



Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS340A Operate and Monitor a Steam Turbine

Release: 1

UEPOPS340A Operate and Monitor a Steam Turbine

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor 1)

This unit deals with the skills and knowledge required to operate and monitor of an in-service steam turbine.

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 may require a licence to practise in the workplace in some States or Territories. There may also be additional assessment activities required by regulatory authorities for the issue of the licence to practise.

Practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships.

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 Safety issues are identified to comply with enterprise/site requirements
	1.2 Work requirements are identified from relevant personnel and documentation
	1.3 Pre-operational checks are carried out on plant according to manufacturer recommendations and site requirements
	1.4 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

ELEMENT	PERFORMANCE CRITERIA
2 Operate plant	2.1 Turbine output is adjusted to meet demand whilst observing operating requirements and minimising turbine life expenditure
	2.2 Plant is operated in accordance with enterprise and manufacturer operating procedures
	2.3 Plant is monitored and observed to detect deviations from normal operating conditions
	2.4 Corrective actions are taken to rectify abnormalities in accordance with manufacturer and enterprise/site procedures
3 Test plant operation	3.1 Tests are performed in accordance with defined procedures applicable to the operational test
	3.2 System and plant is observed for correct operational response
	3.3 Corrective action is taken when response is not in accordance with documentation, plant integrity or personnel safety requirements
	3.4 Plant is returned to required operational status upon completion of test
4 Analyse system faults	4.1 Causes of abnormal plant operating conditions are identified by analysing the technical and operational information in a logical and sequential manner
	4.2 Corrective action taken is in accordance with enterprise/site procedures
	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
5 Monitor plant	5.1 Plant to be monitored is identified
	5.2 Plant is monitored for normal operation or to detect deviations

ELEMENT	PERFORMANCE CRITERIA
	5.3 Appropriate personnel are notified when defects are detected
6 Complete documentation	6.1 Documentation is updated and plant 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 and monitoring a steam turbine 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
- Valve and actuator types and characteristics

REQUIRED SKILLS AND KNOWLEDGE

- Turbine speed control equipment
- Heat transfer principles
- The system components and interaction
- Electricity distribution systems AC and DC
- The system components and their interaction with other plant and equipment external to that covered by this competency
- Station water distribution systems
- Fire protection control systems
- Compressed air systems
- Principles of condensate and feedwater chemical treatment
- Turbine life expenditure and control
- Turbine bypass system
- Vacuum raising and turbine gland sealing systems
- Introduction to power production plant
- Typical arrangements of power production plant
- Mathematics
- Mechanics
- Thermodynamics
- Properties of matter
- Lubrication and bearings
- Pumps
- Liquid pumping systems
- Power plant cycle
- General responsibilities for power production plant operations
- Turbine construction and operating principles
- Turbine lubrication and oil systems
- Condensate and feedwater systems
- Feedwater heating and drainage systems
- Circulating water system
- Condenser systems
- Turbine operations
- Turbine efficiency
- Electrical principles
- Transformers

REQUIRED SKILLS AND KNOWLEDGE

- Electric motors
- Switchgear
- Heating of electrical equipment
- Electrical protection
- Schematic diagrams
- 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 turbine plant and equipment
- 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
- Co-ordinate the operation of equipment to maintain plant integrity, personnel safety, continuity of supply and optimum efficiency.

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, 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 turbine plant and equipment
 - Operationally testing plant
 - Analysing plant faults
 - Monitoring plant operation
 - Knowledge of the system components and their interaction
 - Knowledge of turbine operational processes
 - Knowledge of turbine supervision and control systems
 - 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	Refer to the following example of application: Seek advice and apply solutions to problems relevant to the workplace environment.

	situations	
--	------------	--

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 turbine and auxiliary plant; turbine lubrication and power/control oil systems; turbine by-pass system plant; condensate and feedwater system plant to boiler economiser inlet NRV; condensate polishing plant; high and low pressure heating systems; steam condensing and cooling systems; condenser vacuum raising equipment; turbine gland sealing equipment; cooling water systems plant; boiler feedwater deaerating equipment; condensate and feedwater chemical treatment equipment; electric motors AC and DC; electricity distribution systems AC and DC; station water distribution systems; hydraulic oil system; pumps; compressed air systems; computers with equipment control functions; supervisory, alarm, protection and control equipment; and diesel engine driven auxiliary plant.

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

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

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

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

Tests may include loss of a major auxiliary controls response checks, stand-by plant "cut-in" tests, valves operating checks, on-load turbine valve and emergency governor operation test, performance tests, boiler feed pumps "low load leak off" valve operation tests, heater leak checks, alarm and protection tests.

Appropriate personnel to consult, give or receive direction may include supervisor/team leader or equivalent; other coordinators of energy production or equivalent; technical and engineering officers or equivalent; maintenance staff; other operating staff and contractor staff.

Operating environment may be remote from plant and equipment being operated; where operation is assisted by remote indicators of plant status and other parameters monitored; in wet/noisy/dusty/hot areas; during night periods; and during inclement or

RANGE STATEMENT

otherwise harsh weather conditions.

Faults and abnormal operating conditions may include loss of a major auxiliary; loss of electrical Generation to auxiliaries); turbine water ingress; excessively high turbine and turbine valves heating/cooling rates/differentials; high condenser vacuum; condenser tube leak; high dissolved oxygen, conductivity; high turbine bearing temperatures/vibration; high/low bearing oil temperature; loss of turbine bearing oil flow/pressure; low/high pressure heaters malfunctions; actuator/valve mechanical/electrical faults/failure; failed field devices; and turbine protection.

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.