

# Operate a boiler (advanced)

Code OHSCER241A

Workplace Health and Safety Queensland is moving to a new learning and assessment system for certificates to work in prescribed occupations. Learning and assessment will now be conducted in the Vocational Education and Training (VET) sector in which units of competency set out the knowledge and skills needed to demonstrate competent performance in a prescribed occupation.

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**CODE:** OHSCER241A

**TITLE:** Operate a boiler (advanced) with multiple fuels simultaneously fired

**DESCRIPTOR:** This unit of competency covers the functions required to operate a boiler with the features of modulating combustion air supply, modulating heat source, superheaters and economisers with multiple fuel type which may be fired simultaneously during normal operation to meet minimum training and assessment standards for the purposes of certification. This does not include boilers which change fuel type during sequence. This unit has been developed in accordance with the licensing and assessment requirements of NOHSC:1006 [2001].

This unit involves starting, operating, monitoring, shutting down and storing boiler.

**PREREQUISITE:** OHSCER240A Operate a boiler (intermediate)

Element	Performance Criteria
<b>1.0 Start boiler</b>	
1.1 Select and use personal protective clothing and equipment	1.1.1 <i>Personal protective clothing and equipment</i> is selected for use, ensuring statutory requirements and work place procedures are followed.  1.1.2 Functions that require the use of <i>personal protective clothing and equipment</i> are reported to enable the function to be assessed using the hierarchy of prevention/control procedure.
1.2 Carry out pre-operational safety checks	1.2.1 <i>Pre-operational</i> safety checks of boiler are conducted in accordance with statutory requirements, manufacturer's recommendations and plant operating procedures.  1.2.2 <i>Maintenance</i> requirements are identified and reported in accordance with workplace procedures.
1.3 Maintain health and safety standards in the work area	1.3.1 <i>Hazards and potential hazards</i> in work area are identified in accordance with statutory requirements and work place procedures.  1.3.2 <i>Hazards</i> are reported in accordance with statutory requirements and work place procedures.  1.3.3 Prevention/control measures are selected in accordance with the hierarchy of control.
1.4 Start boiler	1.4.1 <i>Boiler</i> is started and brought on line safely, in accordance with statutory requirements, manufacturer's recommendations and work place procedures.  1.4.2 <i>Maintenance</i> requirements are to be identified and reported in accordance with workplace requirements.

Element	Performance Criteria
<b>2.0 Operate and monitor boiler</b>	
2.1 Conduct take/hand over procedures for boilers.	2.1.1 Operating status of boiler is diagnosed. 2.1.2 <i>Operating log</i> is maintained clearly and accurately, in accordance with statutory requirements and workplace procedures. 2.1.3 Information regarding boiler, its status and operation is <i>communicated</i> clearly in accordance with workplace procedures.
2.2 Monitor boiler operation	2.2.1 Boiler is <i>monitored</i> in accordance with statutory requirements manufacturer's recommendations and workplace procedures. 2.2.2 Boiler water quality tests are conducted in accordance with manufacturers recommendations and workplace procedures. 2.2.3 Boiler water is adjusted as a result of tests to meet manufacturer's recommendations and workplace criteria. 2.2.4 Boiler house <i>chemicals</i> are stored and handled in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.
2.3 Maintain health and safety standards during boiler operation	2.3.1 <i>Maintenance</i> requirements are identified and reported in accordance with work place procedures. 2.3.2 Boiler <i>emergency</i> is responded to in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.
<b>3.0 Shut down and store boiler</b>	
3.1 Carry out boiler operational shutdown	3.1.1 Boiler is <i>shut down</i> in accordance with statutory requirements, manufacturer's recommendations and workplace procedures. 3.1.2 <i>Maintenance</i> requirements are identified and reported in accordance with workplace procedures.
3.2 Carry out boiler shutdown for an internal inspection.	3.2.1 Boiler is <i>shut down</i> in accordance with statutory requirements, manufacturer's recommendations and workplace procedures. 3.2.2 Boiler is cleaned internally and externally in accordance with statutory requirements, manufacturers recommendations and workplace procedures, particularly regarding entry into <i>confined spaces</i> . 3.2.3 Boiler <i>valves and fittings</i> are removed for maintenance in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.

Element	Performance Criteria
3.3 Store boiler in shutdown mode	3.3.1 Appropriate <i>mode</i> of storage is identified in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.  3.3.2 Boiler is <i>stored</i> in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.

## RANGE STATEMENT

The assessment must determine that there is sufficient skill and knowledge for the operator to take the licence and operate in a new workplace. The assessment must be adjustable but prescriptive to ensure transferability.

What is the definition of a boiler?

A vessel or an arrangement of vessels and interconnecting parts, wherein steam or other liquid is heated at a pressure above that of the atmosphere by the application of fire, the products of combustion, electrical power, or similar means.

It also includes valves, gauges, fittings, controls, the boiler setting and directly associated equipment.

Boiler does not include a fully flooded or pressurised system where water or other liquid is heated to a temperature lower than the normal atmospheric boiling temperature of the liquid.

For the purpose of certification, a boiler ends at the first connection point after the first valve or valve assembly, and it does not include:

- (a) any vessel where the design of the vessel is such that will allow the vessel to operate deprived of all liquid or vapour that is intended to be heated, without affecting the structure or operation of the vessel; and
- (b) a direct fired process heater.

What is included in the definition of direct-fired process heater?

An arrangement of tubes comprising one or more coils located in the radiant zone or convection zone (or both) of a combustion chamber, whose prime purpose is to raise the temperature of a process fluid which is circulated through the coils, to allow distillation/fractionation/reaction (or other petrochemical process) of that process liquid. The process fluid may be entirely liquid, entirely gas or a liquid/gas combination.

What is included in the term water?

Boilers used for purposes other than the generation of steam, the term water means liquid.

What is included in the term steam?

Boilers used for purposes other than the generation of steam, the term steam means fluid at/or above its boiling point at atmospheric pressure.

What range of advanced boilers may be operated?

Boilers may be operated with the following features:

- modulating combustion air supply
- modulating heat source
- super heaters and economisers with multi fuel types which may be fired simultaneously during normal operation. This does not include boilers which change fuel type during start sequence..

What personal *protective clothing and equipment* may be relevant to this standard?

The relevant personal protective equipment may include but not be limited to:

- thermally insulated gloves
- hard hat head protection
- ear protection (muffs or plugs)
- chemical resistant gloves and apron
- respiratory devices
- eye protection
- working protective gloves
- whole body fire-resistant clothing.

What may be involved in routine *pre-operational* checks of boilers?

The pre-operational checks of boilers may include but not be limited to:

- checks of feed water supply and system
- fuel supply/heat source system
- the operation and position of boiler valves
- combustion air supply system
- combustion equipment
- boiler water level
- essential fittings
- selection of personal protective equipment
- inspection and location of explosion doors
- identification and management of hazards and maintenance problems
- fire fighting equipment
- whole body resistant clothing
- manufacturer's recommendations.

What *hazards or potential hazards* may be encountered in the workplace?

Hazards that may be encountered in the workplace include but are not limited to:

- chemical hazards
- thermal hazards
- manual handling hazards
- machinery guard requirements
- illumination of work area
- rubbish and combustibles in area
- leakage of steam plant
- leakage of fuel
- obstructions in work area
- hot exposed steam pipe
- broken ladder hand rail
- excessive noise from machinery
- spillage of oil on the workplace floor
- odour of gas
- fumes from a liquid chemical spill
- boiler low water condition.

What may be included in an *Operating Log*?

Information contained in the operating log must be in accordance with workplace requirements, statutory legislation and manufacturer's recommendations.

Records may include:

- time in use
- steam pressure
- chemical treatment
- test results
- maintenance/repair requirements.

What *valves and fittings* may be associated with the boiler?

Valves and fittings may include but not be limited to:

- safety valves
- gauge glasses
- main steam stop valve
- feed water stop valve
- blow down valve
- flame failure detection device
- water level controller
- boiler steam pressure gauge.

What information regarding the boiler is *communicated* in take/hand over?

Information may include but not be limited to:

- Previous load requirements
- maintenance issues
- operational incidences
- read operating log
- general inspection of boiler to detect any defects
- accept responsibility of boiler
- equipment malfunctions are noted
- equipment tested as required.

What may be included as boiler house *chemicals*?

Chemicals may include but not be limited to:

- extinguishing agent's carbon dioxide
- water
- soda acid
- organic foam and dry powder
- oxygen scavenger
- feed water additives
- other chemicals
- amines
- condensate chemicals.

What *modes* can a boiler be stored in?

Modes for storing boilers include:

- dry storage
- open/close condition
- wet storage.

What enterprise (workplace) requirements may apply to this standard?

The enterprise requirements that may apply include but are not limited to:

- Australian Standards
- State/Territory legislation
- manufacturer operating instructions
- local operating procedures
- environmental requirements
- noise standards.

What *maintenance* requirements may be encountered in the workplace?

Maintenance requirements that may be encountered in the workplace include but are not limited to:

- leaking steam pipe
- exposed electrical wiring
- defective lighting in the workplace
- leaking feed pump gland
- leaks in high pressure feed line
- leaking gauge glass mounting
- leaking safety valve
- lockout tags.

Leaks may include:

- steam
- gas
- exhaust fumes
- oils
- fuels
- water
- chemicals.

What occupational health and safety requirements may be relevant to this standard?

Safe systems and procedures for:

- Hazard Identification and Risk Control
- extreme temperatures (hot/cold)
- Material Safety Data Sheets(MSDS)
- maintenance and inspection of reciprocating steam engines
- reciprocating steam engine emergencies
- selection and use of personal protective clothing and equipment
- chemical hazards
- thermal hazards
- manual handling hazards
- machine guards
- illumination of work area

- rubbish and combustibles in work area
- obstructions in work area
- manual handling
- working in confined spaces (chemical/lubrication storage rooms)
- the protection of people in the workplace
- using lifting equipment and associated gear to manufacturers specification.

What permits may be relevant to this standard?

Consider any permits required to carry out job activity are obtained from the relevant authorised personnel for example confined spaces, chemical or dangerous goods storage, hot work permits.

What work area may be relevant to this standard?

The work area may include but not be limited to:

- factories
- ships
- hospitals
- laundries
- chemical plants
- power stations
- sugar mills
- heritage areas
- mining
- rail.

Who are downstream users?

Downstream users may include but not be limited to:

- production workers
- maintenance workers
- supervisors
- other boiler operators.

What checks may be included in starting the *boiler*?

Starting a boiler may include but not be limited to checks of:

- heat input
- warm up reticulation system
- steam traps and steam line purge system operations
- reticulation line pressure
- steam usage and supply.

How might the boiler be operated in a safe, controlled and correct manner?

The boiler is operated with consideration to the manufacturer's instructions and specifications, Australian Standards, State/Territory legislation, workplace procedures.

What checks may be included in *monitoring* the boiler?

Monitoring a boiler may include but not be limited to:

- checks of steam reticulation line pressure
- usage of and supply of steam
- quality of steam
- combustion/heat source system
- feed water system
- fuel system
- combustion air supply
- water level
- boiler steam pressure
- operation of control/safety devices.

What may be involved in responding to boiler *emergency*?

Responses to a boiler emergency may include but not be limited to:

- identification of emergency
- isolation of heat source
- selection and application of appropriate fire-fighting equipment
- establishment of water level
- notification of downstream users
- operation of boiler only when safe to do so
- notify appropriate regulatory authorities – state, federal and manufacturer.

What types of *equipment* may be associated with boilers :?

The types of equipment associated with boilers include but is not limited to:

- gas monitoring equipment
- water testing equipment
- fire fighting equipment
- personal protective equipment
- first aid equipment (basic)
- work platform and associated gear.

What checks may be included in the operational *shutdown* of a boiler?

Operational shutdown of a boiler may include but not be limited to:

- checks of water level
- cooling down process
- boiler pressure/vacuum
- fuel/heat source isolation
- super heater/economiser where fitted
- shutdown must be in accordance with manufacturers instructions.

What checks may be included in the *shutdown* of a boiler for an internal inspection?

Shutdown of a boiler for internal inspection may include but not be limited to:

- checks of cooling down process
- boiler/pressure vacuum
- fuel/heat source isolation
- removal of inspection openings
- removal of combustion equipment
- isolation from any common connection
- opening of all access points required for inspection.

What checks may be involved in procedures regarding entry into *confined spaces*?

Entry into confined spaces may include but not be limited to:

- checks of opening size
- available room to manoeuvre in confined space
- lighting voltage
- air quality in confined space
- air supply
- need to enter
- permits.

What are the key considerations when coordinating operations?

The boiler is operated with consideration to:

- communication with other operators
- hand-over procedures
- maintenance of log-books
- effect on the equipment of end-users
- nature of limited/unlimited attendant's boiler.

What self management skills may be associated with boilers?

Self management skills include but are not limited to:

- performance management including time management
- planning
- scheduling of operations
- training of personnel.

What procedures may be included in *storing* the boiler?

Procedures include but are not limited to selecting the appropriate and relevant method of dry (open), dry (closed) or wet storage and following the process for the selected method.

What records may need to be kept or updated?

Records may include but not limited to:

- log books
- maintenance records
- records of faults and potential faults
- repairs carried out according to manufacturers specification and operating procedures
- workplace record keeping requirements
- details of any daily or periodic maintenance work
- details of yearly programmed or any additional maintenance work.

## EVIDENCE GUIDE

The evidence guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the performance criteria, the range statement and the assessment guidelines.

Competence in this standard requires evidence of the ability to utilise the components and controls of a boiler to carry out operations without damage to the boiler, property or injury to people. It requires the ability to conduct pre-start and shut-down procedures to ensure mechanical reliability, communicate and cooperate with other personnel such as downstream users and maintain operating records.

What **critical aspects** of evidence are required to demonstrate competency in this unit?

- Location, interpretation and application of relevant information, standards and specifications.
- Compliance with the site safety plan and occupational health and safety legislation/regulations/codes of practice/advisory standards applicable to workplace operations.
- Compliance with organisational policies and procedures including quality requirements.
- Safe and effective operational use of tools, boiler and equipment.
- Communication and working effectively and safely with others.

What **specific knowledge** is needed to achieve the performance criteria?

- Components, controls and features of reciprocating steam engines and their functions.
- Operating principles and operating methods of boilers and steam equipment.
- Legislative requirements with regard to licensing.
- Processes and procedures relevant to working with a boiler and steam equipment
- Principles of the safe removal of obstacles and hazards from the workplace.
- The hierarchy of hazard control measures with elimination of substitution, isolation and engineering control measures being selected before safe work practices and personal protective equipment.
- Workplace communication procedures.
- Current state/territory occupational health and safety legislation, standards, codes of practices and advisory standards,
- Obtain licences and permits
- Demonstrate safe and environmentally responsible workplace practices.
- Electrical/steam/boiler hazards.

What **specific skills** are needed to achieve the performance criteria?

- Readily familiarise self with local conditions.
- Perform routine safety, basic service and maintenance procedures.
- Demonstrate emergency operating procedures.
- Read and interpret manufacturers' specifications, work and maintenance plans and material safety data sheets.
- Communicate faults, malfunctions and workplace hazards, reports and maintain operational records.
- Comprehend and apply task instructions.
- Manual lifting
- Working with other boiler operators and personnel in a team environment.
- Able to listen and understand job requirement.
- Understand written documents.
- Understand tables and figures for job procedures.
- Understand interrelationship among workplace processes and procedures in the English language.
- Understand and interpret signals and instructions in the English language.

What **methods of** assessment should apply?

- Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge.
- Assessment must include as a minimum the achievement of competence to the standard established in the NOHSC assessment instrument. Additional requirements may need to be achieved to comply with the AQTF including key competencies.
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge.
- Assessment must be applied in a real work environment or replicated industrial workplace.

In what **context** should the assessment occur?

- The application of competency is to be assessed in the workplace or replicated industrial workplace.
- Assessment is to occur using standard and authorised work practices including safety equipment and environmental constraints.
- Assessment of essential underpinning knowledge, other than the confirmatory questions, will usually be conducted in an off-site context.
- Assessment is to comply with relevant regulatory requirements including specific Australian Standards.

What are the **specific resource requirements** for this unit?

- Workplace location or replicated work facility in accordance with the OHS instrument relating to the OHS jurisdiction.
- Specifications and work instructions
- Plant that has the features of an advanced boiler. This can include a high category boiler modified to replicate the features of an advanced boiler.
- Documented hazard analysis of workplace and equipment
- Personal protective clothing and equipment.
- Occupational Health and Safety Certification Training and Assessment Delivery Guide
- Occupational health and safety assessment instruments
- Occupational health and safety authority learner guide
- Occupational health and safety authority trainer guide.

## What key competencies should be applied to this unit of competency?

There are a number of processes that are learnt throughout work and life which are required in all jobs. They are fundamental processes and generally transferable to other work functions. Some of these are covered by the **key competencies**, although others may be added. The questions below highlight how these processes are applied in this competency standard. Following each question a number in brackets indicates the level to which they key competency needs to be demonstrated where:

0 = not required

1 = perform the process

2 = perform and administer the process

3 = perform, administer and design the process

1. How can <b>communication of ideas and information</b> be applied?	Information and ideas with regard to boilers should be discussed with supervisors and co-workers. <b>Level 1</b>
2. How can <b>information be collected, analysed, and organised</b> ?	Information with regard to performance, faults and maintenance may be observed and monitored for analysis and organised by records, maintenance logs, logbooks and reports. <b>Level 1</b>
3. How can <b>activities be planned and organised</b> ?	Activities involving planning the work and hazard identification may be planned or coordinated around work schedules, or sequenced as required.  Planning required in working with operators and operators of associated equipment. <b>Level 1</b>
4. How can <b>team work</b> be applied?	Team work may be applied in communication methods and procedures to work cooperatively with other team members. <b>Level 1</b>
5. How can the use of <b>mathematical ideas and techniques</b> be applied?	Mathematics may be applied in the basic calculation of volume, mass and density of water used in an out of boilers. <b>Level 1</b>
6. How can <b>problem solving skills</b> be applied?	Contingencies for changed or difficult operating conditions or to control hazards and maintenance problems. <b>Level 1</b>
7. How can the use of <b>technology</b> be applied?	To access, communicate, measure and record information with regard to maintenance, usage and performance of reciprocating steam engine job requirements. <b>Level 1</b>

Are there any other competency standards that could be assessed with this one?

This competency standard could be assessed on its own or in combination with the other units of competency relevant to the job function.

There is essential information about assessing this competency standard for the consistent performance and where and how it may be assessed in the Assessment Guideline developed by the National Occupational Health and Safety Commission. All users of this competency standard must have access to this guideline.