



Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS343B Operate hydro-electric generating plant and auxiliary equipment

Release: 1

UEPOPS343B Operate hydro-electric generating plant and auxiliary equipment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

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 2)

This unit is intended to augment formally acquired competencies.

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.

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 3 Writing 3 Numeracy 3

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 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. 1.5 Plant and auxiliary equipment operational pre-requisites 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.

ELEMENT	PERFORMANCE CRITERIA
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 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

ELEMENT	PERFORMANCE CRITERIA
	appropriate personnel, and reference to plant, technical and operational documentation.
	4.4 Appropriate personnel are notified when defects are detected.
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

8) 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.

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

T1 Relevant environmental, occupational health and safety legislation and regulations

T2 Enterprise procedures

T3 Plant drawings and manufacturers manuals

T4 Introduction to and typical arrangements of hydro power production plant

T5 Relevant plant and equipment, its location and operating parameters

T6 Electric motor types and characteristics

T7 Pump and compressor types and characteristics

T8 Valve, damper and actuator types and characteristics

T9 Switchgear types and characteristics

T10 Electrical protection types and characteristics

T11 Electrical fundamentals

T12 Plant status

T13 Enterprise recording procedures

T14 Control and data acquisition systems

T15 Headgate, tailgate, intake, penstock, tunnels and tail races, types and characteristics

T16 Dam, types and characteristics

T17 Principles of hydro electric generation

T18 Hydro turbine, types and characteristics

T19 Hydro turbine governor, types and characteristics

T20 Hydro generator types and characteristics

T21 Bypass and relief valves, types and characteristics

T22 Transformers, types and characteristics

T23 Auxiliary plant, types and characteristics

T24 Speed control systems

T25 Electrical supply and distribution systems

T26 Lubrication systems and oil conditioning systems

T27 Equipment behaviours under the influence of high water pressure and/or flows

T28 Civil and hydraulic structures

T29 Governing, frequency, excitation, voltage, voltage phase and speed matching, synchronising, active and reactive power setting.

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Specific skills needed to achieve the Performance Criteria:

T1 Interpret plant drawings and manufacturers manuals

T2 Apply relevant state and territory regulations

REQUIRED SKILLS AND KNOWLEDGE

- T3 Apply enterprise recording procedures;
- T4 Identify plant status;
- T5 Prepare plant/equipment for operation
- T6 Organise resources
- T7 Apply diagnostic and testing techniques
- T8 Identify and respond to abnormal plant operating conditions
- T9 Plan and prioritise work
- T10 Use relevant hand tools
- T11 Communicate effectively
- T12 Apply data analysis techniques and tools
- T13 Operate equipment under the influence of high water pressures and/or flows

Evidence Guide

EVIDENCE GUIDE

9) 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 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'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**

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 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 **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 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, synchronising equipment, 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.

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,

RANGE STATEMENT

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 Section 2.1 Preliminary Information and Glossaries.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	11)
	Operations.