining line and phase voltages and currents and neutral current in unbalanced loads.	Energy Systems	9	14
18	**Describe** knowledge of power factor, power factor improvement principles, power harmonics and power measurement techniques in alternating current (a.c.) circuits in single, two and three-phase installations.	Includes consequences of unity and low power factor, methods of leading and lagging power factor correction, measurement theory and methods to obtain true power, apparent power and Volt-Ampere Reactive (VAR) values.	General Understanding	**Describe** power factor. **Explain** the consequences of unity and non-unity power factor. **Explain** the consequences of power harmonics. **Describe** means of improving power factor. **Describe** and **Apply** power measurement methods to obtain true and apparent power values.	Energy Systems	11	13
19 **Critical evidence components included in red text**	**Describe** knowledge of renewable energy generation and storage systems, including methods of control and isolation for grid-connect and stand-alone power systems, battery energy storage systems, power conversion equipment and electric vehicle charging equipment.	Includes requirements for safe installation, operation, isolation and repair with reference to applicable standards.	Essential Knowledge and Skills	**Describe** different types of renewable energy generation systems including wind, solar, stand-alone, grid-connected and battery storage. **Describe** types of batteries and how they work. **Describe** types of charging systems and how they work. **Explain** the importance of using direct current (d.c.) rated switches and circuit breakers to open or isolate d.c. circuits. **Describe** different types of power conversion equipment and how they work. **Describe** appropriate uses for different types of generators, batteries, charging systems and power conversion equipment. **Describe** the fundamental requirements for mechanical and electrical protection for generators, batteries, charging systems and power conversion equipment including earthing arrangements. **Describe** d.c. polarity and power conversion equipment principles for generation, storage and the connection of d.c. systems to alternating current (a.c.) systems.	Energy Systems	55	12
20 **Critical evidence components included in red text**	**Describe** knowledge of protection by electrical separation (Isolated Supply), separated extra-low voltage (SELV) and protected extra-low voltage (PELV) systems and their application and testing requirements in accordance with AS/NZS 3000.	Includes protection against direct and indirect contact with live parts using Isolated Supply, SELV and PELV systems.	Essential Knowledge and Skills	**Explain** the purpose of Isolated Supply, SELV and PELV circuits, when they should be used and why. **Describe** the electrical configurations used for Isolated Supply, SELV and PELV circuits. **Describe** the earthing requirements for Isolated Supply, SELV and PELV circuits. **Apply** the earthing requirements for Isolated Supply, SELV and PELV circuits. **Describe** the testing requirements for Isolated Supply, SELV and PELV circuits. **Apply** the testing requirements for Isolated Supply, SELV and PELV circuits.	Conductors and Circuits	20	24

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21 **Critical evidence components included in red text**	**Describe** knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial and underground conductors and associated wiring support systems.	Includes selecting various conductor types suitable for the purpose and environment in which they are to be installed, the correct installation method and wiring support system.	Essential Knowledge and Skills	**Describe** and **Apply** methods for selecting aerial and underground conductors and situations where their use would be appropriate. **Describe** the limitations applying to aerial and underground conductors. **Describe** specific requirements applying to the installation of aerial conductors including aerial span limitations, required clearances and the selection of aerial supporting poles/posts and struts for a given application. **Describe** and **Apply** the correct use of and requirements for catenary support systems. **Describe** acceptable cable types and mechanical protection methods for different underground wiring categories. **Describe** the requirements for underground wiring depth and mechanical protection methods. **Apply** the requirements for underground wiring depth and mechanical protection methods. **Explain** the requirements for underground wiring clearances from other services.	Conductors and Circuits	27	20
22	**Describe** the construction, specifications, colour coding and application of various types of cords and cables.	Includes common conductor materials, stranding, colour coding, sheathing types and other construction parameters and limitations of cords and cables. Common application examples of the various cable types and interpretation of cable manufacturers data.	General Understanding	**Describe** cable conductor materials and their configuration for common types of cords and cables. **Describe** permitted cable core colours of conductors for installation wiring, including International Electrotechnical Commission (IEC)/European specifications. **Describe** permitted cable colour required to identify protective earthing and equipotential bonding conductors, including IEC specifications. **Describe** permitted cable core colours for conductors in flexible cords and equipment wiring, including IEC specifications. **Describe** the application of cables as defined by the properties of their insulation, sheathing, armouring and/or screening.	Conductors and Circuits	32	15
23 **Critical components included in red text**	**Describe** and **Demonstrate** the knowledge and skills to install, joint and terminate a variety of conductors in a wide range of applications to AS/NZS3000 requirements.	Includes installation requirements for a wide range of typically used conductors such as thermoplastic-sheathed (TPS), elastomer, cross-linked polyethylene, neutral screened and Wiring System (WS) Classified Cables, in a variety of situations and accessories. Separation from other services and fire wall penetrations.	Essential Knowledge and Skills	**Describe** typical cable routes for installations. **Describe** and **Demonstrate** the use and application of flat and circular TPS cables and conductors. **Describe** and **Apply** the use of steel wire or tape armoured, WS classified and flexible cables and conductors. **Describe** and **Demonstrate**, for various types of conductors the types of termination devices that can be used, how they are used and their application, including tunnel and screw terminals in compliance with standards and manufacturers instruction. **Describe** methods of joining dissimilar metals and the consequences of incorrect terminations. **Describe** and **Demonstrate** the use and application of wiring accessories. **Describe** and **Apply** methods of drawing-in, placing and fixing conductors. **Describe** methods of maintaining fire rating integrity.	Conductors and Circuits	33, 35	16

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24	**Demonstrate** the knowledge and skills to install wiring support systems and install and terminate catenary supported cables, accessories and trailing cables to AS/NZS 3000 and AS/NZS 3008 requirements.	Includes the installation requirements of wiring support systems including catenary wires, metallic and PVC conduit, trunking/ducting enclosures and cable tray/ladder, incorporating spacing and environmental factors including underground methods. Installation and termination requirements of catenary supported cables, accessories and trailing cables.	Essential Knowledge and Skills	**Describe** and **Demonstrate** sizing requirements for wiring enclosures based on the space factor recommendations in AS/NZS 3000 and AS/NZS 3008. **Describe and Demonstrate** the use and application of wiring enclosures and support systems including non-metallic and metallic conduit, trunking and duct enclosures, cable ladder/tray, underground and catenary systems. **Describe and Demonstrate** the use and application and installation requirements of caternary supported cables and accessories. **Describe** the use and application of trailing cables.	Conductors and Circuits	36, 39	16, 17
25 **Critical evidence components included in red text**	**Describe** the requirements for connecting underground and overhead consumers' mains to an installation in accordance with applicable standards and local Electricity Distributor requirements.	Installation of consumers mains including from multiple sources of supply; terminations at pillars, pits and mains connection boxes; bonding and earthing requirements.	Essential Knowledge and Skills	**Describe** the planning process for connection of consumer mains to an Electricity Distributor. **Describe** the arrangement of metering equipment and **Demonstrate** the correct cable preparations for connection of Electricity Distributor's equipment. **Describe** methods and requirements for installing underground and overhead consumer mains. **Describe** methods of terminating consumer mains at pillars, pits, mains connection boxes and switchboards. **Describe** methods and requirements of installing consumer mains to premises with multiple sources of electricity supply. **Describe** and **Demonstrate** methods of bonding and earthing metallic enclosures.	Conductors and Circuits	38	21
26	**Describe** the functioning of basic electronic circuits and equipment used in common electrical power circuit applications including related hazards and safety requirements	Includes basic theory and measurement. Common applications where electronic circuits and equipment are used, including lighting control, smoke alarms, inverters, batteries and battery chargers and switch mode power supply. Common hazards and safety requirements associated with electronic circuits and equipment including static electricity discharge from components.	General Understanding	**Describe** different types of electronic circuits and equipment used in electrical systems and their application. **Describe** input and output parameters of equipment incorporating electronic components for controlling and switching lighting, motors and battery chargers. **Describe** energy measurement and control using rectifying and inverting equipment, including switch mode power supply. **Describe** and **Demonstrate** manufacturer's instructions for installation and testing of equipment incorporating electronic components. **Describe** common hazards associated with electronic equipment including static electricity discharge.	Conductors and Circuits	51	22
27 **Critical evidence components included in red text**	**Describe** an understanding of the types of main and distribution switchboards and their use, including regulatory requirements for location and the arrangement of equipment following applicable standards including AS/NZS 3000 and the National Construction Code (NCC).	Includes determining suitable locations for switchboards taking into account environmental factors and personnel access requirements. Identification of main and distribution switchboards and switchboard equipment.	Essential Knowledge and Skills	**Describe** the requirements for accessibility of and the restricted locations of main and distribution switchboards. **Describe** the construction requirements of main and distribution switchboards. **Describe** and **Demonstrate** the requirements for the identification of main and distribution switchboards. **Describe** and **Demonstrate** the arrangement and identification of main and distribution switchboard equipment. **Describe** and **Demonstrate** main and distribution switchboard wiring and fire-protection measures.	Switchgear and Control gear	24	26

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28 **Critical evidence components included in red text**	**Demonstrate** the control and protection requirements for installations and equipment, selection of suitable equipment and switchgear for an installation or part of an installation using applicable standards.	Includes main and distribution board controls and submain/final sub-circuit controls. Assessment of the prospective short circuit current and operating current. Selection and installation of equipment and protection equipment to protect conductors and installed equipment. Selection and installation of residual current devices (RCD), residual current circuit breaker with overload protection (RCBO) and arc fault detection devices (AFDD).	Essential Knowledge and Skills	**Define** minimum fault levels specified by an Electricity Distributor. **Describe** and **Demonstrate** methods and arrangement for protection against short-circuit currents, overload currents and earth fault. **Describe** and **Demonstrate** the requirements for coordination and installation of overload and short-circuit protection devices. **Describe** and **Demonstrate** coordination between conductor current ratings, overload protection devices and the connected load. **Explain** causes of over and undervoltage. **Describe** and **Demonstrate** device requirements for protection against switchboard over and under voltage, internal arc faults, prosective fault current and surges. **Describe** and **Demonstrate** the requirements for coordination and installation of residual current devices (RCD) and residual current circuit breaker with overload protection (RCBO). **Describe** the requirements for coordination and installation of arc fault detection devices (AFDD). **Describe** control and protection requirements for safety services in accordance with AS/NZS 3000 requirements.	Switchgear and Control gear	23	27
29 **Critical evidence components included in red text**	**Demonstrate** the knowledge and skills to install final sub circuit wiring into switchboards and connect to switchboard equipment in accordance with AS/NZS 3000 requirements.	Includes planning the installation and terminating sub circuit conductors at switchboards and switchboard equipment.	Essential Knowledge and Skills	**Describe** and **Demonstrate** correct interconnection between switchgear, protection devices and links. **Describe** and **Demonstrate** requirements to ensure conductor sizes are adequate. **Describe** and **Demonstrate** clear identification of equipment. **Describe** and **Demonstrate** clear identification of neutral conductors. **Describe** and **Demonstrate** correct polarity.	Switchgear and Control gear	37	28
30	**Describe** the knowledge and skills for selection and attachment of electrical accessories, using appropriate fixing devices and methods in accordance with applicable standards and manufacturers instructions.	Includes types of accessories and their intended use. Selection and safe application of fixing devices for use on various materials to AS/NZS 3000 requirements. Identifying hazards and safety measures when working with adhesives and chemical fixing devices, hand and power tools and powder and compressed gas operated tools. Installing accessories to maintain and achieve required fire rating and protection.	General Understanding	**Describe** different types of accessories and their intended use. **Describe** and **Demonstrate** the requirements for the selection and safe application of devices for fixing to timber, metal, hollow structures, masonry and concrete. **Describe** and **Apply** the risks and safety measures when working with adhesives and chemical fixing devices, hand and power tools and powder and compressed gas operated tools. **Describe** and **Apply** the fire rating and protection requirements for accessories. **Define** the requirements for following manufacturer's instructions. **Explain** the ability to recognise designed building fire protection systems.	Accessories and Equipment	34	29

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31	**Describe** the basic operation and energy efficiency of various types of luminaires.	Includes discharge, fluorescent, filament and light emitting diode (LED) luminaires and their respective ancillary equipment.	General Understanding	**Explain** operating concepts and parameters of common luminaire types and associated control gear. **Explain** typical applications of luminaire types. **Describe** AS/NZS 3000 requirements for the installation of luminaires and associated controlgear. **Describe** the National Construction Code (NCC) requirements for lighting. **Explain** temperature lighting scales (Kelvin) and applications for different temperature ranges.	Accessories and Equipment	53	30
32 **Critical evidence components included in red text**	**Describe** and **Demonstrate** the requirements of Multiple Earthed Neutral (MEN) earthing system in accordance with AS/NZS 3000 requirements including fault loop impedance calculations and **Describe** different types of earthing systems and where they may be required by Regulatory Authorities.	Includes earthing arrangements for protective and functional purposes, earthing connections and conductor selection. Calculation of the correct cable size for an installation to achieve protection and cable co-ordination. Different types of earthing systems.	Essential Knowledge and Skills	**Describe** common types of earthing systems including MEN (TN-C-S), TT, IT, TN-S and TN-C and where the use of each system would be more appropriate. **Explain** the purpose of protective and functional earthing. **Describe** the parts of a protective earthing system. **Describe** the types of earthing equipment and equipotential bonding available and when they would be used. **Define** the types and sizes of conductors used in earthing. **Describe** and **Demonstrate** methods of determining the maximum earth-fault loop impedance for a circuit. **Describe** and **Demonstrate** acceptable earthing methods for an MEN system.	Earthing	16	31
33 **Critical evidence components included in red texttt**	**Describ**e comprehensive knowledge of the Multiple Earthed Neutral (MEN) system and its application including on sub-installations and **Demonstrate** how to test an MEN system.	Includes MEN arrangement, resultant fault current path and magnitude. Operation of protective devices and implication of MEN link absence during fault conditions.	Essential Knowledge and Skills	**Describe** the roles of the protective earthing (PE) and neutral (N) conductors in a installation and their relationship to the protective earth neutral (PEN) conductor in the Electricity Distributor's system or submain to an outbuilding. **Explain** the requirements of an MEN link in an installation and its application to distribution board configurations including to an outbuilding. **Describe** the importance of the MEN link when a fault occurs. **Describe** the likely consequences of an open circuit neutral, the absence of the MEN link or high impendence in the PEN conductor under various fault conditions. **Describe** and **Demonstrate** methods of testing a MEN system using an independent earth.	Earthing	17	32
34	**Describe** basic control techniques and diagnostic methods for simple direct current (d.c.) motor control circuits and applications including variable speed drives.	Includes an understanding of concepts and basic applications in modern plant systems, including motor interlocking safety methods.	General Understanding	**Describe** operating principles, components and applications of common d.c. motors. **Explain** the relationships between power, torque and speed. **Describe** types of faults affecting motor performance. **Describe** symptoms and likely causes of supply, field, armature and mechanical faults. **Describe** and **Demonstrate** the use of starting and control circuits, incorporating braking and safety interlock methods. **Explain** safe testing methods for determining supply, starting, control, field and armature faults affecting motor performance.	Motors	52	33

No	Title	Description	Status	Evidence	Category	Previous EPC	Current EPC
						AUS	NZ
35	**Describe** the operating principles, characteristics and suitability of typical control methods for single phase motors and their key components and **Describe** AS/NZS 3000 and Supply Authority requirements for single phase motor installation and starters.	Includes 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.	General Understanding	**Describe** the operating principles, components and applications of common single phase motors including the concept of a rotating magnetic field. **Describe** the principles by which each type of motor produces starting and running torque. **Explain** the application of each type of motor to the load/torque required. **Describe** types of faults affecting motor performance. **Describe** the symptoms and likely causes of faults in single phase motors and circuits. **Describe** and **Demonstrate** safe testing methods for determining single phase motor and circuit faults.	Motors	15	34
36	**Describe** the operating principles and characteristics, possible causes of malfunction and tests required to diagnose faults of three phase induction motors and generators, and **Describe** AS/NZS 3000 and Supply Authority requirements for three phase motor installation and starters.	Includes starting methods required by the Supply Authority to limit the transient current. Power, torque and speed relationships. Common causes of malfunction such as starting equipment failure, insulation deterioration and water ingress. Testing methods for voltage, amperes and insulation resistance.	General Understanding	**Describe** stator and rotor construction of three phase induction motors and alternators and common uses for three phase induction motors and alternators. **Explain** power, torque and speed relationships of three phase induction motors. **Describe** starting methods required to limit the starting current as specified by Supply Authority requirements for reduced voltage and current starters. **Describe** types of faults affecting three phase motor performance. **Describe** symptoms and likely causes of supply, stator, rotor and mechanical faults. **Describe** and **Demonstrate** safe testing methods for determining supply, stator and rotor faults affecting motor performance. **Describe** wiring diagrams for three phase motors.	Motors	12, 14	35
37 **Critical evidence components included in red text**	**Describe** knowledge of methods of electric motor selection, starting, connection and protection.	Includes design of motor circuits for operator control, isolation, automatic starting and emergency stopping. Methods of starting and speed control. Typical motor lead and circuit terminations. Protection methods, (including by electronic devices) of the motor from environmental, overload, internal faults and supply variation conditions.	Essential Knowledge and Skills	**Describe** criteria for selecting motor starters and overload protection. **Describe** different types of and connection arrangements for direct-on-line and reduced voltage starters. **Describe** different types of soft starters and variable speed drives including the advantages and consequences on an electricity supply. **Describe** thermal, magnetic and thermistor overload protection methods. **Describe** and **Demonstrate** methods for motor circuit operation, control, protection, isolation, automatic starting and emergency stopping.	Motors	12, 13	34

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38 **Critical evidence components included in red text**	**Describe** the basic construction, principles of operation and typical applications of the main types of transformers including key safety considerations and requirements of AS/NZS 3000.	Includes the basic construction, principles and applications of different types of transformers for electricity transmission and distribution, large consumer installations and within electrical equipment and appliances. Safe working procedures when connecting and testing transformers.	Essential Knowledge and Skills	**Describe** the operating principles, components and typical applications of transformers used for the transmission and distribution of power. **Describe** methods of cooling and protection for transformers. **Explain** the turns ratio of transformers. **Describe** the requirements for and restrictions on the installation and use of transformers. **Describe** the safe working procedures when connecting and testing transformers. **Describe** applications for instrument transformers. **Describe** the safety risks and safety control measures associated with the connection and disconnection of instrument transformers (including but not limited to voltage and current transformers) including possible back-feeds from live circuits.	Transformers	18, 19	38
39 **Critical evidence components included in red text**	**Demonstrate** the knowledge and skill to perform safe and effective isolation of electrical installations (with multiple sources of supply), equipment and circuits, including switching and lock out tag out procedures.	Adoption of safe work practices including preparation of a written work procedure. The sequential steps needed to achieve an isolated, tested and safe work area.	Essential Knowledge and Skills	**Describe** the purpose of and **Demonstrate** Safe Work Method Statements (SWMS) or risk assessments for safe and effective isolation of electrical equipment and circuits. **Explain** and **Demonstrate** the ability to identify multiple sources of supply to be isolated, including from capacitors banks, battery systems, photovoltaic arrays, power conversion equipment and engine-driven generator sets. **Describe** methods for safe isolation and testing of power conversion equipment, generators, battery storage and charging systems including delayed start systems and **Demonstrate** the safe isolation of an installation with two or more alternate supplies. **Describe** and **Demonstrate** the effective isolation of a sub-main and a final sub-circuit including identifing the source(s) of supply, lock-out and tagging out procedures and confirming the effective isolation. **Describe** AS/NZS 3000 requirements for dealing with unused conductors and equipment.	Isolation and Testing	31	2
40 **Critical evidence components included in red text**	**Demonstrate** the knowledge and skill for identifying, diagnosing and rectifying faults in electrical installations, equipment and associated circuits in accordance with applicable standards.	Includes safe working practices associated with electrical installations, equipment and circuits. Identifying faults within installations, equipment and circuits. Carrying out electrical repairs in compliance with relevant standards.	Essential Knowledge and Skills	**Explain** the symptoms of the following faults or failures: • open circuit • short circuit • earth fault • incorrect connections • insulation failure • apparatus, complonent or equipment failure • related mechanical failure **Explain** and **Demonstrate** methods and tests to identify faults in circuits and equipment. **Describe** and **Apply** fault rectification/repair and/or replacement work on circuits and equipment in compliance with AS/NZS 3000 and other applicable standards.	Isolation and Testing	54	36

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41 **Critical evidence components included in red text**	**Demonstrate** the requirements to perform mandatory electrical checks and tests to ensure safety and compliance of electrical installations, in accordance with AS/NZS 3000, AS/NZS 3017 and regulatory requirements.	Includes calibration requirements of electrical testing equipment. The tests to ensure the requirements of the applicable Standards have been met, including visual inspection, testing energised and de energised circuits, earth continuity, insulation resistance, polarity, correct connections, fault loop impedance and residual current device (RCD) tests. Reading and understanding test results. Completing required certification or documentation.	Essential Knowledge and Skills	**Define** the standards that cover electrical testing. **Explain** the calibration requirements for electrical testing equipment. **Demonstrate** the requirements to determine whether an electrical installation is safe by undertaking electrical tests mandated by regulation or standards including: • verification of testing equipment • visual inspection • earth continuity • insulation resistance • polarity • correct circuit connections • fault loop impedance • operation of RCDs **Demonstrate** the test results for installations and **Describe** the reasons why they are compliant or noncompliant. **Demonstrate** the documentation or certification requirements required for an electrical installation to show that it has been tested and is safe to connect.	Isolation and Testing	30	37
42 **Critical evidence components included in red text**	**Demonstrate** a systematic approach for commissioning and decommissioning electrical installations and equipment.	Includes safety checks and procedures commissioning and decommissioning installations and equipment in accordance with manufacturers instructions, standards and workplace procedures.	Essential Knowledge and Skills	**Describe** and **Demonstrate** mandatory testing, installation and commissioning requirements prior to energisation. **Demonstrate** correct identification and isolation and procedural requirements for the removal of equipment and termination of unused cables. **Describe** the risks associated with mechanical damage to cables and equipment. **Demonstrate** the ability to follow inspection and testing procedure. **Demonstrate** the requirements to commission electrical equipment including systematic loading up and correct functioning of the equipment. **Describe** types of records and documentation required for commissioning and decommissioning equipment, circuits or electrical components. **Describe** acceptable methods for disposing of hazardous materials.	Isolation and Testing	50	25
43	**Describe** the types of operational situations that carry an increased electrical safety risk and require additional competency and/or authorisation, including applicable regulatory requirements.	Includes understanding individual personal competence for hazardous, high risk or specialist areas of work. Process for seeking assistance and authorisations.	General Understanding	**Define** who is authorised to: • disconnect electrical supply to an installation, circuit, appliance, equipment or fitting • undertake High Voltage (HV) switching, isolation and earthing procedures • safely shutdown and start up plant or equipment **Describe** the process for consulting with experienced personnel to establish the nature of reported electrical faults in plant or equipment. **Describe** the process to obtain assistance and sign off from an experienced and/or authorised person.	Hazardous and Specialist Areas	49	39
44 **Critical evidence components included in red text**	**Describe** knowledge of the AS/NZS 3000 requirements for electrical installations in hazardous areas and an awareness of the additional hazardous area standards which apply.	Includes an understanding of concepts and practices that apply to hazardous areas as set out in AS/NZS 3000. Awareness of additional hazardous area standards.	General Understanding	**Explain** areas classified as hazardous in accordance with AS/NZS 3000. **Define** the standards to which the selection, installation, inspection and maintenance of electrical equipment and installations in hazardous areas shall comply. **Describe** the training, experience and safety requirements required to work competently in hazardous areas.	Hazardous and Specialist Areas	28	40

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45 **Critical evidence components included in red text**	**Describe** knowledge of the AS/NZS 3000 requirements for special electrical installations and an awareness of the applicable specialist standards which apply, including applicable jurisdictional regulatory requirements.	Includes AS/NZS 3000 requirements for special electrical installations and the following additional standards: • AS/NZS 3001 Connectable electrical installations and supply arrangements • AS/NZS 3002 Shows and carnivals • AS/NZS 3003 Patient areas • AS/NZS 3004 Marinas and recreational boats • AS/NZS 3010 Generating sets	General Understanding	**Explain** installations classified as special electrical installations in AS/NZS 3000. **Define** the standards to which the selection, installation, inspection and maintenance of electrical equipment in special electrical installations in the following situations shall comply: • connectable electrical installations • shows and carnivals • patient areas. • marinas and boats. • electric vehicle charging infrastructure • generating sets	Hazardous and Specialist Areas	29	40
46 **Critical evidence components included in red text**	**Describe** an understanding of the AS/NZS 3000 for the installation of electrical equipment in damp situations and wet areas.	Includes damp zones and related electrical equipment requirements. Assessment of the earthing requirements and wiring systems for damp and wet areas. Equipment rating and suitability and methods of protecting equipment.	Essential Knowledge and Skills	**Define** areas specified as damp situation classified zones. **Describe** the limitations applying to the installation of electrical equipment in classified zones. **Describe** and **Demonstrate** appropriate selection and location of electrical equipment suitable for installation in classified zones. **Define** when the use of residual current devices (RCD), separated extra-low voltage (SELV), protected extra-low voltage (PELV) and isolated supply methods are required for damp situations. **Define** when equipotential bonding is required in damp zones. **Describe** other methods of protecting equipment from moisture including using ingress protection (IP) rated equipment. **Explain** how to maintain the IP rating of accessories and equipment.	Hazardous and Specialist Areas	25	42
47 **Critical evidence components included in red text**	**Describe** 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.	Includes the assessment of supply requirements, construction wiring, lighting, socket outlet and final circuit protection and requirements.	Essential Knowledge and Skills	**Describe** the supply requirements for construction sites. **Describe** the types of switchboards required for construction and demolition sites. **Describe** installation methods and requirements for construction wiring, lighting and socket outlets. **Describe** methods of protection and control of circuits. **Describe** the requirements for circuits for construction lifts. **Describe** the requirements and methods for the initial and periodic inspection and testing.	Hazardous and Specialist Areas	26	41

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48 **Critical evidence components included in red text**	**Describe** knowledge and understanding of the significant dangers of High Voltage (HV) equipment and distribution systems in accordance with regulatory requirements.	Includes step and touch voltages, induced voltages, creepage and clearance requirements. Stored energy and earthing requirements. Safe working procedures for HV equipment and systems.	Essential Knowledge and Skills	**Describe** Electricity Distributor and regulatory requirements for working on or near HV equipment and distribution systems. **Describe** step, touch and induced voltages. **Describe** sources of induced voltage and stored energy. **Describe** creepage and clearance requirements. **Describe** safe working procedures for working in the vicinity of HV equipment and conductors. **Describe** common scenarios where HV equipment and conductors are used. **Describe** knowledge of wind and large-scale solar renewable energy systems and the interaction with HV equipment and systems.	Hazardous and Specialist Areas	48	43