Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS432B Start up a heat recovery steam generator unit

Release: 1

UEPOPS432B Start up 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 prepare a Heat Recovery Steam Generator for service. Placing the Heat Recovery Steam Generator in service will require the admission of the heating medium and the control the level of water within the steam/water drums, the flow and quality of the feedwater, the rate of steam pressure and temperature increase and the rate of rise of metal temperatures within design limits to the point at which the Heat Recovery Steam Generator is supplying a constant flow of steam at rated temperature and pressure to the consumer.

Application of the Unit

Application of the Unit **2)**

This unit is intended to augment formally acquired competencies.

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

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 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'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	Start up a heat recovery steam generator unit	2.1	Pre-operation conditions of the Heat Recovery Steam Generator and Gas Turbine are established in accordance with enterprise standards and site requirements.
		2.2	Minimum operation of gas turbine is established and supported in accordance with enterprise, manufacturer's and site requirements.
		2.3	Monitoring of Heat Recovery Steam Generator drum level, feedwater flow, steam and metal temperature rates of rise, steam pressure rate of rise and control of steam flow and drainage is carried out in accordance with manufacturer's and site requirements
		2.4	Gas Turbine exhaust gas temperature and flow to the Heat Recovery Steam Generator and Gas Turbine power output are adjusted to achieve required steam conditions and demand, observing operating requirements

ELEMENT		PERFORMANCE CRITERIA	
		2.5	Plant is operated within limits of plant design, enterprise or site requirements.
		2.6	Plant is monitored and observed to detect deviations from required operating conditions.
		2.7	Corrective action is taken to rectify abnormalities in accordance with manufacturer's 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 is 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.
5	Complete documentation	5.1	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 starting up 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-PO432B 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
- Steam and water systems types and characteristics
- Duct burners types and characteristics
- H.R.S.G construction and principles
- Thermodynamics
- Properties of Matter
- Control and data acquisition systems;
- Mechanical and electrical supervisory,
- Alarm, protection and control equipment;
- Safe operating principles.
- The principles of control of heat transfer and rate of temperature rise during a heat recovery steam generator start up;
- Heat recovery steam generator efficiency;
- The arrangement of the heat recovery steam generator gas path and water and

REQUIRED SKILLS AND KNOWLEDGE

steam circuits;

- The heat recovery steam generator system components and their interaction with other plant and equipment external to that covered by this competency.
- 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 enterprise recording procedures;
- Identify plant status;
- Prepare plant/equipment for operation;
- Organise resources;
- Operate heat recovery steam generator 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;

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, polices 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 together with 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 resources for **9.3)**

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.

UEPOPS411B Run up 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 and 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; station water distribution systems; feedwater chemical dosing equipment, hydraulic power oil systems; compressed air systems; distributed control systems; supervisory, protection, alarm and control equipment.
Safety standards may include relevant sections of OHS 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; dedicated computer equipment; enterprise/site standing instructions and plant notes; enterprise log books; manufacturer's operation and maintenance manuals; and equipment and alarm manuals.
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 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:
Returns to service with the heat recovery steam generator in a cold, warm or hot condition; heat recovery steam generator internal chemical clean; raising pressure to allow steam main blow-out; raising pressure to allow safety valve setting, operational testing.
Operational tests may include:
Loss of a major auxiliary control response checks; drum level protection tests; stand-by plant "cut-in" tests; dampers/valves operating checks and pre and post start tests
Faults and abnormal operating conditions may include:

RANGE STATEMENT

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; high differential pressures on oil/air filters and strainers; failed field devices; failed/malfunctioning actuators/dampers/valves; feedwater pumps malfunctions 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