



Australian Government

UEENEEG177A Select low voltage power factor correction equipment

Release 2

UEENEEG177A Select low voltage power factor correction equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the selection (sizing) of power factor correction equipment for commercial and/or industrial installations using appropriate equipment based on the load profile of the selected installation. The correction equipment is limited to the capacitive type including control devices/systems including contactors or solid state types. It encompasses safe working practices, corrective equipment for multiphase circuit arrangements and issues related to protection, including circuit problems derived from harmonic generation and resonance problems within the installation.

Application of the Unit

Application of the Unit 2)

2.1) General Application

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

2.2) Importation

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

Licensing/Regulatory Information

License to practice 3)

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) 4)

Competencies 4.1)

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

UEENEEE1 01A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE1 02A Fabricate, dismantle, assemble of electrotechnology components

UEENEEE1 Solve problems in d.c circuits

| | | |
|-----------------------------|-----------------|--|
| Prerequisite Unit(s) | 4) | |
| | 04A | |
| | UEENEEE1 05A | Fix and secure electrotechnology equipment |
| | UEENEEE1 07A | Use drawings, diagrams, schedules, standards, codes and specifications |
| | UEENEEG0 06A | Solve problems in single and three phase low voltage machines |
| | UEENEEG0 33A | Solve problems in single and three phase electrical apparatus and circuits |
| | UEENEEG0 63A | Arrange circuits, control and protection for general electrical installations |
| | UEENEEG1 01A | Solve problems in electromagnetic devices and related circuits |
| | UEENEEG1 02A | Solve problems in low voltage a.c. circuit |
| | UEENEEG1 03A | Install wiring and accessories for low voltage circuits |
| | UEENEEG1 04A | Install appliances, switchgear and associated accessories for low voltage electrical installations |
| | UEENEEG1 05A | Verify compliance and functionality of low voltage general electrical installations |
| | UEENEEG1 06A | Terminate cables, cords and accessories for low voltage circuits |
| | UEENEEG1 07A | Select wiring systems and cables for general electrical installations |
| | UEENEEG1 08A | Trouble-shoot and repair faults in electrical apparatus and circuits |
| | UEENEEG1 09A | Develop and connect electrical control circuits |

Literacy and numeracy skills 4.2)

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 4 Writing 4 Numeracy 4

Employability Skills Information**Employability Skills 5)**

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.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit 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 power factor correction equipment | 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 are identified, obtained and understood. |

| ELEMENT | PERFORMANCE CRITERIA |
|--|--|
| | 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 power factor correction equipment | 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. |
| 3 Document power factor correction equipment installation details. | 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

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

Evidence shall show that knowledge has been acquired of selecting power factor correction equipment for commercial/industrial electrical installations.

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

KS01-EG177A selection

Power factor correction — equipment

Evidence shall show an understanding of power factor correction and equipment selection to an extent indicated by the following aspects:

T1 Definitions, concept of power factor and reasons for improving power factor.

T2 Situations leading to reduction of power factor.

T3 Consequences of poor power factor encompassing:

- demand tariff costs
- non-compliance with NSP and system energy loss

T4 Design considerations encompassing:

- special conditions existing and the suitability for PFC such as existence of distortion due to electronic loads, UPS systems, power generation facilities or complex electronic loads
- load profile and the nature of the load in all operating modes and with all possible sources of supply using three phase power recorders
- power supply quality issues in terms of voltage and frequency stability
- calculation of corrective VARs
- circuit protection issues and safety
- nominal location, arrangement
- types of capacitors to be used
- use of synchronous motor for large installations
- possibility of resonance
- discharge measures
- types of PFC controls
- LV PFC; HV PFC; solid state switched

T5 Compliance with Australian Standards encompassing:

- AS1013-1971 Shunt capacitors for connection to power frequency systems
- AS/NZS 3000 Wiring Rules
- AS/NZS 3947 low voltage switchgear and Control gear

T6 Testing and commissioning of power factor equipment including controls.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

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.

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 – UEE11'. 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 power factor correction equipment for electrical installations as described as in 8) and including:
 - A Determining the extent and nature of the installation from job specifications
 - B Obtaining and understand the safety and other regulatory

requirements to which the electrical installation shall comply

C Determining power factor correction equipment using graphical or mathematical methods.

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 equipment and systems requirements 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 power factor equipment for electrical installations.

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)

Nil

Range Statement**RANGE STATEMENT**

10) 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 at least two different power factor installations as listed:

- Low voltage installation using contactor switching
- Low voltage installation using solid state switching
- High voltage installation using contactor switching
- High voltage installation using solid state switching

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

Competency Field 11)
 Electrical