



Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS405B Operate and monitor a.c. electrical systems

Release: 1

UEPOPS405B Operate and monitor a.c. electrical systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals with the skills and knowledge required to operate and monitor local and remote operation of a.c. electrical switchgear, switchboards and distribution systems including transformers.

Application of the Unit

Application of the Unit 2)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice 3)

The skills and knowledge described in this unit do not require a licence to practise in the workplace. However, practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) 4)

Competencies 4.1)

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

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

There are no pre-requisite units.

Literacy and numeracy skills 4.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, 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 Plan and prepare for switching operations	1.1 Safety issues are identified to comply with enterprise/site and legislative requirements
	1.2 Work requirements are identified from relevant personnel and documentation
	1.3 Documentation to determine plant status is assessed and evaluate
	1.4 Localised plant/equipment inspection, pre-operational checks and field preparation for service are carried out in accordance with manufacturer's and enterprise/site procedures
	1.5 Switchboard/equipment operational pre-requisites and switching sequences are established in accordance with manufacturer's and enterprise/site procedures
	1.6 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training
2 Carry out operation of switchgear, switchboards	2.1 Operation of switchgear is carried out in accordance with manufacturer's and enterprise/site procedures and programmes
	2.2 Isolation, removal and reinstatement of switchgear/switchboards/rectification systems is carried out in accordance with manufacturer's and enterprise/site procedures
	2.3 Paralleling/balancing requirements are assessed and met to ensure system stability
	2.4 Rectification system is operated, isolated and reinstated in accordance with manufacturer's and enterprise/site procedures
3 Test switchgear and equipment operation	3.1 Tests are performed in accordance with defined procedures applicable to the operational test
	3.2 Switchgear and equipment is observed for correct operational response

ELEMENT	PERFORMANCE CRITERIA
	3.3 Corrective action is taken when response is not in accordance with documentation, system integrity or personnel safety requirements
	3.4 Switchgear equipment is returned to required operational status upon completion of test
4 Analyse system, switchgear and equipment faults	4.1 Causes of abnormal system/switchgear operating conditions are identified by analysing the technical and operational information in a logical and sequential manner
	4.3 Corrective action taken is in accordance with enterprise/site procedures
	4.4 System/switchgear/plant integrity and personnel safety are maintained through consultation with appropriate personnel, and reference to plant, technical and operational documentation
5 Inspect and monitor system and switchboards	5.1 System/switchgear to be monitored/ inspected is physically identified
	5.2 System/switchgear is monitored /inspected for normal operation or to detect deviations
	5.3 Corrective action taken is in accordance with enterprise/site procedures
	5.4 Appropriate personnel are notified when defects and abnormal operating conditions are detected
6 Complete documentation	6.1 Documentation is updated and equipment problems, abnormalities and status are reported and logged in accordance with enterprise/site procedures

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 operating and monitoring a.c. electrical systems.

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

The extent of the Essential Knowledge and Associated Skills required follows:

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T1 Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant environmental, occupational health and safety legislation and regulations
- Enterprise procedures
- Plant drawings and manufacturers manuals
- Introduction to and typical arrangements of power production plant
- Relevant plant and equipment, its location and operating parameters
- Plant status;
- Enterprise recording procedures
- Control and data acquisition systems
- Computers and software
- Supervisory, alarm, protection and control equipment
- Switchboard(s), switch yard(s) and ring main(s) layout and configuration
- Switchgear types and characteristics
- Electrical protection types and characteristics
- Relevant state and territory regulations
- Electrical protection equipment, types and characteristics
- Plant status;
- Enterprise procedures;
- Circuit breaker construction and operation;
- Switchgear - operation, isolation and earthing
- Protection - systems, types and function
- Switching practices and procedures
- Electrical principles
- Transformers types and characteristics
- Electric motors types and characteristics
- a.c. generators types and characteristics
- Heating of electrical equipment
- Auxiliary supply systems

T2 Specific skills needed to achieve the Performance Criteria:

REQUIRED SKILLS AND KNOWLEDGE

- Interpret plant drawings and manufacturers manuals
- Apply enterprise recording procedures;
- Identify plant status
- Prepare plant/equipment for operation
- Organise resources
- Operate switchgear and equipment
- Conduct switching operations
- Apply diagnostic and testing techniques
- Identify and respond to abnormal plant operating conditions
- Plan and prioritise work
- Use relevant hand tools
- Communicate effectively
- Apply data analysis techniques and tools
- Produce and/or assess internal and external switching procedures
- Assess and evaluate protection operation and determine the appropriate response.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and 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 competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitude 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 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 accord 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. Hence, sources of evidence need to be 'rich' in nature so as 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 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 pre-requisites 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 – UEP12". 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 6) Essential Knowledge and Associated Skills of this unit

- Demonstrate an appropriate level of employability skills
- Conduct work observing the relevant Anti-Discrimination legislation, regulations, policies and workplace procedure
- Demonstrated performance across a representative range of contexts from the prescribed items below:
 - The knowledge and application of relevant sections of: Occupational Health and Safety legislation; Statutory legislation; Enterprise/site safety procedures; Enterprise/site emergency procedures
 - Preparation and planning of work
 - Operation of switch gear
 - Conducting switching operations
 - Operationally testing plant
 - Analysing equipment, system and protection faults
 - Monitoring equipment, system and protection operation
 - Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

**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.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working in limited spaces with different types of plant and equipment as well as different structural/construction types and methods and in a variety of

environments

**Method of
assessment**

9.4)

This unit shall be assessed by methods given in Section 1.3.00 Assessment Guidelines.

Note::

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed 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)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

Nil

Range Statement

RANGE STATEMENT

10) This relates to the competency standard 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.

Systems, plant and or equipment may include high and low voltage switchboards/yards/ring mains; supervisory, control and protection equipment; circuit breakers, air, air blast, minimum oil, bulk oil, SF6, vacuum, transformers, oil natural air natural (ONAN), oil natural air forced (ONAF), oil forced air forced (OFAF), dry type, earthing and neutral, voltage and current; Isolators, load breaking, non-load breaking; combined fuse switches (CFS), with or without contactor units; low voltage equipment, fuses, mini circuit breakers, contactors; switchboard/yard auxiliary supplies, control, supervision, protection, indication; earthing systems, earthing circuit breakers, integral earths, earth switches, portable earths and protection systems.

Safety standards may include relevant sections of Occupational Health and Safety legislation, enterprise safety rules, relevant State and federal legislation and national standards for plant.

Information and documentation sources may include verbal or written communications; enterprise safety rules documentation; dedicated computer equipment; enterprise/site standing and operating instructions; enterprise log books; manufacturer's operation and maintenance manuals; and equipment and alarm manuals.

Technical and operational indicators may include stimuli (audio, smell, touch, visual), local indicators and recorders, computers and alarms (visible and or audible).

Communications may be by means of telephone, two way radio, pager, public address system, computer (electronic mail) and operating log (written or verbal).

Tests may include post maintenance operating tests, interlock tests, protection tests, alarm tests and emergency/black start checks.

Appropriate personnel to consult, give or receive direction may include supervisor/team leader or equivalent, technical and engineering officers or equivalent, power system control personnel or equivalent, power plant operations personnel, maintenance staff, contractor and specialist staff.

Test, fault finding and operating tools may include voltage testers, proving dead equipment, power or hand tools, control system equipment and fuse testers/multimeters.

Operating environment may be during inclement or otherwise harsh weather conditions, in wet/noisy/dusty/hot areas or during night periods.

Faults and abnormal operating conditions may include switch yard protection operation, switchboard protection operation, transformer protection operation, circuit/feeder protection operation; transformer faults, low oil level, loss of fans/pumps; circuit breaker faults, loss of supervisory/control supplies, low gas/oil/air pressure, failure of pump/motors and fuse failure.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms are given in Section 2.1 Preliminary Information and Glossaries.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	11)
	Operations