



Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS433A Operate and Monitor a Heat Recovery Steam Generator Unit

Release: 1

UEPOPS433A Operate and Monitor a Heat Recovery Steam Generator Unit

Modification History

Not Applicable

Unit Descriptor

- **Unit Descriptor** 1)

This unit deals with the skills and knowledge required to operate an in-service Heat Recover Steam Generator.

Operation of the Heat Recover Steam Generator (with or without supplementary firing) will be required through the full range of output, up to and including the maximum continuous rating.

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 are subject to regulations directly related to Occupational Health and Safety. Individuals may require a licence to practise in the workplace depending on the requirements of the various State OHS regulations. .

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

- **Prerequisite Unit(s)** 2)

Competencies 2.1)

Competency in this unit may be assessed concurrently with or only after the following competency has been acquired:

- | | |
|------------|---|
| UEPOPS333A | Operate and monitor H.R.S.G. hot gas control system |
| UEPOPS407A | Start and run up a gas turbine |
| UEPOPS433A | Start up a heat recovery steam generator unit |

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. |
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Elements and Performance Criteria

- | • ELEMENT | • PERFORMANCE CRITERIA |
|---------------------|---|
| 1 Plan&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 Operational checks are carried out on plant according to manufacturer's recommendations and site requirements |

- **ELEMENT**
 - **PERFORMANCE CRITERIA**
- | | | | |
|---|-----------------------|-----|--|
| 2 | Operate plant | 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. |
| | | 2.1 | Gas turbine exhaust gas flow and power output are adjusted to achieve required steam flow and conditions, observing operating requirements. |
| | | 2.2 | Supplementary Firing System (if provided) is placed into and out of service as required to maintain design steam flow and steam conditions. |
| | | 2.3 | Monitoring and control of Heat Recovery Steam Generator drum level, feedwater flow, steam temperature, pressure and flow are carried out in accordance with manufacturer's and site requirements |
| | | 2.4 | Plant is operated within limits of plant design, enterprise or site requirements. |
| | | 2.5 | Corrective action is taken to rectify abnormalities in accordance with manufacturer's and enterprise/site procedures. |
| 3 | Monitor Plant | 3.1 | Plant to be monitored is identified. |
| | | 3.2 | Plant is monitored for normal operation and/or to detect deviations from required operating conditions. |
| | | 3.3 | Plant integrity and personnel safety is maintained through consultation with appropriate personnel, and reference to plant technical and operational documentation |
| | | 3.4 | Appropriate personnel are notified when defects are detected. |
| 4 | Analyse system faults | 4.1 | Causes of abnormal plant operating conditions are identified by analysing the relevant technical and operational information in a logical and sequential manner. |
| | | 4.2 | Corrective action taken is in accordance with |

• ELEMENT	• PERFORMANCE CRITERIA
5 Test plant operation	enterprise/site procedures.
	5.1 Tests are performed in accordance with defined procedures applicable to the operational test
	5.2 System and plant are observed for correct operational response
	5.3 Plant is returned to required operational status upon completion of test
	5.4 Corrective action is taken when response is not in accordance with documentation, plant integrity or personnel safety requirements
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 operating and monitoring a heat recovery steam generator unit.

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
- Environmental legislation
- Relevant enterprise/site safety procedures
- Enterprise/site emergency procedures and techniques
- Enterprise recording procedures
- Communication principles
- Control and data acquisition systems

• **REQUIRED SKILLS AND KNOWLEDGE**

- Computers and software
- Mechanical and electrical supervisory,
- Alarm, protection and control equipment
- Enterprise/site standard operating procedures; safe operating principles
- Mathematics, mechanics, physics, chemistry and electrical principles
- Motor performance characteristics; pump and compressor performance characteristics
- Valve, damper and actuator types and performance characteristics
- The principles of control of steam temperature and pressure throughout the full range of heat recovery steam generation operation up to and including maximum continuous rating
- Heat recovery steam generator efficiency
- Principles of heat recovery steam generator steam and feedwater chemical treatment
- The arrangement of the heat recovery steam generator gas path and water and steam circuits
- Fuel conditioning and supplementary firing equipment
- Principles governing efficient combustion
- The heat recovery steam generator system components and their interaction with other plant and equipment external to that covered by this competency.
- AC and DC electrical distribution systems
- Electric motors
- Switchgear
- Station water distribution systems
- Fire protection control systems
- Compressed air systems
- Auxiliary supply systems

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

• REQUIRED SKILLS AND KNOWLEDGE

- Apply enterprise recording procedures
 - Identify plant status Prepare plant/equipment for operation
 - Organise resources
 - Operate HRSG plant and equipment
 - Apply temperature and pressure raising techniques and principles
 - 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
 - Coordinate the operation of equipment to maintain plant integrity, personnel safety, continuity of supply and optimum efficiency.
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Evidence Guide

• EVIDENCE GUIDE

8) This provides essential advice for assessment of the competency standard unit 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 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.

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 in the Assessment

- **EVIDENCE GUIDE**

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 procedure
- Demonstrated performance across a representative range of contexts from the prescribed items below:
 - The knowledge and application of relevant sections of occupational, health and safety legislation; statutory legislation; enterprise/site safety procedures; enterprise/site standard operating procedures and safe operating principles; enterprise/site emergency procedures
 - The knowledge of principles and techniques of operation of heat recovery steam generator plant and equipment
 - The knowledge of operational testing of plant
 - The knowledge of system components and the manner in which these components interact with other plant and equipment
 - The knowledge of temperature and pressure raising requirements
 - The knowledge of the principles of heat recovery steam generator and feedwater sampling and chemical treatment
 - The ability to prepare and plan work
 - The ability to prepare plant/equipment for operation
 - The ability to operate plant/equipment in accordance with enterprise/site standard operating procedures and safe operating principles
 - The ability to analyse plant faults
 - Dealing with an unplanned event by drawing on

• EVIDENCE GUIDE

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.

UEPOPS336A Operate and monitor a gas turbine

• EVIDENCE GUIDE

UEPOPS340A Operate and monitor a steam turbine

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.	2
How is team work used within this competency?	Refer to the following example of application: Coordinate activities of the team 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 routine projects, operations, tasks, estimation of distances, levels, loads and material requirements.	2
How are problem solving skills	Refer to the following example of application: Determine solutions which focus on long and	2

• **EVIDENCE GUIDE**

applied?	short-term resolution of work task problems.	
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How is use of technology applied?	Refer to the following example of application: Access, communicate, measure and provide information to monitor operations and performance of plant and equipment.	2
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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.

How is use of tools and equipment?	Refer to the following example of application:	
6	Performing the work task in non-routine or contingent situations	Refer to the following example of application: Seek advice and apply solutions to problems relevant to the workplace environment.

Range Statement

• RANGE STATEMENT

7) This relates to the competency standard unit 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: gas turbines; gas turbine emission control equipment; gas turbine exhaust gas control dampers; heat recovery steam generators and auxiliary plant; heat recovery steam generator supplementary duct firing equipment; fuel delivery systems; fuel management systems; flame detection equipment; steam temperature control equipment; AC and DC electrical distribution systems; electrical switchgear; electric motors; electric motor driven pumps and fans; diesel engine driven auxiliary plant; station water distribution systems; hydraulic power oil systems; compressed air systems; distributed control systems; supervisory, protection, alarm and control equipment.

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

Information and documentation sources may include verbal or written communications; enterprise safety rules documentation; enterprise operating instructions; computer-based and computer accessed documentation; enterprise/site standing and operating instructions; enterprise log books; manufacturer's operation and maintenance manuals; and equipment and alarm manuals.

Technical and operational indicators may include stimuli (auditory, olfactory, tactile, visual), local indicators and recorders, computers and alarms (visible and/or audible).

Communications may be by direct personal interaction or by means of telephone, verbal or text-based telephone messaging, two way radio, pager, computer (electronic mail) and/or operating logs (written or verbal).

Appropriate personnel for consultation, giving or receiving direction may include: supervisor/team leader or equivalent, power plant operations personnel or equivalent, technical and engineering officers or equivalent, maintenance staff, other operating staff or equivalent, system controller/network controller, field operator, restricted H.V. operators, independent generators and customers and contractor staff.

Operating environment may be remote from the plant and equipment being operated, (in cases where operation is assisted by remote indication of operating parameters and plant status), during inclement or otherwise harsh weather conditions, in hot/wet/noisy/dusty/elevated/confined or enclosed areas or during night periods.

Plant operations (systems requirements) may include:

Load changes over the full range of operation up to and including maximum continuous rating, operational testing.

- **RANGE STATEMENT**

Operational tests may include:

Loss of a major auxiliary control response checks; stand-by plant "cut-in" tests; dampers/valves operating checks and post start tests.

Faults and abnormal operating conditions may include:

Gas Turbine trip, excessively high or low steam/water drum level, loss of a major auxiliary; loss of electrical supply to switchboards, drive motors or valve actuators; feedwater chemical operating limits exceeded; automatic control loop(s) malfunctions; high temperatures on/in, heat recovery steam generator heating surfaces/tubes/headers, low temperatures on/in, heat recovery steam generator heating surfaces/tubes/headers; High/low superheater or reheater steam temperatures; high temperatures on/in: motor and/or pump bearings, lubricating oil or motor windings; heat exchange element tube leaks; excessive drum water level split; excessively high heating/cooling rates; loss of flame on supplementary firing combustors; fuel delivery system malfunction; fuel preparation and delivery systems fires; high differential pressures on oil/air filters and strainers; failed field devices; failed/malfunctioning actuators/dampers/valves; feedwater pumps malfunctions; heat recovery steam generator protection operation.

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 numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 Literacy and Numeracy

Reading 4 Writing 4 Numeracy 4

Competency Field

Competency Field 4)
Operations