



**Australian Government**

# **PMAOPS323 Operate and monitor heating furnace**

**Release: 1**

# **PMAOPS323 Operate and monitor heating furnace**

## **Modification History**

Release 1. Supersedes and is equivalent to PMAOPS323A Operate and monitor heating furnace

## **Application**

This unit of competency covers the skills and knowledge required to operate and monitor a fired heating furnace and ancillary equipment.

This unit of competency applies to operations technicians who are required to demonstrate a significant understanding of the process and the equipment operation in order to identify and rectify operational problems, predict the potential impact of the heating furnace on the operation of the whole plant, and facilitate output changes within legislative and other requirements.

The unit applies to furnaces used for heating heat transfer fluids which may include natural and synthetic oils or other media and other industrial uses as required in the workplace. It applies to furnaces that are:

- singular or in a battery of furnaces
- modulating combustion air supply
- modulating single heat source
- modulating firing rate.

This unit of competency applies to an individual operating independently in a plant with local control or in liaison with the control room operator in a plant with a centralised control panel, such as distributed control system (DCS) type controls. In the case of large complex plant, the operations technician would be part of a team during start-up and shutdown procedures.

This unit of competency applies to an individual working alone or as part of a team or group and working in liaison with other shift team members and the control room operator, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

## **Pre-requisite Unit**

Nil

## **Competency Field**

Operations

## Unit Sector

### Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

- |   |                                                |     |                                                                                               |
|---|------------------------------------------------|-----|-----------------------------------------------------------------------------------------------|
| 1 | <b>Prepare for work</b>                        | 1.1 | Receive and give shift handover                                                               |
|   |                                                | 1.2 | Identify work requirements                                                                    |
|   |                                                | 1.3 | Identify and control hazards                                                                  |
|   |                                                | 1.4 | Coordinate with appropriate personnel                                                         |
|   |                                                | 1.5 | Check for recent work undertaken on furnace                                                   |
|   |                                                | 1.6 | Note any outstanding/incomplete work                                                          |
|   |                                                | 1.7 | Check operational status of furnace                                                           |
|   |                                                |     |                                                                                               |
| 2 | <b>Start up furnace</b>                        | 2.1 | Perform pre-start-up checks                                                                   |
|   |                                                | 2.2 | Start up individual items of equipment and the entire furnace system                          |
|   |                                                | 2.3 | Start up from standby and after maintenance                                                   |
|   |                                                | 2.4 | Increase temperature steadily with no surges or lulls                                         |
|   |                                                | 2.5 | Stabilise furnace to produce required heat within required time                               |
|   |                                                |     |                                                                                               |
| 3 | <b>Monitor and control the heating furnace</b> | 3.1 | Complete routine checks, logs and paperwork                                                   |
|   |                                                | 3.2 | Recognise the signs of potential and actual problems                                          |
|   |                                                | 3.3 | Take action to minimise the impact of potential and actual problems                           |
|   |                                                | 3.4 | Monitor condition of heat transfer components (if any) and take action required by procedures |
|   |                                                | 3.5 | Monitor fuel/air supplies and ratios and take action in accordance with procedures            |

- |   |                                       |     |                                                                                                                                                      |
|---|---------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                       | 3.6 | Trim furnace in accordance with procedures                                                                                                           |
| 4 | <b>Change heating rates</b>           | 4.1 | Predict from rates and schedule when a transition will be required                                                                                   |
|   |                                       | 4.2 | Give advanced notice of transition to work team                                                                                                      |
|   |                                       | 4.3 | Trim plant in a manner which prepares it for the change                                                                                              |
|   |                                       | 4.4 | Manage changes smoothly and in a timely manner                                                                                                       |
| 5 | <b>Maintain furnace effectiveness</b> | 5.1 | Monitor furnace and its component plant items frequently and critically throughout shift using measured/indicated data and senses                    |
|   |                                       | 5.2 | Describe impacts of any changes upstream and downstream                                                                                              |
|   |                                       | 5.3 | Recognise actual and developing situations which may require action                                                                                  |
|   |                                       | 5.4 | Apply operational knowledge to resolve problems                                                                                                      |
|   |                                       | 5.5 | Take other appropriate actions on abnormal situations which cannot be resolved during the shift to ensure safety and the resolution of the situation |
|   |                                       | 5.6 | Follow through items initiated until final resolution has occurred                                                                                   |
| 6 | <b>Shut down furnace</b>              | 6.1 | Determine type of shutdown required                                                                                                                  |
|   |                                       | 6.2 | Give advance warning of shutdown where possible                                                                                                      |
|   |                                       | 6.3 | Changeover individual items of equipment                                                                                                             |
|   |                                       | 6.4 | Shut down individual items of equipment and the entire furnace system                                                                                |
|   |                                       | 6.5 | Shut down to a stand-by condition, if required                                                                                                       |
|   |                                       | 6.6 | Shut down in an emergency, when required.                                                                                                            |

|   |                                                                   |     |                                                                 |
|---|-------------------------------------------------------------------|-----|-----------------------------------------------------------------|
| 7 | <b>Isolate and de-isolate furnace system and individual items</b> | 7.1 | Isolate furnace system and or any component plant item          |
|   |                                                                   | 7.2 | Make safe for required work                                     |
|   |                                                                   | 7.3 | Check furnace/plant item is ready to be returned to service     |
|   |                                                                   | 7.4 | De-isolate and prepare furnace/plant item for return to service |

## Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

## Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

### Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements

All operations to which this unit applies are subject to stringent health, safety and environment (HSE) requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

### Hazards

Hazards include one or more of the following:

- electricity
- gas
- gases and liquids under pressure
- structural hazards
- structural collapse
- equipment failures
- industrial (machinery, equipment and product)
- equipment or product mass
- noise, rotational equipment or vibration
- plant services (steam, condensate and cooling water)
- working at heights, in restricted or confined spaces, or in environments subjected to heat, noise, dusts or vapours
- flammability and explosivity
- hazardous products and materials
- unauthorised personnel
- sharp edges, protrusions or obstructions
- slippery surfaces, spills or leaks
- extreme weather
- other hazards that might arise

**Situations requiring action**

Situations requiring action include one or more of the following:

- fuel variations (rate and quality)
- heating requirements change
- coke, soot and scale build up
- flame pattern
- weather conditions

**Non-routine problems**

Non-routine problems are unexpected problems, or variations of previous problems and must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes
- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person

Operational knowledge includes one or more of the following:

- procedures

- training
- technical information such as journals, engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people.

**Start up/shut down**

Start up/shut down includes the following:

- start up and shut down to/from normal operating conditions
- start up and shut down to/from isolated, cold or empty
- start up and shut down to/from other conditions/situations experienced on the plant

**Procedures**

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, include one or more of the following:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant

**Operate**

Operate is to monitor, adjust/make change to the production unit and/or its component items to meet specifications, by one or both of the following:

- manually in the plant
- using local controller in the plant

This competency does not require the operation of a central control panel.

**Product**

Product includes anything produced by a process step and so includes:

- intermediate products, such as the product from one process step, which then becomes the feed for another

**Pre-operational checks** Pre-operational checks include one or more of the following:

- heat exchange fluid feed supply
- fuel supply/heat source
- furnace valves - their operation and position
- combustion air supply and combustion equipment

**Ancillary equipment** Ancillary equipment includes one or more of the following:

- economiser
- economiser relief valves
- air heater
- feed heater
- main heating fluid stop valve
- feed pumps
- fans

**Monitor** Monitor includes one or more of the following systems and conditions:

- heating fluid pressure and temperature
- flame and combustion conditions
- heating fluid feed and return systems
- fuel system
- combustion management system
- heating fluid management system
- heating fluid manifold fittings
- soot blowers

## Unit Mapping Information

Release 1. Supersedes and is equivalent to PMAOPS323A Operate and monitor heating furnace

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

# Assessment Requirements for PMAOPS323 Operate and monitor heating furnace

## Modification History

Release 1. Supersedes and is equivalent to PMAOPS323A Operate and monitor heating furnace

## Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria, and include the ability to:

- undertake checks and observations and use data and own senses to monitor process and equipment and maximise performance
- perform pre-start checks, start-up/shutdown procedures, isolations and de-isolations, and maintenance checks
- predict impact of a change in one unit/area on other plant units/areas and take appropriate action
- predict the need for process changes and prepare and manage smooth transitions
- identify early warning signs of equipment/processes needing attention or with potential problems and take action
- identify hazards and risks and apply risk control procedures.

## Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- all items on a schematic of the production unit and functions of each
- principles of operation of plant/equipment
- interactions between plant items/processes
- systems' operating parameters, integrity limits, product specifications and tolerances, temperature, pressure and flow
- process-specific science (physics and chemistry) to the level of being able to interpret the science and extract factors controlling the process and product, including heating fluid (if any) properties
- operational shutdown processes and procedures, including cooling down, furnace pressure/vacuum and fuel/heat source isolation
- the processes for starting a furnace, including heat input, warm-up of the reticulation system, systems operation, reticulation line pressure, heating fluid usage and supply, and ancillary equipment
- shutdown processes and procedures for internal inspection, including confirming furnace cooling down, vacuum/pressure, fuel/heat source isolation, and removal of combustion equipment and water from furnace

- procedures for monitoring a furnace, including heating fluid reticulation line pressure/temperature, usage, supply and quality of heating fluid, combustion/heat source system, fuel system, combustion air supply, operation of control/safety devices, combustion management system, and ancillary equipment
- function, purpose and location of ancillary equipment
- various modes of furnace storage and reasons for selecting a particular mode
- types and purpose of furnace fittings
- function and troubleshooting of major components and their problems and problem resolution
- hierarchy of control
- hazards that may arise in the job/work environment, and:
  - their possible causes
  - potential consequences
  - appropriate risk controls.

## Assessment Conditions

- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
  - should occur over a range of situations which include typical disruptions to normal, smooth operations
  - will typically include a supervisor/third-party report focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
  - must include the use of industrial style furnace allowing operation
  - may use industry-based simulation for part only of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible, or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment reflecting realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from one or more of:
  - walk-throughs
  - pilot plant operation
  - demonstration of skills
  - industry-based case studies/scenarios
  - ‘what ifs’.

- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition, the assessor or anyone acting in subject matter expert role in assessment must demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they must assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
  - relevant VET or other qualification/Statement of Attainment
  - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
  - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
  - being currently employed undertaking the type of work being assessed
  - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
  - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
  - conducting on-the-job training/assessments of the type of work being assessed
  - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>