



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

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| | 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>