



Australian Government

MEM10020 Install low voltage cabling and fit-off accessories, appliances and equipment

Release: 3

MEM10020 Install low voltage cabling and fit-off accessories, appliances and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in installing low voltage cabling/wiring; fitting off accessories, appliances and equipment to an electrical switchboard in a variety of situations; and connecting consumer mains to an installation.

It covers a comprehensive understanding of AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand Wiring Rules) and regulatory requirements and knowledge of other standards that apply to particular situations and installations for selecting and fixing of accessories; the location of switchboards; arrangement and identification of switchboard equipment; and access requirements, including the separation and minimising the spread of fire.

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

Essential Performance Capabilities (EPCs):

- EPC 29 – Knowledge of the 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.
- EPC 36 – Demonstrate the knowledge and skills for the installation of wiring support systems.
- EPC 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.

And

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

- EPC 24 – Demonstrate an understanding of the AS/NZS 3000 and regulatory requirements for the location of switchboards and the 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 knowledge of AS/NZS 3000 requirements for electrical installations in hazardous areas and an awareness of the standards to which it refers.
- 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 consumer mains to an installation, in accordance with AS/NZS 3000 and local supply authority requirements.

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: 4

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 controls devices by type and rating, fit to switchboards and install earthing
MEM10023	Design and connect control switching of circuits for building services and industrial equipment
MEM10024	Install and troubleshoot luminaires and ancillary equipment
MEM18001	Use hand tools

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. Determine job requirements | 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 job requirements from specifications, drawings, job sheets or work instructions |
| 2. Plan installation of electrical wiring, accessories and appliances | 2.1 Plan cable routes in accordance with requirements contained in the job instructions/specifications |
| | 2.2 Obtain necessary cables, appropriate cable support systems and enclosures, accessories and appliances needed for the installation work in accordance with established procedures and check against job requirements |
| | 2.3 Obtain necessary tools, equipment and testing instruments needed for the installation work |
| 3. Install and fit off electrical wiring, accessories and appliances | 3.1 Isolate and tag circuits and equipment in accordance with procedures, where required |
| | 3.2 Install and fix cable support system in position ensuring components are square and plumb, securely attached using fastenings appropriate to the weight of the components and the material of the mounting |
| | 3.3 Install electrical cables and wiring, accessories and appliances in compliance with specifications and regulatory requirements |
| | 3.4 Maintain fire integrity when installing electrical cables and wiring |
| | 3.5 Check installed accessories and appliances are straight and square in the required locations |
| | 3.6 Terminate cables and conductors at switchboards, |

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

accessories and appliances in accordance with manufacturer specifications and regulatory requirements

3.7 Test and inspect installed circuits to ensure compliance in accordance with legislative and regulatory requirements

3.8 Rectify any defects and re-test to ensure compliance

3.9 Document installation of wiring, accessories and appliances in accordance with SOPs

4. Connect consumers mains to an installation

4.1 Install underground and overhead consumers mains

4.2 Install unprotected consumers mains to reduce the risk of short circuit to a minimum

4.3 Terminate consumers mains at pillars, pits, mains connection boxes and consumers switchboard

4.4 Install bonding conductors, where required

4.5 Ensure correct polarity

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.

Electrical installations include:

- at least one (1) general electrical installation comprising a main switchboard, supplying more than one circuit each for lighting, socket outlets and fixed appliances
- at least one (1) industrial electrical installation comprising a distribution board separate from the main switchboard and at least one circuit supplying a three-phase load and safety

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system in one of the following industrial environments:

- factory
- building
- off shore platform
- mine site processing
- oil and gas installation
- processing plant
- workshop
- underground installation
- three-phase loads include at least one (1) or more of the following:
 - motors – for pumps, conveyors, mills, agitators, crushers and screening plants
 - heaters
 - compressor packages
 - heating, ventilation and air conditioning (HVAC) units
 - facility accommodation units, sea container workshops and storage units, and laboratories
 - workshop equipment including lathes, milling machines and welders
 - underground dewatering systems and ‘gate end’ boxes for drilling equipment

Cable routes include one (1) or more of the following:

- internal to buildings
- underground
- aerial

Electrical cable and wiring types include five (5) or more of the following:

- thermoplastic insulated cable (TPI)
- flat thermoplastic sheathed (TPS)
- circular thermoplastic sheathed (TPS)
- steel wired armoured (SWA)
- fire rated cable (HT or HF or MIMS)
- cross-linked polyethylene (XLPE) cables
- neutral screened cables
- flexible cables
- aluminium conductor/cable
- underground cables

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.

- aerial conductors

Termination of cables and cords include two (2) or more of the following connectors and lugs:

- connectors:
 - screw
 - stud
 - tunnel
- lugs:
 - crimp and compression
 - soldering
 - solderless

Cable support systems include four (4) or more of the following:

- metallic conduit
- non-metallic conduit
- trunking
- duct
- cable tray/ladder
- catenary
- posts/poles/struts

Regulatory requirements include:

- AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3018.1 Electrical installations – Domestic installations (or its equivalent updated version)
- local supply authority requirements

Safe working practices include:

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

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

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 MEM10020 Install low voltage cabling and fit-off accessories, appliances and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

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 on at least two (2) occasions and include:

- 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
- planning the cable routes in accordance with legislative and customer requirements
- installing cable support systems
- complying with the following cable support system requirements:
 - bending steel conduits (where applicable) such that the internal diameter is not significantly reduced
 - preparing entry joints and joints to ensure cable insulation is not damaged
 - joining steel conduits together using appropriate accessories or if required through a welding process
 - ensuring that they are adequately sealed against entry of water or rain
- installing wiring systems using applicable cable support systems according to the electrical installation requirements and standards paying particular attention to factors effecting cable current-carrying capacity
- maintaining fire integrity
- terminating cables and conductors to switchboard protective devices
- terminating cables and conductors at switchboards, accessories and appliances according to legislative, regulatory and manufacturer requirements
- installing all accessories, appliances and equipment square and straight and in the required location using appropriate hand and power tools
- ensuring appropriate Ingress Protection (IP) rating when selecting suitable electrical equipment
- inspecting and testing installed and terminated cables to ensure they comply with continuity and insulation resistance and are safe to connect to the supply
- rectifying any defects and retesting to ensure compliance
- connecting and terminating consumers mains to an installation

- completing appropriate documentation in accordance with SOPs.

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)
- Australian Standards, codes and requirements applicable to the installation for:
 - thermoplastic sheathed (TPS - flat and circular) and thermoplastic insulated (TPI) cables
 - fire protection and mineral insulated metal sheathed (MIMS) cables
 - steel wired armoured (SWA)
 - flexible cords used as fixed wiring
 - trailing cable and catenary wire systems
 - cables support systems
 - protection against mechanical damage
 - wiring systems likely to be disturbed
 - wiring systems installed vertically
 - change of direction
 - prohibited cable locations
 - selection and installation to minimise the spread of fire
 - limitation of circulating and eddy currents
- Australian/New Zealand Wiring Rules requirements for enclosure of cables, including:
 - types of wiring enclosures – change of wiring enclosures, entry of water and support of cables
 - installation of wiring enclosures – support, continuity, bending, passage of conductors, terminations, in direct sunlight, provision for expansion and cable trunking
 - factors effecting cable current-carrying capacity
- dissimilar metals in a corrosive environment
- application of protective coatings, e.g. paint, galvanizing and powder coatings
- techniques, tools and equipment required to install conduit (metallic and non-metallic), enclosures and support systems
- Australian Standards, codes and requirements applicable to the installation of electrical equipment, including:
 - appliances
 - switchgear, controlgear and accessories
 - switchboards – location and access, physical and circuit arrangements
 - socket outlets
 - lighting equipment and accessories, lamps and luminaires
 - smoke and fire detectors
 - cooking appliances

- appliances producing hot water or steam
- room, space and duct heaters
- electric heating cables for floors and ceilings
- electricity converters
- motors, transformers, capacitors and batteries
- control, switching and over current and residual current device (RCD) protection
- required and permitted locations for current-using equipment and accessories
- suitable IP rating
- correct marking of equipment
- terminal configuration of phase, neutral and protective earthing conductors for each type of equipment
- installation standards called up by the Australian/New Zealand Wiring Rules for special situations, including:
 - movable premises and caravan parks
 - shows and carnivals
 - boating marinas
 - electromedical treatment areas
 - outdoor sites under heavy conditions
 - cranes and hoists
 - lifts
 - cold cathode illumination systems
 - electric fences
 - construction and demolition sites
 - film, video and television sites
 - telecommunications networks power supplies
 - hazardous areas e.g. AS/NZS 2430:2004 Classification of hazardous areas, AS/NZS 2381 Set:2008 Electrical equipment for explosive gas atmospheres – Selection, installation and maintenance Set (or their equivalent updated versions)
- Australian/New Zealand Wiring Rules requirements for special electrical installations or locations, including:
 - baths, showers or other fixed water containers
 - swimming pools, paddling pools and spa pools or tubs
 - sauna heaters
 - refrigeration rooms
 - locations where water general hosing down operations are carried out
 - fountains and water features
 - extra-low voltage electrical installations
 - high voltage electrical installations
 - hazardous areas
 - emergency systems

- additional training required to work competently with electrical equipment for hazardous areas
- underground wiring systems, including:
 - arrangements and installation requirements
 - spacing from other underground services
 - consumer mains
- aerial wiring systems, including:
 - types of conductor
 - arrangements, clearances, distance between supports (spans), aerial conductor supports, poles and posts and joints and connections
 - Australian/New Zealand Wiring Rules and local supply authority requirements
 - testing of installed cables in compliance with Australian Standards
- cables supported by catenary, including:
 - types of cables
 - catenary supports
- tools, techniques and procedures for installing cables and wiring systems
- testing and verification of installed and terminated cables to ensure they comply with a visual inspection, all mandatory and optional tests and are safe to connect to the supply
- installation of underground and overhead consumer mains
- termination of consumer mains at pillars, pits, mains connection boxes and consumers switchboard
- installation of unprotected consumers mains to reduce the risk of short circuit to a minimum
- installation of bonding conductors, where required.

Assessment Conditions

- Assessors must:
 - have vocational competency in installing low voltage cabling and fitting off accessories, appliances and equipment at least to the level being assessed with relevant industry knowledge and experience
 - 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.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- 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.

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