



Australian Government

**MARL025 Demonstrate intermediate
knowledge of marine auxiliary machinery
and systems**

Release: 1

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Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to operate and maintain marine auxiliary boilers on a commercial vessel. This includes analysing the responsibilities of an Engineer Class 2 in relation to auxiliary boiler and steam plant of a vessel, the design of marine auxiliary boilers, the operation of thermal fluid heating plants, the layout of marine stem systems and components, and procedures for inspecting marine auxiliary boilers and associated plant.

This unit applies to the work of a Marine Engineer Class 2 on commercial vessels greater than 3000 kW and forms part of the requirements for the Certificate of Competency Marine Engineer Class 2 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 Determine responsibilities of an Engineer Class 2 in relation to auxiliary machinery of a vessel

1.1 Commonwealth, state/territory and local legislation and regulations, which relate to auxiliary machines and systems in terms of safety, repairs and pollution, including implementation, is identified

1.2 Safe operating practices for all steam plant are examined and standing orders as to their operation are prepared or modified

- 1.3 Procedures for establishing engine room staff who are fully conversant with safe practices for operation and maintenance of auxiliary machines and systems are outlined
- 2 Assess material properties and their application to engine room situations**
 - 2.1 Properties of materials and how these can be determined by simple tests are explained
 - 2.2 Common methods for non-destructive testing (NDT) and their application to auxiliary machinery and components are outlined
 - 2.3 Common non-metallic materials used in the marine industry are assessed and their properties, applications and restrictions on usage are explained
 - 2.4 Common metallic materials used in marine industry, their applications, failure mechanisms and methods to limit or reduce failures are assessed
- 3 Outline procedure for sampling and carrying out onboard and laboratory tests on fuel and lubricants**
 - 3.1 Importance and implications of continual monitoring of quality of fuel oils and lubricants in efficient operation of machinery are explained
 - 3.2 Procedures for onboard testing for fuels and lubricants are clarified
 - 3.3 Laboratory tests that may be conducted on fuels and lubricants and how results can be interpreted and utilised as part of a maintenance program are detailed
- 4 Explain pre-treatment of residual fuel and servicing of contaminated fuel and lubricants**
 - 4.1 Operation of centrifugal separators is outlined and factors that affect optimum separation are analysed
 - 4.2 Procedures for dealing with contamination of oils by water, fuel or solid debris including recognition of dangerous levels and possible consequences, are clarified
 - 4.3 Symptoms, causes, effects and methods of treatment of oils that have become infected by bacteria are identified
 - 4.4 Function and operation for onboard fuel blender and alternative fuel treatments are explained
- 5 Assess operational problems with pumps and pumping systems handling sea water**
 - 5.1 Procedure for evaluating pump or pumping system, including heat exchangers and methods of locating cause of problems that affect output and performance, is clarified
 - 5.2 Operation of a self-priming system used on bilge, ballast or cargo pumping arrangements is explained

- 5.3 Different types of distillation plants used on ships are compared and contrasted taking into account operation, performance, problems and applications
- 5.4 Main reasons for corrosion in sea water systems and regions most affected are explained
- 5.5 Operation of corrosion prevention systems fitted to pumping systems is assessed
- 6 Apply fault-finding procedures for air compressors and compressed air systems**
 - 6.1 Effects of common faults on operation of single and multi-stage compressors are interpreted
 - 6.2 Reasons for and effects of high levels of oil or water in compressed air are explained
 - 6.3 Effects of operating air compressors on synthetic lubricating oils are explained with regards to carbon formation and water contamination of the oil
 - 6.4 Procedures for inspecting and maintaining air receivers and associated fittings are clarified
- 7 Outline construction, installation and operation of steering gears, stabilisers and bow thrusters**
 - 7.1 Construction, installation and operation of hydraulic steering gear is explained
 - 7.2 Construction and operation of stabilisers is explained
 - 7.3 Construction and operation of bow thrusters is explained
 - 7.4 Normal alarms and safety devices fitted to steering gears for all classes of vessel are identified
 - 7.5 Auto and manual changeover procedures are analysed in the event of faults occurring in a steering gear
 - 7.6 Oil changing and air purging procedures for a steering gear are clarified
 - 7.7 Fault finding procedures for steering gear are clarified
 - 7.8 Procedures for change over to alternative systems of power or control of steering gear are clarified
- 8 Assess common faults in refrigeration and air conditioning systems**
 - 8.1 Symptoms, effects and remedial action for common faults in refrigeration and air conditioning systems are assessed
 - 8.2 Pumping down, leak test, gas charge and oil charge procedures are clarified

- 8.3 Functions and operation of all components of refrigeration and air conditioning plant are analysed
- 8.4 Correct procedures for recovery of refrigerants from refrigeration systems are implemented
- 9 Outline pollution prevention regulations and operation of equipment**
 - 9.1 International Convention for the Prevention of Pollution from Ships (MARPOL) regulations are identified and their implications for marine engineers and ship operators are explained
 - 9.2 Operation of modern oily water separators, oil content monitors and how they comply with MARPOL regulations are explained
 - 9.3 Operation of typical sewage plants and regulations controlling their usage are explained
 - 9.4 Operation of incinerators, material that may legally be burned and monitoring devices is explained
- 10 Explain basic operation of marine gas turbines**
 - 10.1 Basic flow of air and gas through a simple cycle marine gas turbine is outlined
 - 10.2 Materials and construction of compressor, combustion system and turbine in a single and two-shaft design turbine are outlined
 - 10.3 Basic controls required for control and protection of plant are outlined
 - 10.4 Accessories necessary for safe operation are identified
- 11 Explain shafting arrangement of vessel**
 - 11.1 Different shafting arrangements found on vessels from main engine to propeller are outlined
 - 11.2 Performance of different couplings and coupling bolts is assessed
 - 11.3 Arrangement of a stern tube is completed
 - 11.4 Procedure to mount and unmount propeller on tail shaft is clarified
 - 11.5 Different shaft bearings, couplings, sealing and lubrication arrangements of transmission system are identified
- 12 Explain types, operation, and**
 - 12.1 Types of steam turbines, their location, and typical operating conditions of temperature and pressure are explained

maintenance requirements of steam turbine machinery found in larger vessels

- 12.2 Common operational problems associated with steam turbine plants, symptoms and effects of these problems and possible remedies are outlined
- 12.3 Process of warming-through and shutting down turbine plant is explained
- 12.4 Maintenance requirements for achieving optimum performance of an auxiliary steam turbine plant 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.

Auxiliary machines and systems include one or more of the following:

- boiler
- cargo handling equipment
- compressors
- deck machinery
- diesel generator
- evaporators
- pumps
- refrigerating installation
- separators

Testing includes one or more of the following:

- density
- fuel in lubricating oil
- pour point
- viscosity
- water contamination

Corrosion prevention systems include one or more of the following:

- anodes
- chemical injection
- impressed current
- marine growth inhibiting systems
- special coatings

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- Components of refrigeration and air conditioning plant must include:
 - all fittings
 - safety devices
- Accessories include one or more of the following:
 - accessory gear
 - lube oil:
 - coolers
 - pump
 - filter
 - starting device
- Arrangement of a stern tube includes one or more of the following:
 - lubrication circuit
 - shaft sealing
 - tail shaft bearing

Unit Mapping Information

This unit replaces and is equivalent to MARL6012A Demonstrate intermediate knowledge of marine auxiliary machinery and systems.

Links

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