



Australian Government

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Release: 2

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Modification History

Release 2. This is the second release of this unit of competency in the UEE Electrotechnology Training Package.

Workplace evidence requirements updated in Performance Evidence and Assessment Conditions.
Assessor requirements updated in Assessment Conditions.

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to select wiring systems and cables for electrical installations operating at voltages up to 1,000 volt (V) alternating current (a.c.) or 1,500 V direct current (d.c.).

It includes application of wiring systems and cable types, selecting wiring system compatible with the installation conditions, selecting cables that comply with required current-carrying capacity and voltage drop and earth fault-loop impedance limitations, coordinating between protective devices and conductors, and documenting selection decisions.

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 V a.c. or 120 V d.c..

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, a relevant contract of training, such as an Australian Apprenticeship, may be required.

Additional and/or other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

Pre-requisite Unit

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEECD0019 Fabricate, assemble and dismantle utilities industry components

UEECD0020 Fix and secure electrotechnology equipment

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

UEEEL0003 Arrange circuits, control and protection for electrical installations

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

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

UEEEL0021 Solve problems in magnetic and electromagnetic devices

UEEEL0008 Evaluate and modify low voltage heating equipment and controls

UEEEL0009 Evaluate and modify low voltage lighting circuits, equipment and controls

UEEEL0010 Evaluate and modify low voltage socket outlets circuits

UEEEL0024 Test and connect alternating current (a.c.) rotating machines

UEEEL0025 Test and connect transformers

and

UEECD0043 Solve problems in direct current circuits

or

UEECD0044 Solve problems in multiple path circuits

UEECD0046 Solve problems in single path circuits

Competency Field

Electrical

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Plan wiring systems for general electrical installations

PERFORMANCE CRITERIA

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

- 1.1** Scope and nature of the electrical installation is determined from job specifications
- 1.2** WHS/OHS requirements and workplace procedures and other regulatory requirements are identified and applied
- 1.3** Cable routes, the route lengths of cable, and the conditions in which the wiring system is to operate is determined from job specifications or from consultation

		with appropriate person/s
2 Select wiring systems and cables for general electrical installations	2.1	Wiring system is selected and suitable for the environments in which it will operate
	2.2	Cable conductor sizes are selected to meet current-carrying capacity requirements and voltage-drop and earth fault-loop impedance limitations in accordance with relevant industry standards
	2.3	Circuit protective devices are selected to meet requirement for co-ordination with conductor current-carrying capacity in accordance with relevant industry standards
	2.4	Earthing system components are selected to meet multiple earthed neutral (MEN) system in accordance with relevant industry standards
3 Document electrical installation	3.1	Manufacturer data is referenced in selection of equipment to ensure materials comply with safety requirements and relevant industry standards
	3.2	Rationale for wiring system selections and calculations are documented in accordance with workplace procedures
	3.3	Electrical installation arrangement and specifications for all selected items are documented in accordance with workplace procedures and forwarded to appropriate person/s

Foundation Skills

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

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Selecting wiring systems and cables for at least two general electrical installations,

- a main switchboard, supplying more than one circuit each for:

including:

- lighting
- socket outlets
- fixed appliances
- one installation must include a circuit supplying a three phase load
- one installation must include a safety service or alternate supply
- one installation must include a distribution board separate from the main switchboard.

Unit Mapping Information

This unit replaces and is equivalent to UEENEEG107A Select wiring systems and select cables for low voltage electrical installations.

Links

Companion Volume Implementation Guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least two separate occasions and include:

- # applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures and practices, including using of risk control measures
- # applying sustainable energy principles and practices
- calculating the expected voltage drop in a given circuit
- calculating the expected fault-loop impedance for a given circuit arrangement
- selecting cables to satisfy voltage-drop requirements in addition to current-carrying capacity requirements
- selecting cables to satisfy fault-loop impedance requirements in addition to current-carrying capacity requirements and voltage drop requirements
- # selecting conductor size based on the maximum current requirement for a given installation condition
- # determining the extent and nature of the installation for job specifications
- # determining cable routes, the route lengths of cables and the conditions in which the wiring system is to operate
- determining the number and types of circuits required for a particular installation
- # determining current requirements for given final sub-circuits
- determining layout/schedule of circuits for given installations
- # selecting wiring system suitable for the installation environment
- # selecting cables, including voltage-drop, fault-loop impedance and minimum conductor size to satisfy current-carrying capacity
- # selecting compliant earthing system components
- dealing with unplanned events in accordance with workplace procedures in a manner that minimises risk to personnel, equipment

- determining maximum demand for consumer mains and sub-mains final for an installation in accordance with industry and regulatory standards
- # determining maximum demand for final sub-circuits for an installation in accordance with industry and regulatory standards
- documenting electrical installation design
- identifying and applying installation requirements for switchboards in accordance with industry and regulatory requirements
- identifying layout/schedule of circuits for low voltage (LV) electrical installation
- # arranging installation loads onto separate circuits
- identifying performance requirements for an electrical installation to comply with safety and regulatory requirements
- selecting cables for consumer mains, sub-mains and to meet maximum demand and installation conditions, including any derating factors
- #selecting cables for final sub-circuits to meet maximum demand and installation conditions, including any derating factors
- determining suitability of the cable insulation
- # selecting circuit protection devices to satisfy maximum demand and coordination in accordance with industry and regulatory requirements
- # selecting circuit protection devices to satisfy requirements for discrimination, fault protection and overcurrent
- selecting control and isolation devices to satisfy AS/NZS 3000 requirements for a range of loads and environmental conditions
- selecting isolation and control devices as required by the designed installation and in accordance with industry and regulatory requirements
- applying the requirements of the relevant industry standards, including AS/NZS 3000, to all work tasks.

Knowledge Evidence

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

- design and safety performance requirements, including:
 - harmful effects against which the electrical installation design must provide protection
 - electrical installation performance standards
 - supply characteristic considerations when designing an electrical installation
 - methods to determine maximum demand in consumer mains, sub-mains and final subcircuits
 - reason for dividing electrical installations into circuits and the factors that determine their number and type
 - external factors that may damage an electrical installation
 - methods for protecting persons and livestock against direct and indirect contact with conductive parts and the typical application of each

- methods to protect against risk of ignition of flammable materials and injury by burns from the thermal effects of current in normal service
- likely sources of unwanted voltages and the methods for dealing with this potential hazard
- methods for protecting persons and livestock against injury and property against damage from the effects of overcurrent
- requirements for protection against fault current
- requirements for protection against the harmful effects of faults between live parts of circuits supplied at different voltages
- need for protection against injury from mechanical movement and how this may be achieved
- features of ‘fire rated construction’ and how the integrity of the fire rating can be maintained in relation to electrical installation
- final sub-circuit arrangements including:
 - considerations when determining the number and type of circuits for an installation
 - daily and seasonal demand for lighting, power, heating and other loads in an installation
 - number and types of circuits required for a particular installation
 - current requirements for given final sub-circuits
 - layout/schedule of circuits for given installations
- factors effecting the suitability of wiring systems, including:
 - wiring systems used for particular construction methods and environments
 - installation conditions that may affect the current-carrying capacity of cables
 - external influences that may affect the current-carrying capacity and/or may cause damage to the wiring system
 - AS/NZS 3000 requirements for selecting wiring systems for a range of circuits, installation conditions and construction methods into which the wiring system is to be installed. Note: Wiring systems include cable enclosures, underground wiring, aerial wiring, catenary support, emergency systems, busbar trunking and earth sheath return
- maximum demand on consumer mains/sub-mains, including:
 - methods for determining the maximum demand on an installation’s consumer mains and sub-mains
 - maximum demand for the consumer mains for given installations up to 400 ampere (A) per phase
 - maximum demand for given sub-mains
- cable selection based on current-carrying capacity requirements, including:
 - installation conditions for a range of wiring systems and applications
 - external influences that require the use of a derating factor
 - suitability of the cable insulation
 - AS/NZS 3000 requirements for coordination of cables and protection devices
 - AS/NZS 3008 Electrical installations - Selection of cables, used to select conductor size based on the maximum current requirement for a given installation condition, including any applicable derating factors
- cable selection based on voltage-drop requirements including:

- AS/NZS 3000 requirements for maximum voltage-drop in an installation
- relevant tables in AS/NZS 3008 Electrical installations - Selection of cables, for unit values of voltage-drop
- cable selection based on fault-loop impedance requirements, including:
 - AS/NZS 3000 requirements for maximum fault-loop impedance in an installation
 - relevant tables in AS/NZS 3008 Electrical installations - Selection of cables, to determine cable impedances
- selecting protection devices, including:
 - acceptable methods of protection against indirect contact
 - AS/NZS 3000 requirements for selecting methods and devices to protect against indirect contact for a range of installation types and conditions
 - coordination between conductors and protection devices to ensure the protection of cables from overheating due to overcurrent
 - possible injuries to persons and livestock from hazards due to a short circuit
 - AS/NZS 3000 requirements for selecting devices to protect against overload current for a range of circuits and loads
 - AS/NZS 3000 requirements for selecting devices to protect against short circuit current for a range of installation conditions
- selecting devices for isolation and switching, including:
 - requirements for the provision of the isolation of every circuit in an electrical installation
 - need for protection against mechanical movement of electrically activated equipment
 - AS/NZS 3000 requirements for selecting devices for isolation and switching for a range of installations and conditions
- switchboards, including:
 - AS/NZS 3000 and local supply authority requirements for switchboards
 - tariff structures for the supply of electricity
 - equipment installed at the main switchboards with capacities up to 400 A per phase
 - layout of a main switchboard for an installation supplied with:
 - single phase single tariff whole current metering
 - single phase multiple tariff whole current metering
 - multi-phase single tariff whole current metering
 - multi-phase multiple tariff whole current metering
 - layout of a main switchboard for a multiple tenancy installation with whole current metering
 - layout of a main switchboard, including metering, for an installation supplied with three phase current transformer metering
 - local supply authority requirements for connection of an electrical installation to electrical supply system
- relevant manufacturer specifications

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessors must also hold the occupational licence for the jurisdiction the assessment is occurring where the activity being assessed requires a licence to practice.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so, where this is not appropriate, assessment must occur in suitable simulated workplace operational situations that replicate workplace conditions.

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.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, relevant industry standards, codes of practice and operation manuals.

In addition, evidence of Performance Evidence items of this unit marked with a hash (#) must be gathered in authentic workplace operational conditions (not simulated) before final determination of competence in this unit can be made.

Links

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