



Australian Government

MARL004 Demonstrate basic knowledge of marine auxiliary machinery and equipment

Release: 1

MARL004 Demonstrate basic knowledge of marine auxiliary machinery and equipment

Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to operate and maintain auxiliary machinery and associated systems on board a commercial vessel.

This unit applies to people working in the maritime industry as a Marine Engineering Watchkeeper on commercial vessels greater than 750 kW or as an Engineer Class 3 Near Coastal.

This unit has links to legislative and certification requirements.

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 Outline layout of engine room and functions of auxiliary machinery in engine room	1.1	Layout of a typical engine room is outlined
	1.2	Types and functions of auxiliary machinery found in an engine room are explained
	1.3	Location, function and operation of all safety devices found on main and auxiliary machinery and within engine room, including shut downs and engine room escape routes is outlined
	1.4	Common operating pressures and temperatures of fluids within engine room are identified and how to respond to

		abnormal parameters is clarified
2	Explain duties and responsibilities of a watchkeeper engineer during a watch	2.1 Duties and responsibilities of a watchkeeper engineer with respect to safety of personnel and vessel during and taking over the watch are clarified 2.2 Importance of ensuring all events related to machinery are recorded in the log is explained 2.3 Duties and responsibilities of a watchkeeper engineer in prevention and extinction of fire in machinery spaces are clarified 2.4 Duties and responsibilities of a watchkeeper engineer in relation to prevention of flooding and avoidance of pollution are clarified 2.5 Routine duties and responsibilities of a watchkeeper engineer with respect to safe operation of propulsion and auxiliary machinery are clarified 2.6 Duties and responsibilities of a watchkeeper engineer on an unmanned machinery space (UMS) vessel are clarified 2.7 Procedure for familiarising oneself on joining a new vessel is clarified
3	Recognise key features, applications and treatment of fuels, lubricants and chemicals used on board vessels	3.1 Types, properties, applications and treatments of various fuels used on board vessels are outlined 3.2 Procedures to be followed before and during fuel bunkering are clarified 3.3 Types, properties, applications and treatments of various lubricants used on board vessels are outlined 3.4 Uses and safe handling methods for various types of chemicals used on board vessels are outlined 3.5 Fuel system layout including fuel treatment method is detailed 3.6 Working principle, construction and safe operation of purifiers and clarifiers is explained
4	Explain operation and maintenance of typical pumping systems used on	4.1 Basic working principles, components and properties of different types of pumps are outlined 4.2 Types of heat exchangers, their basic working principles and applications are outlined

board vessels	4.3	Correct operation and maintenance of pumps and heat exchangers is detailed
	4.4	Key features of bilge, cargo and ballast pumping systems are outlined
	4.5	Types, operating principles and requirements for oily-water separators or similar equipment are outlined
	4.6	Other approved methods of disposing of oily water are identified
	4.7	Procedure for completing oil record book is clarified
5 Explain operation and maintenance of marine air compressors	5.1	Types, characteristics, components and applications of various compressors used on board vessels are compared and contrasted
	5.2	Correct pre-operational checks, starting procedure, safe operation and basic maintenance required for air compressors are detailed
	5.3	Potential safety hazards associated with compressed air are identified
	5.4	Locations of all mountings, safety devices, alarms and shut downs on compressors, air receivers and compressed air systems are identified and their functions are outlined
	5.5	Different requirements and production methods for control air, method of production and special requirements for a breathing apparatus compressor, are clarified
6 Explain different types, safe operation and testing of steering gear commonly used on board vessels	6.1	Essential statutory regulations covering operation of steering gear are established
	6.2	Operation of different types of steering gear used on board vessels is clarified
	6.3	Working principle of variable delivery pumps used in steering gear is explained
	6.4	Location of all alarms and safety devices associated with steering gear is identified and their functions are outlined
	6.5	Process for testing steering gear and monitoring its performance is explained
7 Explain operation of	7.1	Why ‘fresh water’ may have to be produced from seawater is

an evaporator		explained
	7.2	Function, construction and operation of evaporators is explained
	7.3	Correct starting procedure, safe operation and basic maintenance required for an evaporator is clarified
	7.4	Process for testing the evaporator and monitoring performance is explained
	7.5	Treatment of distillate for domestic purposes is outlined
	7.6	Quality necessary if water being produced by a distiller is to be used for human consumption is outlined
8 Explain basic operation of marine refrigeration systems	8.1	Properties of an ideal refrigerant are listed
	8.2	Refrigerants commonly used on board are listed and reason for their use is clarified
	8.3	Basic construction and operation of a marine refrigeration system is explained
	8.4	Preparation, operation, fault detection and necessary actions to prevent damage in marine refrigeration systems is confirmed
	8.5	Personal safety and environmental hazards associated with CFCs and ozone depleting substances are identified
9 Explain basic operation of marine air-conditioning and ventilation systems	9.1	Basic construction and operation of marine air-conditioning and ventilation systems in routine and emergency situations is explained
	9.2	Preparation, operation, fault detection and necessary actions to prevent damage in marine air-conditioning and ventilation systems is confirmed
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 detailed
	10.3	Basic controls required for the control and protection of the plant are outlined
	10.4	Accessories necessary for safe operation are listed

11 Explain types, safe operation and maintenance of deck machinery

- 11.1 Types, basic construction and operation of deck machinery are outlined
- 11.2 Preparation, operation, fault detection and necessary actions to prevent damage in deck machinery is confirmed

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

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

Range of Conditions

Specifies different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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

Types of auxiliary machinery include one or more of the following:

- boiler
- compressors
- diesel generator
- evaporators
- pumps
- refrigerating installation
- separators

Functions of auxiliary machines include one or more of the following:

- applying main power of engines for propulsion and manoeuvring
- keeping ship dry and trimmed
- mooring ship and handling cargo
- providing for safety
- supplying domestic needs such as fresh water
- supplying needs of main engines and boilers
- supplying ship with electric power and lighting

Types of chemicals include one or more of the following:

- cleaning fluids
- fuel additives
- solvents

Types of pumps include one or more of the following:

- axial flow
- centrifugal
- gear
- reciprocating
- screw
- vane

Types of heat exchangers include one or more of the following:

- plate
- shell and tube

Features of bilge, cargo and ballast pumping systems include one or more of the following:

- safety fittings
- sensing devices
- types of valves

Compressors include one or more of the following:

- breathing apparatus compressor
- lubricated reciprocating air compressors
- non-lubricated reciprocating air compressors
- oil free air compressors
- rotary screw compressors

Types of steering gear include one or more of the following:

- electrical
- ram
- rotary vane
- oscillating steering

Steering gear includes one or more of the following:

- hunting gear
- telemotor

Accessories include one or more of the following:

- accessory gear
- lube oil coolers
- lube oil drive
- lube oil filter
- starting device

Deck machinery includes one or more of the following:

- accommodation ladders
- anchor winch
- cranes
- davits
- mooring winch

Unit Mapping Information

This is a new unit. This unit is equivalent to MARL5006A Demonstrate basic knowledge of marine auxiliary machinery and equipment.

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 MARL004 Demonstrate basic knowledge of marine auxiliary machinery and equipment

Modification History

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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 and performance criteria on at least one occasion and include:

- accessing information and sketching diagrams to interpret and explain testing requirements related to the operation of marine auxiliary machines
- assessing own work outcomes and maintaining knowledge of current codes, standards, regulations and industry practices
- explaining basic principles of marine auxiliary machines
- identifying and interpreting numerical and graphical information related to starting up and shutting down marine auxiliary machines on commercial vessels
- identifying and suggesting ways of rectifying faults and malfunctions in marine auxiliary machines on commercial vessels
- identifying methods, procedures and materials needed for operating, maintaining and repairing marine auxiliary machines on commercial vessels
- imparting knowledge and ideas through verbal, written and visual means
- providing accurate and reliable information
- providing appropriate level of detail in responses
- reading and interpreting written information related to the operation, performance and maintenance of marine auxiliary machines, including machinery specifications, machinery design drawings, machine drawings, operational manuals, specifications and electrical and control circuit diagrams.

Knowledge Evidence

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

- fuels and basic principles of fuel systems
- nature and causes of typical start up and shut down malfunctions of main and auxiliary machinery and associated systems, and available methods for their detection and rectification
- operational characteristics and performance specifications for different types of auxiliary machinery and associated systems usually found on a commercial vessel, including pumps, air compressors, steering gears, heat exchangers and evaporators
- principles and procedures of machinery lubrication

- procedures for carrying out start up and shut down of main and auxiliary machinery and associated systems to ensure compliance with company and survey requirements and regulations
- purpose and content of safety data sheets/material safety data sheets
- safety, environmental and hazard control precautions and procedures relevant to start up and shut down of marine auxiliary machinery and associated systems
- types of auxiliary machinery and components
- work health and safety (WHS)/occupational health and safety (OHS) legislation and policies.

Assessment Conditions

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

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions.

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.

Resources for assessment must include access to:

- tools, equipment, machinery, materials and personal protective equipment currently used in industry
- applicable documentation such as legislation, regulations, codes of practice, workplace procedures and operational manuals
- range of relevant exercises, case studies and/or simulations.

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