



Australian Government

MEM10025 Undertake a capstone assessment

Release: 4

MEM10025 Undertake a capstone assessment

Modification History

Release 4. Prerequisite units updated

Release 3. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 2. Equivalent - correction to include missing prerequisites

Release 1. New unit

Application

This assessment is to be carried out after the completion of all other assessment requirements of the units of competency that make up MEM31219 Certificate III in Engineering – Industrial Electrician and prior to application for an Electrical Licence.

This assessment is to be carried out at the premises of the Registered Training Organisation (RTO) and is expected to be conducted by an assessor other than the one who has been a regular instructor to the apprentice.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capabilities (EPCs) classified as ‘critical’:

- EPC 2 – Demonstrate a knowledge of the various effects of electric current.
- EPC 5 – 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.
- EPC 8 – Demonstrate a knowledge of alternating voltage & current generation, phase relationships, energy in an AC circuit, and actual measurement methods.
- EPC 10 – Demonstrate an understanding of the fundamental principles of the AS/NZS 3000 Part 1. Knowledge of the hierarchy of standards. Normative/informative text.
- EPC 13 – Demonstrate a knowledge of methods of electric motor selection, starting, connection and protection.
- EPC 16 – Describe and apply in practice the requirements of AS/NZS 3000 in relation to earthing arrangements and fault loop impedance calculations. Knowledge of alternate earthing systems when required by local Regulatory Authorities.
- EPC 17 – Demonstrate a comprehensive knowledge and understanding of the MEN system and its application, including on sub-installations. Demonstrate how to test a MEN system.
- EPC 19 – List the key safety issues of various types of transformers, including AS/NZS 3000 requirements.
- EPC 20 – Demonstrate a knowledge of the SELV and PELV systems, their application and testing in accordance with AS/NZS 3000.

- EPC 21 – 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.
- EPC 22 – 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 capacity, maximum demand, earth loop impedance and voltage drop.
- EPC 23 – 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/NZS 3000.
- EPC 24 – 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.
- EPC 25 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the installation of electrical equipment in given damp situations and wet areas. IP rating of electrical equipment.
- EPC 26 – 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.
- EPC 27 – Demonstrate knowledge of AS/NZS 3000 and local regulatory requirements for the installation of aerial conductors and underground wiring. Including specialist cables.
- EPC 28 – 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.
- EPC 30 – Demonstrate to AS/NZS 3000 and AS 3017 standards the electrical checks and tests required to ensure electrical installations are safe, reporting of test results typically required to satisfy regulatory requirements.
- EPC 31 – 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.
- EPC 35 – Demonstrate the knowledge and skill to install and terminate a variety of electrical cables in a wide range of applications (including final subcircuits) to AS/NZS 3000.
- EPC 37 – 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.
- EPC 38 – Connect consumers mains to an installation, in accordance with AS/NZS 3000 and local supply authority requirements.
- EPC 40 – Demonstrate ability to read, sketch and interpret electrical diagrams and specifications.
- EPC 42 – 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.
- EPC 43 – Demonstrate understanding of the requirements for personal safety in the workplace and application of safety practices.

- EPC 44 – Describe a workplace safety check, identify potential workplace hazards and suggest measures for accident prevention.
- EPC 46 – Describe the method of rescuing a person in contact with live electrical conductors or equipment.
- EPC 47 – Describe the emergency first aid requirements for an electric shock victim and demonstrate the knowledge and application skill of CPR.
- EPC 48 – Demonstrate knowledge and understanding of the significant dangers of High Voltage equipment and distribution systems.
- EPC 50 – Describe methods of commissioning and/or decommissioning electrical equipment or an installation, using a systems approach.
- EPC 54 – Demonstrate the knowledge and skills for diagnosing and rectifying faults in electrical apparatus and associated circuits.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 1

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM10020	Install low voltage cabling and fit-off accessories, appliances and equipment
MEM10021	Inspect, test and verify electrical installations
MEM10022	Commission and decommission high and low voltage equipment or installations
MEM10023	Design and connect control switching of circuits for building services and industrial equipment
MEM10024	Install and troubleshoot luminaires and ancillary equipment
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM13017	Apply safety practices, procedures and compliance standards associated with licensed electrical work

MEM17003	Assist in the provision of on-the-job-training
MEM18001	Use hand tools
MEM18100	Fault-find, test and rectify AC machines and circuits
MEM18102	Fault-find, test and rectify single and three-phase transformers
MEM18103	Fault-find, test and rectify electrical circuits and equipment
MEM18104	Dismantle, replace and assemble electrical components and equipment
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG102A	Solve problems in low voltage a.c. circuits

Competency Field

Installation and commissioning

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Prepare to undertake a capstone assessment	1.1. Follow standard operating procedures (SOPs) 1.2. Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures 1.3. Use appropriate personal protective equipment (PPE) in accordance with SOPs 1.4. Identify practical assessment requirements from specifications, drawings, job sheets or work instructions

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
2. Carry out practical assessment	2.1. Obtain necessary tools, equipment and testing devices needed for completing the practical assessment and check for correct operation and safety
	2.2. Select cable types and sizes to suit loads and electrical installation environment
	2.3. Select circuit protection devices by type and rating
	2.4. Install and terminate low voltage (LV) cabling and wiring, fit off accessories, appliances and equipment in accordance with specifications and regulatory requirements
	2.5. Inspect, test and verify electrical installation to ensure compliance with regulatory requirements
	2.6. Rectify all non-compliance defects and re-test to ensure compliance
3. Carry out a theory assessment	3.1. Obtain all applicable standards and other approved reference books relevant to the test being undertaken
	3.2. Complete the written component of the capstone assessment within the allocated timeframe
4. Complete the capstone assessment	4.1. Demonstrate fundamental knowledge and comprehension of electrical concepts and safety principles, using (where possible) problems that test a combination of practical and theoretical skills
	4.2. Satisfy the minimum requirements of both the written and practical component of the capstone assessment
	4.3. Demonstrate fundamental knowledge and comprehension of electrical concepts and safety principles, using (where possible) problems that test a combination of practical and theoretical skills
	4.4. Satisfy the minimum requirements of both the written and practical component of the capstone assessment

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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|---|--|
| Assessment requirements include: | <ul style="list-style-type: none">• as described by the National Uniform Electrical Licensing Advisory Council or its successor – Capstone assessment requirements for prospective electricians include the following:<ul style="list-style-type: none">• all ‘critical items’ of the EPCs list• may be an ‘open book’ style, with the permitted use of standards and published reference books (programmable calculators, computers and personal notes are to be excluded) |
| Capstone assessment includes: | <ul style="list-style-type: none">• written component – objective assessment methods to be used, including a sensible proportion of multiple choice questions (‘essay style’ to be avoided) and some written answers to the objective questions, aimed at demonstrating a trainee’s understanding of the ‘critical’ aspects as specified in the EPC list• practical component – required demonstration of fundamental knowledge and comprehension of electrical concepts and safety principles, as specified in the ‘critical’ items of the EPC list, using (where possible) problems that test a combination of practical and theoretical knowledge and skills |
| Duration of capstone assessment includes: | <ul style="list-style-type: none">• one full working day to complete, with the practical component representing about 70% of the whole test, e.g. written test 2-3 hours and practical test 4-6 hours |
| Minimum requirements of the capstone assessment include: | <ul style="list-style-type: none">• written – the apprentice is required to demonstrate satisfactory performance in every ‘critical’ item tested• practical – the apprentice is required to have demonstrated *competence for the ‘critical’ items tested |

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

***Note:** Competence in this setting means that it is evident that the person comprehends the key safety issues and the practical work performed does not suffer from any defects of the kind categorised as ‘serious’ by Electrical Regulators

Safe working practices include:

- demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 3. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities and inclusion of missing prerequisites.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM10025 Undertake a capstone assessment

Modification History

Release 4. Prerequisite units updated

Release 3. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 2. Equivalent - correction to include missing prerequisites

Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- demonstrating fundamental knowledge and comprehension of electrical concepts and safety principles, using (where possible) problems that test a combination of practical and theoretical skills
- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings, plans and specifications relevant to the work to be undertaken
- obtaining the necessary tools, equipment and testing devices ensuring that they are checked for safety and operation
- undertaking the necessary calculations in determining current carrying capacity, short circuit capacity, maximum demand and voltage drop and earth loop impedance for the given installation
- selecting cables ensuring coordination between protective devices and conductors in accordance with specifications and regulatory requirements
- selecting and installing suitable switch gear and circuit protection devices complying with specifications and regulatory requirements
- installing and terminating low voltage cabling and wiring; fitting off accessories, appliances and equipment in accordance with specifications and regulatory requirements
- performing a visual inspection ensuring that it meets the requirements of the Australian/New Zealand Wiring Rules – Testing and Verification Visual Inspection Check List
- performing the mandatory and optional circuit tests required for electrical cables in a range of installations and final subcircuits, including:
 - following safe testing procedures
 - testing to show if the earth continuity is sufficiently low
 - testing to show if the insulation resistance is sufficiently high
 - testing to show if the polarity and circuit connections are correct
 - testing to show earth fault-loop impedance is sufficiently low

- performing testing to verify that residual current devices (RCDs) operate as intended
- demonstrating how to test a multiple earthed neutral (MEN) system
- identifying and rectifying of any non-compliance defect/s and retesting to ensure compliance
- completing all mandatory documentation in accordance with regulatory and local supply authority requirements
- completing the written component of the capstone assessment in the allocated timeframe
- satisfying the minimum requirements of both the written and practical component of the capstone assessment.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- various effects of electric current
- operation of a simple practical circuit
- determination of resistance, voltage, current and power in any part of a direct current (DC) circuit using theory and actual measurements
- alternating voltage and current generation, phase relationships, energy in an alternating current (AC) circuit and actual measurement methods
- understanding of the scope, application and fundamental principles of AS/NZS 3000: 2007 Electrical installations (known as the Australian/New Zealand Wiring Rules) Part 1
- methods of electric motor selection, starting, connection and protection
- requirements and its application of Australian/New Zealand Wiring Rules in relation to earthing arrangements and fault-loop impedance calculations
- alternate earthing systems when required by local regulatory authorities
- understanding of the MEN system and its application, including on sub-installations
- applications of transformers and key safety issues
- requirements and application of Australian/New Zealand Wiring Rules in relation to circuit protection and other relevant Australian Standards e.g. AS/NZS 3018:2001 Electrical installations – Domestic installations (or its equivalent updated version)
- requirements and application of Australian/New Zealand Wiring Rules in relation to separated extra-low voltage (SELV) and protected extra-low voltage (PELV) systems, their application and testing
- cable selection for mains and submains using Australian/New Zealand Wiring Rules and AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions based on current carrying capacity, short circuit capacity, maximum demand and voltage drop for single-phase and three-phase installations, including multiple installations

- cable selection for final subcircuits using Australian/New Zealand Wiring Rules and AS/NZS 3008.1.1:2009 Electrical Installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV – typical Australian installation conditions based on current-carrying capacity, short circuit capacity, earth loop impedance and voltage drop
- control and protection requirements for installations and equipment and the ability to select suitable equipment, switchgear and RCDs for a particular installation or part of an installation
- minimum fault levels specified by electricity network operator
- requirements and application of Australian/New Zealand Wiring Rules in relation to location of switchboards and arrangement of switchboard equipment in installations
- methods of determining prospective fault current
- switchboard form types
- installation of electrical equipment in given damp situations and wet areas in accordance with Australian/New Zealand Wiring Rules and regulatory requirements
- Ingress Protection (IP) rating of electrical equipment
- installation, modification and testing of electrical installations and equipment for construction and demolition sites complying with AS/NZS 3012:2010 Electrical installations – Construction and demolition sites, and applicable workplace safety legislation
- need for calibration of instruments
- requirements of Australian/New Zealand Wiring Rules in relation to the installation of aerial conductors, underground wiring and specialist cables
- requirements Australian/New Zealand Wiring Rules in relation for electrical installations in hazardous areas and awareness of the standards to which it refers
- additional training required to work competently with electrical equipment for hazardous areas
- electrical tests and checks to be performed as required by Australian/New Zealand Wiring Rules and AS 3017:2007 Electrical installations – Verification guidelines to ensure electrical installations are safe
- reporting of test results typically required to satisfy regulatory requirements
- effective safe isolation of any equipment, including capacitor banks, including switch and lock off, circuit isolation, equipment testing and tagging procedures
- installation and termination requirements for a variety of cables in a wide range of applications (including final subcircuits to Australian/New Zealand Wiring Rules
- circuit tests requirements for electrical cables in a range of installations, with attention to final subcircuits
- installation requirements of final subcircuit wiring into switchboards and connection to switchboard equipment in accordance with Australian/New Zealand Wiring Rules and local supply authority requirements
- connection requirements of consumer mains to an installation in accordance with Australian/New Zealand Wiring Rules and local supply authority requirements
- reading, sketching and interpretation of electrical diagrams and specifications

- basic statutory work health and safety (WHS) responsibilities for employers and employees, including supervisory requirements and employees' own 'duty of care', including asbestos awareness and hazardous gases
- requirements for personal safety in the workplace, including safe isolation and application of safety practices
- workplace safety checks, identification of potential workplace hazards and working with others to suggest measures for accident prevention
- method of rescuing a person in contact with live electrical conductors or equipment
- emergency first aid requirements for an electric shock victim and demonstrate the knowledge and application skill of cardiopulmonary resuscitation (CPR)
- understanding of the significant dangers of high voltage equipment and distribution systems
- methods of commissioning and/or decommissioning electrical installation using a systems approach
- diagnosing and rectifying faults in electrical apparatus and associated circuits.

Assessment Conditions

- Assessors must:
 - hold a current electrical licence be an assessor other than the one who has been a regular instructor to the apprentice
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires
- The capstone assessment is an entirely RTO conducted assessment at the RTO's chosen location where the entire assessment needs to be carried out in one day.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Links

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<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>