



Australian Government

UEENEEG107A Select wiring systems and cables for low voltage general electrical installations

Release: 3

UEENEEG107A Select wiring systems and cables for low voltage general electrical installations

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers selecting wiring systems and cables for electrical installations operating at voltages up to 1,000V a.c. or 1,500 V d.c. It encompasses knowledge and 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, coordination between protective devices and conductors and documenting selection decisions

Application of the Unit

Not Applicable

Licensing/Regulatory Information

1.2) License to practice

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

Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) 2)

2.1) Competencies

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101 A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102 A Fabricate, dismantle, assemble of electrotechnology components

UEENEEE104 A Solve problems in d.c circuits

UEENEEE105 A Fix and secure electrotechnology equipment

UEENEEE107 Use drawings, diagrams, schedules,

Prerequisite Unit(s)	2)	
	A	standards, codes and specifications
	UEENEEG006	Solve problems in single and three phase low voltage machines
	A	
	UEENEEG033	Solve problems in single and three phase electrical apparatus and circuits
	A	
	UEENEEG063	Arrange circuits, control and protection for general electrical installations
	A	
	UEENEEG101	Solve problems in electromagnetic devices and related circuits
	A	
	UEENEEG102	Solve problems in low voltage a.c. circuit
	A	
	UEENEEG106	Terminate cables, cords and accessories for low voltage circuits
	A	

Employability Skills Information

Employability Skills 3)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Application of the Unit 4)

4.1) General Application

This unit applies to competency development entry-level employment based programs incorporated in approved contracts of training.

4.2) Importation

RTOs wishing to import this unit into any qualification under the flexibility provisions of NQC Training Package Policy

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to select wiring systems and cables for general electrical installations	1.1 The extent and nature of the electrical installation is determined from job specifications.
	1.2 Safety and other regulatory requirements to which the electrical installation shall comply area are identified, obtained and understood.
	1.3 Cable routes, the route lengths of cables and the conditions in which the wiring system is to operate is determined from job specifications or from consultation with appropriate persons.
2 Select wiring systems and cables for general electrical installations	2.1 Wiring systems are selected for suitability for the environments in which they are to operate.
	2.2 Cable conductor sizes are selected to meet current-carrying capacity requirements and voltage-drop and earth fault-loop impedance limitations.
	2.3 Circuit protective devices are selected to meet requirement for co-ordination with conductor current-carrying capacity.
	2.4 Earthing system components are selected to meet requirements of an MEN system.
	2.5 Evidence is obtained that electrical equipment selected complies with safety requirements.

ELEMENT

PERFORMANCE CRITERIA

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|-------------------------------------|--|
| 3 Document electrical installation. | 3.1 Evidence is obtained from manufacturers/suppliers that electrical equipment selected complies with safety requirements. |
| | 3.2 Reasons for selections made, including calculations, are documented in accordance with established procedures. |
| | 3.3 Electrical installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s). |

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of selecting wiring systems and cables for general electrical installations.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

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Electrical installation — cable selection and

co-ordination

Evidence shall show an understanding of selecting cables and ensuring co-ordination between protection device and conductors in electrical installations that comply with the Wiring Rules, Selection of cables standards and Service Rules to an extent indicated by the following aspects:

T1 Performance requirements - design and safety encompassing:

- harmful effects against which the design of an electrical installation must provide protection.
- performance standards of a correctly functioning electrical installation.
- supply characteristics that shall be considered when designing an electrical installation.
- acceptable methods for determining the maximum demand in consumer's mains and sub-mains.
- AS/NZS 3000 requirements limiting voltage drop in an installation.
- reason for dividing electrical installations into circuits and the factors that shall determine their number and type.
- typical external factors that may damage an electrical installation and that shall be considered in the installation design.
- methods for protecting persons and livestock against direct and indirect contact with conductive parts and the typical application of each.
- acceptable methods of protection against the risks 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.
- acceptable methods for protecting persons and livestock against injury and property against damage from the effects of over current.
- requirement for protection against fault current.
- requirement 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.

REQUIRED SKILLS AND KNOWLEDGE

- features of 'fire rated construction' and how the integrity of the fire rating can be maintained in relation to electrical installation.
- T2 Final subcircuit arrangements encompassing:
- factors that shall be considered in determining the number and type of circuits required for an installation.
 - daily and seasonal demand for lighting, power, heating and other loads in a given installation.
 - number and types of circuits required for a particular installation.
 - current requirements for given final subcircuits.
 - layout/schedule of circuits for given installations.
- T3 Factors affecting the suitability of wiring systems encompassing:
- wiring systems typically used with various construction methods and particular 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.
- T4 Maximum demand on consumer's mains/submains encompassing:
- acceptable methods for determining the maximum demand on an installation's consumer's mains and submains.
 - maximum demand for the consumer's mains for given installations up to 400 A per phase.
 - maximum demand for given submains.
- T5 Cable selection based on current carrying capacity requirements encompassing:
- installation conditions for a range of wiring systems and applications.
 - external influences that require the use of a derating factor.
 - AS/NZS 3000 requirements for coordination of cables and protection devices.
 - AS/NZS 3008 used to select conductor size based on the maximum current requirement for a given installation condition including any applicable derating factors.
- T6 Cable selection based on voltage drop requirements encompassing:
- AS/NZS 3000 requirements for maximum voltage drop in an installation.
 - relevant tables in AS/NZS 3008 for unit values of voltage drop.
 - calculation of the expected voltage drop in a given circuit.
 - selecting cables to satisfy voltage drop requirements in addition to current carrying capacity requirements.
- T7 Cable selection based on fault loop impedance requirements encompassing:

REQUIRED SKILLS AND KNOWLEDGE

- AS/NZS 3000 requirements for maximum fault loop impedance in an installation.
- relevant tables in AS/NZS 3008 to determine cable impedances.
- calculation of the expected fault loop impedance for a given circuit arrangement.
- selecting cables to satisfy fault loop impedance requirements in addition to current carrying capacity requirements and voltage drop requirements.

T8 Selecting protection devices encompassing:

- 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 over heating due to over current.
- 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.

T9 Selecting devices for isolation and switching encompassing:

- 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.

T10 Switchboards encompassing:

- 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.
- layout of a main switchboard for an installation supplied with single phase multiple tariff whole current metering.
- layout of a main switchboard for an installation supplied with multiphase single tariff whole current metering.
- layout of a main switchboard for an installation supplied with multiphase 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 CT metering.
- local supply authority requirements for connection of an electrical installation to the electrical supply system

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

EVIDENCE GUIDE

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
 - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
 - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
 - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
 - Demonstrate an appropriate level of skills enabling employment
 - Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Selecting wiring systems and cables for general electrical installations as described as in 8) and including:
 - A Determining the extent and nature of the installation for job specifications
 - B Obtaining and understand the safety and other regulatory requirements to which the electrical installation shall comply
 - C Determining cable routes, the route lengths of cables and the conditions in which the wiring system is to operate.

EVIDENCE GUIDE

- D Selecting wiring system suitable for the environment requirements.
- E Selecting cable conductors sizes in consideration to current-carrying capacity and voltage-drop / earth fault-loop limitation.
- F Ensuring co-ordination between circuit protective device and conductor current-carrying capacity.
- G Selecting compliant earthing system components
- H Documenting wiring systems and cables to be used, specification for items selected and reasons for the selections made.
- I Dealing with unplanned events

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to selecting and arranging equipment for general electrical installations.

EVIDENCE GUIDE

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEE063A Arrange circuits, control and protection for general electrical installations

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to selecting and selecting wiring systems and cables for at least two general electrical installations comprising a main switchboard, supplying more than one circuit each for, lighting, socket outlets, and fixed appliances. One of the installations shall include a distribution board separate from the main switchboard and at least one circuit supplying a three-phase load and a fire pump.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	5	Writing	5	Numeracy	5
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Custom Content Section

Competency Field	5)
	Electrical

