



Australian Government

MARL055 Demonstrate basic knowledge of marine auxiliary machinery and equipment

Release: 1

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Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package.

Application

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

This unit applies to people working in the maritime industry in the capacity of:

- Electro-Technical Officer (STCW Electro-Technical Officer Unlimited)
- Engineer Class 3 Near Coastal
- Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited).

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit.

- Regulatory requirements include STCW International Maritime Organization (IMO) model course competencies and areas of knowledge, understanding and proficiency, together with the estimated total hours required for lectures and practical exercises. Teaching staff should note that timings are suggestions only and should be adapted to suit individual groups of trainees depending on their experience, ability, equipment and staff available for training.

Near Coastal Qualifications:

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Engineer Class 3 Near Coastal as defined in the Marine Order 505 (Certificates of competency - National Law) 2013.

Blue Waters Qualifications:

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Electro-Technical Officer (STCW Electro-Technical Officer Unlimited) or Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited) and to meet regulatory requirements this unit must be delivered consistent with Marine Orders and with the relevant sections of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

Pre-requisite Unit

Not applicable.

Competency Field

L - Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

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 shutdowns and engine room escape routes are 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 an Engineer Watchkeeper during a watch	2.1	Duties and responsibilities of an Engineer Watchkeeper 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 an Engineer Watchkeeper in prevention and extinction of fire in machinery spaces are clarified
		2.4	Duties and responsibilities of an Engineer Watchkeeper in relation to prevention of flooding and avoidance of pollution are clarified
		2.5	Routine duties and responsibilities of an Engineer Watchkeeper with respect to safe operation of propulsion and auxiliary machinery are clarified
		2.6	Duties and responsibilities of an Engineer Watchkeeper 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 onboard vessels	3.1	Types, properties, applications and treatments of various fuels used onboard 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 onboard vessels are outlined
		3.4	Uses and safe handling methods for various types of chemicals used onboard vessels are outlined
		3.5	Fuel system layout, including fuel treatment method, is detailed
		3.6	Working principles, construction and safe operation of purifiers and clarifiers are explained
4	Explain operation and maintenance of typical pumping systems used onboard vessels	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
		4.3	Correct operation and maintenance of pumps and heat exchangers are 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 onboard vessels are compared and contrasted
		5.2	Correct pre-operational checks, starting procedures, 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 shutdowns 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 onboard vessels	6.1	Essential statutory regulations covering operation of steering gear are established
		6.2	Operation of different types of steering gear used onboard

			vessels is clarified
		6.3	Working principles of variable delivery pumps used in steering gear are 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 an evaporator	7.1	Why freshwater may have to be produced from seawater is explained
		7.2	Function, construction and operation of evaporators is explained
		7.3	Correct starting procedures, safe operation and basic maintenance required for an evaporator are 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 onboard are listed and reasons for their use are

			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 are confirmed
		8.5	Personal safety and environmental hazards associated with chlorofluorocarbons (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 are explained
		9.2	Preparation, operation, fault detection and necessary actions to prevent damage in marine air conditioning and ventilation systems are 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	Types, basic construction and operation of deck machinery are outlined, and 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 are confirmed

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.

Unit Mapping Information

This unit replaces and is equivalent to MARL004 Demonstrate basic knowledge of marine auxiliary machinery and equipment.

Links

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

Assessment Requirements for MARL055 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
- calculating to show air can be treated as an ideal gas
- 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:

- accessories, including:
 - accessory gear
 - lube oil coolers
 - lube oil drive
 - lube oil filter
 - starting device
- basic principles of marine auxiliary machines, including:

- 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 freshwater
- supplying needs of main engines and boilers
- supplying ship with electric power and lighting
- compressors, including:
 - breathing apparatus compressor
 - lubricated reciprocating air compressors
 - non-lubricated reciprocating air compressors
 - oil-free air compressors
 - rotary screw compressors
- deck machinery, including:
 - accommodation ladders
 - anchor winch
 - cranes
 - davits
 - mooring winch
- features of bilge, cargo and ballast pumping systems, including:
 - safety fittings
 - sensing devices
 - types of valves
- fuels and basic principles of fuel systems
- nature and causes of typical start-up and shutdown 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:
 - air compressors
 - evaporators
 - heat exchangers
 - pumps
 - steering gears
- principles and procedures of machinery lubrication
- procedures for carrying out start-up and shutdown 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 (SDS)/material safety data sheets (MSDS)
- safety, environmental and hazard control precautions and procedures relevant to start-up and shutdown of marine auxiliary machinery and associated systems
- steering gear, including:

- hunting gear
- telemotor
- types of chemicals, including:
 - cleaning fluids
 - fuel additives
 - solvents
- types of heat exchangers, including:
 - plate
 - shell and tube
- types of steering gear, including:
 - electrical
 - ram
 - rotary vane
 - oscillating steering
- types of auxiliary machinery and components, including:
 - boiler
 - compressors
 - diesel generator
 - evaporators
 - pumps
 - purifiers and fuel oil treatment
 - refrigerating installation
 - thermal fluid heating systems
- types of pumps, including:
 - axial flow
 - centrifugal
 - gear
 - reciprocating
 - screw
 - vane
- work health and safety (WHS)/occupational health and safety (OHS) legislation and policies.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

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.

Practical assessment must occur in a workplace, or realistic simulated workplace, under the normal range of workplace conditions.

Simulations and scenarios may be used where situations cannot be provided in the workplace or may occur only rarely, in particular for situations relating to emergency procedures and adverse weather conditions where assessment would be unsafe, impractical or may lead to environmental damage.

Resources for assessment must include access to:

- applicable documentation, such as legislation, regulations, codes of practice, workplace procedures and operational manuals
- tools, equipment, machinery, materials and relevant personal protective equipment (PPE) currently used in industry.

Links

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<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2>