



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **UEPOPS339A Operate and Monitor a Boiler Unit**

**Release: 1**

## UEPOPS339A Operate and Monitor a Boiler Unit

### Modification History

Not Applicable

### Unit Descriptor

#### Unit Descriptor

1)

This unit deals with the skills and knowledge required to operate and monitor the in-service boiler unit capable of supplying steam.

### 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.

### 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 |

| <b>ELEMENT</b>          | <b>PERFORMANCE CRITERIA</b>                                                                                                                                                  |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 Operate plant         | 2.1 Combustion is established and supported in accordance with enterprise, manufacturer and site requirements. Combustion support fuel consumption is kept at minimum levels |
|                         | 2.2 Fuel and air and feed flows are adjusted to achieve required steam conditions and demand and observing operating requirements                                            |
|                         | 2.3 Plant is operated within limits of plant design, enterprise or site requirements                                                                                         |
|                         | 2.4 Plant is monitored and observed to detect deviations from required operating conditions                                                                                  |
|                         | 2.5 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 are 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                                                                                                             |

| <b>ELEMENT</b>           | <b>PERFORMANCE CRITERIA</b>                                                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 Monitor plant          | 5.1 Plant to be monitored is identified                                                                                                                    |
|                          | 5.2 Plant is monitored for normal operation or to detect deviations                                                                                        |
|                          | 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 boiler unit 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

## REQUIRED SKILLS AND KNOWLEDGE

- Supervisory, alarm, protection and control equipment
- Emergency procedures
- Basic motor performance
- Basic pump and compressor performance
- Valve, damper and actuator types and characteristics
- Boiler operation processes
- The system components and their interaction with other plant and equipment external to that covered by this competency
- Principles of air heater operation
- Principles of relevant fuel combustion;
- Electricity distribution system, AC and DC
- Station water distribution systems
- Fire protection control systems
- Compressed air systems
- Principles of boiler and feedwater chemical treatment
- Introduction to power production plant
- Typical arrangements of power production plant
- Mathematics
- Mechanics
- Thermodynamics
- Properties of matter
- Lubrication and bearings
- Compressors
- Feedwater treatment
- Power plant cycle
- General responsibilities for power production plant operations
- Coal handling plant
- Bunkering
- Steam power plant boiler water and steam systems
- Boiler draft system
- Fuels
- Principles governing efficient combustion

## REQUIRED SKILLS AND KNOWLEDGE

- Fuel conditioning and fuel firing equipment
- Control of a boiler
- Boiler efficiency
- Electrical principles
- Transformers
- Electric motors
- Switchgear
- Heating of electrical equipment
- Electrical protection
- Schematic diagrams
- Auxiliary supply 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 boiler 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.

## EVIDENCE GUIDE

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:

## 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, 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 boiler plant and equipment
  - Operationally testing plant
  - Analysing plant faults
  - System components and interaction with other plant and equipment
  - Temperature and pressure requirements
  - Ability to prepare plant/equipment for operation
  - Principles of relevant fuel combustion
  - Principles of boiler and feedwater chemical treatment
  - 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:

## EVIDENCE GUIDE

- 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

## EVIDENCE GUIDE

### 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:<br><br>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:<br><br>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:<br><br>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:<br><br>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:<br><br>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:<br><br>Determine solutions which focus on long and short-term resolution of work task problems.                 | 2 |

|                                          |                                                                                                                                                                                   |   |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| How are<br><del>mathematical ideas</del> | Refer to the following example of application:                                                                                                                                    |   |
| How is use of<br>technology applied?     | Refer to the following example of application:<br><br>Access, communicate, measure and record<br>information with regard to operations and<br>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<br>Employment |                                                                        | Example of Application                                                                                                                                           |
|--------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                        | Developing and<br>using skills<br>within a real<br>workplace           | Refer to the following example of application:<br><br>Completion of tasks within an acceptable timeframe and<br>performance with some supervision.               |
| 2                        | Learning to learn<br>in the workplace                                  | Refer to the following example of application:<br><br>Comprehension and application of theoretical knowledge to<br>well-developed skills.                        |
| 3                        | Reflecting on the<br>outcome and<br>process of work<br>task            | Refer to the following example of application:<br><br>Focused on improvement in own and other team member's<br>performance in the workplace.                     |
| 4                        | Interacting and<br>understanding of<br>the context of the<br>work task | Refer to the following example of application:<br><br>Working understanding of the processes and systems which<br>apply to the workplace.                        |
| 5                        | Planning and<br>organising the<br>meaningful work<br>task              | Refer to the following example of application:<br><br>Achieving work tasks in a timely manner and ensuring that the<br>work team achieves its stated work goals. |
| 6                        | Performing the<br>work task in<br>non-routine or                       | Refer to the following example of application:<br><br>Seek advice and apply solutions to problems relevant to the                                                |

|   |                                                  |                                                                          |
|---|--------------------------------------------------|--------------------------------------------------------------------------|
| 5 | Planning and responding to contingent situations | Refer to the following example of application:<br>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 electrical supply switchboard(s) and transformers; boiler and auxiliary plant; fuel and fuel delivery system plant; fuel management system; flame detection equipment; steam temperature control plant; boiler heating surfaces dust removal system; combustion waste extraction system; electric motors (AC and DC, high and low voltage); electricity distribution system (AC and DC transformers); diesel engine driven auxiliary plant; station water distribution systems; hydraulic power oil system; compressed air systems; computers with equipment control functions; and supervisory, alarm, protection and control equipment

Safety standards may include relevant sections of Occupational Health and Safety legislation, enterprise safety rules, electricity workers act and national standards for plant

Information and documentation sources may include verbal or written communications; enterprise isolation documentation; site operating instructions; plant limit book; equipment and alarm manuals; crippled plant book; daily log book; dedicated computer equipment; and local and general documented enterprise instructions.

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, facsimile, 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, dampers/valves operating checks and performance 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; (operation is assisted by remote indicators of plant status and other parameters monitored); in wet/noisy/dusty/hot areas or during continuous operation.

Plant operations (systems requirements) may include normal operating/ generating mode.

Faults and abnormal operating conditions may include loss of a major auxiliary (eg.

## RANGE STATEMENT

boiler combustion air fan); loss of electrical supply to switchboard(s), motors; boiler water chemical operating limits exceeded; automatic control loop(s) malfunctions; boiler heating surfaces dust removal system malfunctions (high/low pressure/temperature, control equipment faults, jammed sootblowers); high temperatures on/in, boiler heating surfaces/tubes/headers, boiler exhaust (back end), steam to turbine, ex superheater or reheater, motor, fan, pump bearings and lubricating oil, motor windings; boiler tube leaks; air heater cold end temperatures low; air heater/combustion air ductwork fires; fuel preparation and delivery systems fires; fuel system malfunction; excessive drum water level split; excessively high heating/cooling rates; high/low furnace dp; high dp's on oil/air filters and strainers; failed field devices (pressure/level switches/transmitters, thermocouples); failed/malfunctioning actuators/dampers/ valves; boiler feedwater pumps malfunctions (high bearing vibration, high suction strainer dp, low NPSH, high temperature differentials, pump trip, lubricating oil/electric motor cooler tube leak.

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.

