Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS405A Operate and Monitor AC Electrical Systems

Release: 1

UEPOPS405A Operate and Monitor AC Electrical Systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

This unit deals with the skills and knowledge required to operate and monitor local and remote operation of AC electrical switchgear, ring mains, switchboards and distribution systems including transformers and the remote operation of high voltage switch yards.

Application of the Unit

Application of the Unit **3**)

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

License to practise **3.1**)

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.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite Unit(s) **2)**

Competencies **2.1)**

Competency in this unit shall be assessed only after the following competency has been acquired:

UEPOPS426A	Interpret and analyse multi-operation protection devices

Employability Skills Information

Refer to the Evidence Guide

Elements and Performance Criteria Pre-Content

5) 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 Plant 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 evaluated
	1.4	Localised plant/equipment inspections, pre-operational checks and field preparation for service are carried out in accordance with manufacturer's and enterprise/site procedures
	1.5	Switchboard/yard operational prerequisites are established in accordance with manufacturer's

ELEMENT		PERFORMANCE CRITERIA	
			and enterprise/site procedures
		1.6	Sequence for recommissioning of plant is determined to suit existing circumstances in accordance with enterprise/site requirements
		1.7	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	Conduct switching operations	2.1	Switching operations are carried out in accordance with enterprise and manufacturer's operating procedures and programmes
		2.1	Synchronising requirements are assessed and met to ensure system stability
		2.3	Switchboard, switch yard and transformer loads are monitored to prevent overloading during switching operations
3	Carry out local operation of switchgear	3.1	Local operation of switchgear is carried out in accordance with manufacturer's and enterprise/site procedures and programs
		3.2	Isolation, removal and reinstatement of switchgear is carried out in accordance with manufacturer's and enterprise/site procedures
4	Carry out circuit and feeder earthing	4.1	Earthing requirements are assessed in accordance with enterprise/site requirements
		4.2	Circuit/feeder is de-energised, isolated and tested prior to earthing in accordance with enterprise/site procedures
		4.3	Earthing of circuit/feeders are achieved using the appropriate approved earthing devices
5	Carry out switchboard and ring main earthing	5.1	Isolation and earthing requirements are assessed in accordance with enterprise/site requirements
		5.2	Switchboard/ring main is de-energised, isolated and tested prior to earthing in accordance with enterprise/site procedures
		5.3	Earthing of switchboard/ring main is achieved

ELEMENT		PERFORMANCE CRITERIA	
			using appropriate approved earthing devices in accordance with enterprise/site procedures
6	Test switchgear operation	6.1	Tests are performed in accordance with defined procedures applicable to the operational test
		6.2	Switchgear is observed for correct operational response
		6.3	Corrective action is taken when response is not in accordance with documentation, system integrity or personnel safety requirements
		6.4	Switchgear is returned to required operational status upon completion of test
7	Analyse system and switchgear faults and operation	7.1	Cause of abnormal system/switchgear operating conditions are identified by analysing the technical and operational information in a logical and sequential manner
		7.2	Operation of protection systems is identified and assessed to evaluate the nature and cause of fault conditions
		7.3	Corrective action taken is in accordance with enterprise/site procedures
		7.4	System/switchgear/plant integrity and personnel safety are maintained through consultation with appropriate personnel, and with reference to plant, technical and operational documentation
8	Inspect and monitor system, switchboards, transformers and protection systems	8.1	Plant to be monitored/inspected is physically identified
		8.2	Plant is monitored/inspected for normal operation or to detect deviations
		8.3	Corrective action taken is in accordance with enterprise/site procedures
		8.4	Appropriate personnel are notified when defects and abnormal operating conditions are detected

ELEMENT	PERFORMANCE CRITERIA
9 Complete documentation	9.1 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

6) 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 AC electrical systems.

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

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

- Relevant Occupational Health and Safety regulations
- Relevant statutory legislation
- Relevant enterprise/site safety procedures
- Enterprise/site emergency procedures and techniques
- Relevant plant and equipment, its location and operating parameters
- Plant status
- Environmental legislation
- Enterprise recording procedures
- Communication principles
- Control and data acquisition systems
- Computers and software
- Supervisory, alarm, protection and control equipment
- Supervisory, alarm, protection and control equipment
- Switchboard(s), switch yard(s) and ring main(s) layout and configuration
- Switchgear - operation, isolation and earthing

REQUIRED SKILLS AND KNOWLEDGE

- Protection - systems, types and function
- Earthing procedures, requirements and protocol Interlocks and inter-tripping systems
- Emergency and system disturbance procedures
- Switching practices and procedures
- Introduction to power production plant
- Typical arrangements of power production plant
- Mathematics
- General responsibilities for power production plant operations
- Electrical principles
- Transformers
- Electric motors
- AC generators
- Alternators, excitors and hydrogen systems
- Heating of electrical equipment
- Schematic diagrams
- Auxiliary supply systems
- High voltage systems
- Safe operating principles

Specific skills needed to achieve the Performance Criteria:

- Apply relevant Occupational Health and Safety regulations
- Apply relevant statutory legislation
- Apply relevant enterprise/site safety procedures
- Apply enterprise/site emergency procedures and techniques
- 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

REQUIRED SKILLS AND KNOWLEDGE

- Use relevant hand tools
- Communicate effectively
- Apply data analysis techniques and tools
- Use diagrams, drawings and symbols
- Produce and/or assess internal and external switching procedures
- Assess and evaluate protection operation and determine the appropriate response
- Apply switching practices and procedures.

Evidence Guide

EVIDENCE GUIDE

8) 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

8.1)

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.

EVIDENCE GUIDE

Sample assessment instruments are included in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

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 - UEP06". Evidence shall also comprise:

- A representative body of Performance Criteria 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:

EVIDENCE GUIDE

- 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 skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices 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

8.3)

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.

EVIDENCE GUIDE

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

8.4)

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 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

8.5)

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

Key competencies

8.6)

Evidence that particular key competencies have been achieved within this unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following example of application: Explain ideas and actions, make suggestions for alternative actions and deal with contingencies and non-routine situations.	2
How can information be collected, analysed and organised?	Refer to the following example of application: Information with regard to operations, faults and maintenance may be observed and monitored for analysis and organised into records and reports.	2
How are activities planned and organised?	Refer to the following example of application: Planning the required activity, to include co-ordination and use of equipment, materials and tools to avoid backtracking and rework.	2
How is team work used within this competency?	Refer to the following example of application: Coordinate activities of the team and provide appropriate support to other team members in completion of work tasks to meet the team's goals.	2
How are mathematical ideas and techniques used?	Refer to the following example of application: Calculation of time to complete routine projects, operations, tasks, estimation of distances, levels, loads and material requirements.	2
How are problem solving skills applied?	Refer to the following example of application: Determine solutions which focus on long and short-term resolution of work task problems.	2
How is use of technology applied?	Refer to the following example of application: Access, communicate, measure and provide information to monitor operations and performance of plant and equipment.	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		**Example of Application**
1	Developing and using skills within a real workplace	Refer to the following example of application: Completion of tasks within an acceptable timeframe and performance with some supervision.
2	Learning to learn in the workplace	Refer to the following example of application: Comprehension and application of theoretical knowledge to well-developed skills.
3	Reflecting on the outcome and process of work task	Refer to the following example of application: Focused on improvement in own and other team member's performance in the workplace.
4	Interacting and understanding of the context of the work task	Refer to the following example of application: Working understanding of the processes and systems which apply to the workplace.
5	Planning and organising the meaningful work task	Refer to the following example of application: Achieving work tasks in a timely manner and ensuring that the work team achieves its stated work goals.
6	Performing the work task in non-routine or contingent situations	Refer to the following example of application: Seek advice and apply solutions to problems relevant to the workplace environment.

Range Statement

RANGE STATEMENT

7) 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

RANGE STATEMENT

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 Volume 2, Part 1.

Unit Sector(s)

Not Applicable

Literacy and numeracy skills

Literacy and numeracy skills **2.2**)

Participants are best equipped to achieve 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

Competency Field

Competency Field **4**)

Operations