



Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS433B Operate and monitor a heat recovery steam generator unit

Release: 1

UEPOPS433B Operate and monitor a heat recovery steam generator unit

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

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 2)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice 3)

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.

Pre-Requisites

Prerequisite Unit(s) 4)

Competencies 4.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

Common Unit Group

Unit Code	Unit Title
UEPOPS333B	Operate and monitor H.R.S.G. hot gas control system
UEPOPS407B	Start and run up a gas turbine
UEPOPS433B	Start up a heat recovery steam generator unit

Literacy and numeracy skills 4.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading	4	Writing	4	Numeracy	4
---------	---	---------	---	----------	---

Employability Skills Information

Employability Skills 5)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit. 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 & 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
	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 Operate plant	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.

ELEMENT	PERFORMANCE CRITERIA
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 enterprise/site procedures.
5 Test plant operation	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

8) 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.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

The extent of the Essential Knowledge and Associated Skills required follows:

KS01-PO433B A heat recovery steam generator unit

T1 Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant environmental, occupational health and safety legislation and regulations
- Enterprise procedures
- Plant drawings and manufacturers manuals
- Introduction to and typical arrangements of power production plant
- Relevant plant and equipment, its location and operating parameters
- Relevant state and territory regulations
- Electric motor types and characteristics
- Pump and compressor types and characteristics
- Valve, damper and actuator types and characteristics
- Switchgear types and characteristics
- Electrical protection types and characteristics
- Electrical principles
- Process control principles
- Plant process control systems
- a.c. generators types and characteristics
- Transformers types and characteristics
- Duct burners types and characteristics
- H.R.S.G construction and principles
- Thermodynamics
- Properties of Matter
- Enterprise recording procedures
- Control and data acquisition systems
- Mechanical and electrical supervisory,
- Alarm, protection and control equipment
- 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
- The arrangement of the heat recovery steam generator gas path and water and

REQUIRED SKILLS AND KNOWLEDGE

steam circuits

- Fuel conditioning and supplementary firing equipment
- The heat recovery steam generator system components and their interaction with other plant and equipment external to that covered by this competency.
- a.c. and d.c. electrical distribution systems
- Station water distribution systems
- Fire protection control systems
- Compressed air systems
- Auxiliary supply systems

T2 Specific skills needed to achieve the Performance Criteria:

- Interpret plant drawings and manufacturers manuals
- Apply relevant state and territory regulations
- Apply enterprise recording procedures
- Identify plant status
- Prepare plant/equipment for operation
- Organise resources
- Operate HRSG 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

Evidence Guide

EVIDENCE GUIDE

9) 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 9.1)

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 Guidelines of this Training Package.

**Critical aspects
of evidence
required to
demonstrate
competency in
this unit**

9.2)

Before the critical aspects of evidence are considered all pre-requisites 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 – UEP12". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this

shall incorporate evidence that shows a candidate is able to:

- Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
- Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in 6) Essential Knowledge and Associated Skills of this unit
- Demonstrate an appropriate level of employability skills
- 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 essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific 9.3)

**resources for
assessment**

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****9.4)**

This unit shall be assessed by methods given in Section 1.3.00 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****9.5)**

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.

UEPOPS336B Operate and monitor a gas turbine
UEPOPS340B Operate and monitor a steam turbine

Range Statement

RANGE STATEMENT

10) 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; a.c. and d.c. electrical distribution systems; electrical switchgear; electric motors; electric motor driven pumps and fans; diesel engine driven auxiliary plant; feedwater chemical dosing equipment, 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.

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;

RANGE STATEMENT

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 Section 2.1 Preliminary Information and Glossaries.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	11)
	Operations