



Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS343A Operate Hydro-Electric Generating Plant and Auxiliary Equipment

Release: 1

UEPOPS343A Operate Hydro-Electric Generating Plant and Auxiliary Equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

This unit deals with the skills and knowledge required to operate a hydro-electric generating station. This will include both the operational and maintenance activities associated with such plant.

Application of the Unit

Application of the Unit

3)

This unit is intended to augment formally acquired competencies.

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.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite Unit(s) 2)

Competencies 2.1)

There are no prerequisite units.

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 Plan and Prepare Work

- 1.1 Occupational Health and Safety standards, statutory requirements, relevant Australian standards, codes of practice, manufacturers' specifications, environmental requirements and enterprise procedures are identified, applied and monitored throughout the work procedure.
- 1.2 Work, plant and type of start requirements are identified from relevant personnel and documentation.
- 1.3 Turbine running-up and loading schedules are ascertained from relevant documentation and in accordance with enterprise/site requirements.
- 1.4 Localised plant and auxiliary equipment inspections, pre-operational tests and field preparation for service are carried out in accordance with manufacturer's and enterprise/site procedures.

ELEMENT**PERFORMANCE CRITERIA**

- 1.5 Plant and auxiliary equipment operational prerequisites are established in accordance with manufacturer and enterprise/site procedures.
- 1.6 Sequence for recommissioning of plant and auxiliary equipment is determined to suit existing circumstances in accordance with enterprise/site requirements.
- 1.7 Where appropriate, the team's and individual's roles and responsibilities within the team are identified, and where required, assist in the provision of on-the-job training.
- 1.8 Work is planned in detail including sequencing and prioritising and considerations made, where appropriate, for the maintenance of plant security and capacity in accordance with system/site requirements.
- 1.9 Coordination requirements, including requests for isolations where appropriate, are resolved with others involved, affected or required by the work.
- 2 Operate and Monitor hydro plant
- 2.1 Plant is operated in accordance with enterprise and manufacturer operating procedures.
- 2.2 Key indicator limits are maintained in accordance with manufacturer specifications and enterprise requirements.
- 2.3 Auxiliary equipment is operated in accordance with enterprise and manufacturer operating procedures.
- 2.4 Plant and auxiliary equipment is monitored and observed to detect deviations from normal operating conditions and system requirements.
- 2.5 Plant and auxiliary equipment is operated within legislative requirements to gain maximum efficiency of energy conversion and to meet active and reactive dispatch power outputs.
- 2.6 Corrective actions are taken to rectify any abnormalities in accordance with manufacturer's

| ELEMENT | PERFORMANCE CRITERIA |
|---|--|
| | and enterprise/site procedures. |
| 3 Test plant and auxiliary equipment operation | 3.1 Tests are performed in accordance with defined procedures applicable to the test. |
| | 3.2 Plant and equipment is observed for correct operational response. |
| | 3.3 Corrective action is taken when response is not in accordance with documentation, plant integrity or personal safety requirements. |
| | 3.4 Plant and equipment is returned to required operational status on completion of test. |
| 4 Analyse plant and auxiliary equipment faults. | 4.1 Causes of abnormal operating conditions are identified by analysing the technical and operational information in a logical and sequential manner. |
| | 4.2 Actions necessary to rectify fault are determined. |
| | 4.3 Plant integrity and personnel safety is maintained through consultation with appropriate personnel, and reference to plant, technical and operational documentation. |
| | 4.4 Appropriate personnel are notified when defects are detected. |

| ELEMENT | PERFORMANCE CRITERIA |
|--------------------------|--|
| 5 Complete documentation | 5.1 Documentation is updated, maintained and equipment problems, movements , 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 of operating hydro-electric generating plants and auxiliary equipment for a permit to work.

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
- Emergency procedures
- Motor performance characteristics
- Basic fan performance characteristics
- Pump performance characteristics
- Generator performance characteristics

REQUIRED SKILLS AND KNOWLEDGE

- Valve and actuator type and characteristic (may include pressure conduit valves)
- Speed control systems
- Electrical supply and distribution systems
- Principles of heat exchanger operation
- Unit lubrication systems and oil conditioning systems
- Equipment behaviours under the influence of high water pressure and/or flows
- Civil and hydraulic structures, turbines, valves and gates, governors, bypass and relief valves, generators, exciters, transformers, batteries, communications, auxiliary plant
- Governing, frequency, excitation, voltage, voltage phase and speed matching, synchronising, active and reactive power setting.

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
- 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
- Use diagrams, drawings and symbols
- Operate equipment under the influence of high water pressures and/or flows
- Co-ordinate the operation of equipment to maintain personnel safety and plant integrity; Operate and manage a hydro turbine generator

REQUIRED SKILLS AND KNOWLEDGE

unit.

Evidence Guide

EVIDENCE GUIDE

8) This provides essential advice for assessment of the unit of competency 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'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 accord with Industry and, Regulatory policy in this regard.

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 for Assessors 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:

- 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 procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
 - 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 hydro turbine generator
 - Operationally testing plant
 - Analysing plant faults, Monitoring plant operation
 - Work completion details
 - 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.

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 |
|--|---|-------------------|
| 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. | 1 |
| How is team work used within this competency? | Refer to the following example of application: Share tasks 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 tasks, estimation of distances, levels, loads and material requirements. | 1 |
| 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 record information with regard to operations and performance of plant and equipment. | 1 |

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 unit of competency 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.

Plant and equipment may include turbines; turbines with underslung pumps; inlet valve, inlet bypass valve, scroll case and draft tube, relief valve, wicket gates or spear valve, gate swing ring or spear actuator, runner, turbine bearing; reversible turbines; auxiliary plant and equipment, including batteries, chargers, governor oil pumps, auxiliary generators, standby generators, air compressors, transformer and bearing cooling water pumps, pressure reducing valves, dewatering and sump pumps, seal water filters, bearing oil coolers, oil and water separators, fire detection and protection equipment; governor and associated hydraulic circuits; generator and auxiliary plant including main exciter, commutator, pilot exciter, voltage regulator, cooling systems, lube oil systems, seal systems, brake systems; computer with equipment control functions; supervisory, alarm and control equipment; electrical motors, fans and pumps; electrical supply and distribution systems; valves and dampers (electric, hydraulic, pneumatic and manual); lubrication and oil conditioning systems; static/rotating rectifiers; brush gear and slipring fire protection equipment; sliprings and commutators; AVR/AER; heat exchangers, filters and strainers; generators; transformers; water drainage systems; and environmental protective systems. Safety standards may include relevant sections of Occupational Health and Safety legislation, enterprise safety rules, relevant state and federal legislation, national standards for plant and Australian standards.

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

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

Tests may include motor direction checks, stand-by plant "cut-in" tests, relief valves operation tests, overspeed tests, main inlet valves/guide vanes timing tests, load rejection tests, governor damping tests and phase rotation tests.

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

Appropriate personnel to consult, give or receive direction may include, supervisor/team leader or equivalent, engineering officer/hydro maintenance office or equivalent, technical and engineering officers or equivalent, contractor staff, maintenance staff, applicable water control authority or equivalent and "transgrid" operator or equivalent.

RANGE STATEMENT

Test, fault finding and operating tools may include low and high voltage testers, proving dead equipment, powered or non-powered hand tools.

Operating environment may be remote from plant, aided by indicators and monitors, during inclement or otherwise harsh weather conditions, in wet/noisy/dusty/hot areas, during night periods or locally aided by visual and audible indicators.

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 maths skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 Literacy and Numeracy

| | | | | | |
|---------|---|---------|---|-------|---|
| Reading | 3 | Writing | 3 | Maths | 3 |
|---------|---|---------|---|-------|---|

Competency Field

Competency Field 4)

Operations.