



Australian Government

MARL030 Demonstrate advanced knowledge of marine auxiliary boilers

Release: 1

MARL030 Demonstrate advanced knowledge of marine auxiliary boilers

Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to operate and maintenance of marine auxiliary boilers on a commercial vessel. It includes evaluating steam plant efficiency, interpreting steam plant cycles, evaluating repairs required for boilers and steam plants, outlining survey procedures, and explaining operating steam plant under different conditions.

This unit applies to the work of a Marine Engineer Class 1 on commercial vessels of unlimited propulsion power and forms part of the requirements for the Certificate of Competency Marine Engineer Class 1 issued by the Australian Maritime Safety Authority (AMSA).

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

Pre-requisite Unit

Not applicable.

Competency Field

L – Marine Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

Elements describe the essential outcomes.

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

1 Evaluate steam plant efficiency	1.1	Combustion efficiency from flue gas constituents is assessed
	1.2	Steam and fuel consumption to obtain heating efficiency is analysed
	1.3	Causes of loss of steam plant efficiency are evaluated and recorded

	1.4	Requirements of inert gas generation of boiler plant are determined
2 Interpret complex steam plant cycles	2.1	Operation, function and efficiency of dual pressure cycles and steam/steam generators are compared and contrasted
	2.2	Operation of dual pressure and pass in/out turbines is explained
3 Evaluate boiler and steam plant repairs	3.1	Types and properties of materials used in boilers and steam plant are identified
	3.2	Common component failures in boilers and steam plant are explained and reported
	3.3	Appropriate repairs for failed components in boilers and steam plant are determined
	3.4	Constraints on engineering staff engaged in repairing boilers and steam plant are explained
	3.5	Requirements to report defects in pressurised components of boilers are identified
4 Explain methods of auxiliary steam plant operation and control under variable conditions	4.1	Methods of steam pressure control while manoeuvring and possible adverse impacts are analysed
	4.2	How dew point can be reached when operating at reduced power is examined
	4.3	How low powers can limit steam production by exceeding pinch point is explained
5 Outline procedures surveying for boilers	5.1	Procedure for preparing a boiler for survey is documented and explained
	5.2	Boiler inspection procedure that would cover all possible problem areas is planned
	5.3	Purpose and procedure for carrying out hydrostatic/hydraulic pressure tests and non destructive tests on auxiliary boilers are explained
6 Analyse procedures for protecting steam plant during off load conditions	6.1	Procedures for decommissioning and laying up a boiler for short and long intervals are compared
	6.2	Processes for cleaning boilers are evaluated
	6.3	Procedures for re-commissioning steam plant are explained

		6.4	Chief Engineer responsibilities for setting lifting pressure of safety valves are outlined
7	Assess hazards of operating steam plant under adverse or faulty operating conditions	7.1	Potential hazards of boiler operation with contaminated feed water are assessed
		7.2	Procedure for continuing boiler operation when contamination has exceeded acceptable limits is explained
		7.3	Effects of operating boiler with insufficient water level are explained and actions to be taken under loss of water conditions are identified
		7.4	Causes, consequences and relevant preventative measures associated with furnace explosions are analysed
		7.5	Operating conditions that can lead to an economiser fire and actions that can be taken to prevent and control such fires are evaluated
		7.6	Alternative methods for maintaining heating if a boiler or economiser has to be shut down are determined
8	Explain operation and maintenance of heat transfer oil systems	8.1	Operating procedures of heat transfer oil systems are explained
		8.2	Hazards associated with heat transfer oil systems are analysed
		8.3	Routine maintenance procedures associated with heat oil transfer systems are outlined

Foundation Skills

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

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Causes of loss of steam plant efficiency include

- conduction-heat loss (such as fouled tubes)
- high flue-gas temperature

one or more of the following:

- low combustion-air supply temperature
- low feed-water supply temperature
- low quality fuel
- operation at low or cyclic loads
- poor:
- combustion
- controls/instrumentation
- water treatment
- radiant-heat loss
- too much excess air (i.e. high oxygen [O₂])

Boilers and steam plant include one or more of the following:

- condensers
- economiser
- feed pumps
- fired
- high pressure
- low pressure
- medium pressure
- steam – steam generators
- unfired

Failures include one or more of the following :

- acid dew point corrosion
- caustic gouging
- corrosion fatigue
- distortion
- erosion
- fatigue
- hydrogen damage
- maintenance damage
- material flaws
- over temperature
- pitting
- stress:
- corrosion cracking
- rupture
- thermal fatigue
- vibration
- welding flaws

Constraints include one or more of the following:

- class requirements
- location
- reliability
- time
- type of materials

Safety valves include one or more of the following:

- boiler drum
- economiser
- superheater
- WHU

Unit Mapping Information

This unit replaces and is equivalent to MARL6017A Demonstrate advanced knowledge of marine auxiliary boilers.

Links

Companion Volume implementation guides are found in VETNet -
<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2>

Assessment Requirements for MARL030 Demonstrate advanced knowledge of marine auxiliary boilers

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- accessing information related to marine auxiliary boilers
- applying relevant work health and safety/occupational health and safety (WHS/OHS) requirements and work practices
- assessing own work outcomes and maintaining knowledge of current codes, standards, regulations and industry practices
- identifying and applying relevant solutions for addressing complex problems associated with marine auxiliary boilers, such as maintaining the operation of marine auxiliary boilers under adverse conditions
- identifying and interpreting diagnostic information and performing complex mathematical calculations related to operating, repairing and maintaining marine auxiliary boilers
- identifying methods, procedures and materials needed for operating, maintaining and repairing marine auxiliary boilers
- reading and interpreting manuals, technical specifications, safety data sheets/material safety data sheets and manufacturer guides related to operating, repairing and maintaining marine auxiliary boilers.

Knowledge Evidence

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

- basic principles of operation of boilers and steam systems
- boiler and steam plant repairs
- combustion efficiency
- combustion in boilers and related safety procedures, including importance of purging a boiler and other safety precautions taken when firing a boiler
- common boiler defects and repair procedures
- fittings mounted on boilers
- fuel oil system for an auxiliary boiler

- hazards:
 - associated with running boilers and steam plant
 - of operating steam plant under adverse or faulty operating conditions
- heat transfer oil systems
- methods of auxiliary steam plant operation and control under variable conditions
- operating principles relating to steam generation in fired and unfired boilers
- operation of marine auxiliary boilers
- principles of boiler operation in normal and emergency situations
- procedures for:
 - maintaining water level in boilers
 - protecting steam plant during off load conditions
 - surveying boilers
- purpose of alarms and shut downs in marine boilers
- steam plant:
 - efficiency
 - cycles
- types of auxiliary boilers and typical operating pressures and temperatures
- typical feed systems for marine boilers
- treatment, sampling and testing of boiler water
- WHS/OHS requirements and work practices.

Assessment Conditions

Assessors must satisfy National Vocational Education and Training Regulator (NVR)/Australian Quality Training Framework (AQTF) assessor requirements.

Assessment must satisfy the National Vocational Education and Training Regulator (NVR)/Australian Quality Training Framework (AQTF) standards.

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.

Assessment must occur in workplace operational situations or where these are not available, in simulated workplace operational situations or an industry-approved marine operations site that replicates workplace conditions where advanced knowledge of marine auxiliary boilers can be demonstrated.

Resources for assessment include access to:

- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals
- diagrams, specifications and other information required for performing advanced calculations related to marine auxiliary boilers
- technical reference library with current publications on marine auxiliary boilers and steam plant

- tools, equipment, materials and personal protective equipment currently used in industry.

Performance should be demonstrated consistently over time and in a suitable range of contexts.

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