



Australian Government

MARL029 Demonstrate intermediate knowledge of marine steam turbines and main boilers

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 main steam propulsion plant and associated control systems on a commercial vessel.

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 Evaluate energy balance of steam turbine plant

- 1.1 Heat losses in a turbine and turbine system are analysed
- 1.2 An enthalpy/entropy diagram is used to show how steam properties change through a turbine
- 1.3 The affect air heaters and economisers have on turbine plant efficiency is explained
- 1.4 Practical methods of verifying energy losses are detailed

2 Explain construction

- 2.1 Operation and components of the complete feed system are

and operation of feed system		outlined
	2.2	Construction, operating principles and maintenance requirements of a regenerative condenser are explained
	2.3	Causes of loss of vacuum are identified
	2.4	Construction and operation of air ejectors, vacuums and extraction pumps are explained
	2.5	Construction and operation of gland condensers, low-pressure heaters, drain coolers and high-pressure heaters are explained
	2.6	General arrangement and construction of turbo-feed pumps is outlined
	2.7	Governor control is explained
	2.8	Operating principles and construction details of de-aerators are explained
3 Explain construction, operation and repair of high-pressure water tube boilers	3.1	Operating principles of high-pressure boilers, including water and gas flow circulation are explained
	3.2	Drum, internal fittings and support and expansion arrangements are outlined
	3.3	Procedures for repairing a membrane wall furnace are clarified
	3.4	Operating principles and construction methods of integral and external superheaters are explained
	3.5	Construction and operation of economisers and air heaters is explained
	3.6	Chemistry of combustion is explained
	3.7	Typical burner register arrangements are outlined
	3.8	Construction, operation and maintenance of boiler gauge glasses and safety valves is explained
	3.9	Operation of boiler control and soot blowing system is detailed
	3.10	Blow-down procedure for a high pressure boiler is prepared
4 Explain requirements for	4.1	How salts are precipitated and how metal is corroded in the boiler and feed system is explained and method of prevention

feed water treatment for high-pressure water tube boilers		is outlined
	4.2	How oxygen is eliminated in high-pressure boilers is shown
	4.3	How pH is measured and controlled is explained
	4.4	Normal and maximum operating limits for boiler feed water treatment are identified and procedure to follow if these limits are exceeded is clarified
	4.5	Purpose and procedure for different types of tests of boiler water chemistry are explained
5 Explain construction and operation of high-pressure turbines	5.1	Flow of steam through nozzles is analysed, and pressure and velocity compounding are illustrated
	5.2	Construction of blades, bearings, glands, rotors and casings is explained
	5.3	Warming-through procedure prior to start up is explained
	5.4	Routine checks during operation are detailed
	5.5	Emergency operation of plant with one turbine inoperative is outlined
	5.6	Turbine shutdown procedure is clarified
	5.7	Routine checks carried out at a turbine plant survey are detailed
	5.8	Precautions necessary when turbine and gearing casings are open are explained and any repairs or adjustments that may be required are identified
	5.9	Performance of steam plant by routine observations of pressure temperature speed and vibration of turbine, gearing and associated systems is analysed
6 Explain turbine gearing arrangements	6.1	Single and double reduction gearing systems are outlined
	6.2	Use of double helical involute gear teeth is explained
	6.3	Advantages and disadvantages of single and double locked tandem gearboxes are detailed
	6.4	Purpose of fitting a nodal drive in gearing system is clarified
	6.5	Construction and reason for installing flexible couplings in gearing system is explained

	6.6	Layout of a turbo-electric drive is detailed
7 Analyse flow of air and gas through a simple cycle marine gas turbine	7.1	Construction of compressor, combustion system and single and two shaft turbines is explained
	7.2	Necessary controls required for control and protection of plant are confirmed
	7.3	Accessories necessary for safe operation of simple cycle marine gas turbines are listed

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.

Accessories must include:

- accessory gear
- lube oil:
 - coolers
 - filters
 - pumps
- starting devices

Unit Mapping Information

This unit replaces and is equivalent to MARL6016A Demonstrate intermediate knowledge of marine steam turbines and main boilers.

MARL6016A replaces and is equivalent to TDMMR5807A Manage the operation, monitoring and evaluation of the performance of steam propulsion plant on vessels over 750 kW propulsion power.

Links

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

