



Australian Government

MARL022 Demonstrate basic knowledge of ship construction

Release: 1

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Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to explain the basic principles of ship construction.

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 Outline size, shape and structural components of vessels	1.1	Correct terms to describe size and shape of vessels are used
	1.2	Correct terms to describe structural components of vessels are used
	1.3	Correct terms to describe size or cargo carrying capacity of vessels are used
	1.4	Online and other sources of information on size, shape and structural components of vessels are accessed
2 Explain static and dynamic forces and	2.1	Correct terms to describe effects of forces exerted on hull are used

moments exerted on hull of a vessel	2.2	Various forces acting on the vessel are analysed
	2.3	Stresses on various components of the hull are compared as a result of these forces
	2.4	Typical weight, load, shear force curves and bending moment diagram are sketched
3 Explain how vessel structure is designed to resist distortion	3.1	Scantlings are defined
	3.2	Classification society rules for determining scantling sizes are identified
	3.3	Main strength members of vessel hull are identified
	3.4	Importance of maintaining integrity of principal strength members is explained
4 Identify materials used in hull construction	4.1	Types of materials used in hull construction are identified
	4.2	Properties of high tensile steel are defined
	4.3	Types of steel used in hull construction are identified
	4.4	Use of forged, rolled and cast components in hull construction is explained
5 Explain methods of joining shipbuilding materials	5.1	Different methods and applications of welding used in shipbuilding and repair are outlined
	5.2	How materials are joined so that the strength of components is not impaired is confirmed
	5.3	Different methods used to connect aluminium to steel are outlined
6 Explain bottom structure, forepeak and afterpeak of vessels	6.1	Differentiation is made between different types of keel construction
	6.2	Advantages and disadvantage of duct keel in relation to ship strength are explained
	6.3	How safe access to the duct keel is obtained, is outlined
	6.4	Longitudinally framed double bottom construction is distinguished from a transversely framed double bottom construction
	6.5	Differentiation is made between bracket floors and plate floors

- 6.6 Structural requirements for supporting different types of main engines are outlined
- 6.7 Classification society rules for construction of forepeak and afterpeak sections are explained
- 7 **Explain deck and frame construction**
 - 7.1 Longitudinal, transverse and combined framing are compared and contrasted in relation to ship strength
 - 7.2 Position, purpose and construction of a deep frame are explained
 - 7.3 Transition methods from one frame type to another are outlined
 - 7.4 How the strength of frames is maintained when connecting to deck beams and other strength members is explained
 - 7.5 How stress raisers are reduced around hatchways, door openings, forecastle, bridge structure, watertight doors and gastight doors is explained
 - 7.6 Bilge keels structure with particular reference to fitment to hull is outlined and purpose for this type of fitting is explained
 - 7.7 Classification requirements and restrictions of sheer strake, keel strake and garboard strake are examined
 - 7.8 Requirements for use of suction and discharge valves and fittings in the shell above and below the waterline are outlined
 - 7.9 Strength members required for deck machinery are outlined
- 8 **Explain construction of watertight bulkheads**
 - 8.1 Purpose of bulkheads is stated
 - 8.2 Minimum number of bulkheads and their locations are determined
 - 8.3 Bulkhead is sketched showing construction and attachment to hull
 - 8.4 Purpose, construction and location of collision bulkheads is outlined
 - 8.5 Test procedures for bulkheads are clarified
 - 8.6 How strength is maintained in openings is explained

	8.7	Requirements for penetration of collision bulkhead are stated
	8.8	Situations in which non-watertight bulkheads are fitted are identified
9 Explain bow and stern forces	9.1	Differentiation is made between panting and pounding forces
	9.2	How forepeak sections are strengthened to resist panting and pounding forces is explained
	9.3	Anchor and cable arrangements in forepeak tank are explained
	9.4	Strength members in afterpeak sections are outlined
	9.5	Different rudder support arrangements are clarified
10 Outline vessel ventilation systems	10.1	Different types of ventilation systems are clarified
	10.2	Why ventilator cowls are required is explained
11 Explain damage criteria	11.1	How unsymmetrical flooding is minimised is explained
	11.2	Damage control measures are outlined
	11.3	How damage criteria are applied is explained
12 Explain use of stabilisers to reduce effect of rolling	12.1	Use of stabilisers is explained
	12.2	Bilge keels and fin type stabilisers are compared and contrasted
	12.3	How stabilisers are attached to the hull is explained
	12.4	Hull stiffening requirements for fin and bilge keel types is explained
13 Explain weather tight and watertight integrity	13.1	Weather tight integrity is distinguished from watertight integrity
	13.2	How the position of load line is determined is explained
	13.3	Design criteria imposed by Conditions of Assignment of Load Lines is explained
	13.4	How watertight integrity of weather deck is maintained and tested is explained
	13.5	Different types of tank air vents and their closing devices are compared and contrasted

- 14 Outline processes involved in painting a vessel**
- 14.1 Surface preparation required prior to painting steel is outlined
 - 14.2 Hazards and safety measures to be taken during surface preparations are identified
 - 14.3 Properties of paints required for different areas of vessels are specified
 - 14.4 Procedures required for successful application of paints are clarified
 - 14.5 Precautions required when handling and applying paint are examined
 - 14.6 Action of self-polishing and non-polishing anti fouling paints is compared and outcomes documented
 - 14.7 Reasons for using cathodic protection systems are clarified

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.

Terms to describe size and shape of vessels include one or more of the following:

- breadth
- camber
- draught
- flare
- length
- rake
- rise of floor
- sheer

Terms to describe size or cargo carrying capacity of vessels include one or more of the following:

- deadweight
- gross register tonnage
- gross tonnage
- net register tonnage

- net tonnage
- Terms to describe effects of forces exerted on hull include one or more of the following:
 - hogging
 - racking
 - sagging
 - still water bending moment
- Openings include one or more of the following:
 - cables
 - piping
 - trunking
 - watertight door
- Surface preparation includes one or more of the following:
 - degreasing
 - sand blasting
 - shot blasting
 - ultra high pressure water jetting
 - wet blasting
- Areas include one or more of the following:
 - ballast tanks
 - cargo tanks
 - freshwater tanks
 - superstructures
 - underwater areas
 - weather decks

Unit Mapping Information

This unit replaces and is equivalent to MARL6009A Demonstrate basic knowledge of ship construction.

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 MARL022 Demonstrate basic knowledge of ship construction

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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 online information on ship construction
- 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 determining appropriate ways of responding to problems associated with ship construction
- identifying relevant methods and procedures such as procedures for painting commercial vessels
- identifying, interpreting and processing numerical and graphical information related to ship construction
- imparting knowledge and ideas through verbal, written and visual means
- providing accurate and reliable information and appropriate level of detail
- reading and interpreting technical guides, manuals and information relevant to ship construction.

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:

- bottom structure and the forepeak and afterpeak of vessels
- bow and stern forces
- basic concepts of ship construction
- construction of watertight bulkheads
- damage criteria
- deck and frame construction
- materials used in the construction of ship hull
- methods of joining shipbuilding materials

- processes involved in painting a vessel
- stabilisers to reduce the effect of rolling
- static and dynamic forces and moments exerted on hull of vessel
- terms used to describe size, shape and structural components of vessels
- types of ships and key features of ships
- vessel ventilation systems
- watertight integrity
- weather tight integrity
- WHS/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 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 basic knowledge of ship construction can be demonstrated.

Resources for assessment include access to:

- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals
- appropriate range of relevant operational situations in the workplace
- technical reference library with current publications on commercial shipping
- 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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