



Australian Government

MARL6009A Demonstrate basic knowledge of ship construction

Release 1

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Modification History

Release 1

This is the first release of this unit.

Unit Descriptor

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

Application of the Unit

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).

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

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|--|---|
| 1 Outline size, shape and structural components of vessels | <ul style="list-style-type: none">1.1 Correct <i>terms to describe size and shape of vessels</i> are used1.2 Correct terms to describe structural components of vessels are used1.3 Correct <i>terms to describe size or cargo carrying capacity of vessels</i> are used1.4 Online and other sources of information on size, shape and structural components of vessels are accessed |
| 2 Explain static and dynamic forces and moments exerted on hull of a vessel | <ul style="list-style-type: none">2.1 Correct <i>terms to describe effects of forces exerted on hull</i> are used2.2 Various forces acting on the vessel are analysed2.3 Stresses on various components of the hull are compared as a result of these forces2.4 Typical weight, load, shear force curves and bending moment diagram are sketched |
| 3 Explain how vessel structure is designed to resist distortion | <ul style="list-style-type: none">3.1 Scantlings are defined3.2 Classification society rules for determining scantling sizes are identified3.3 Main strength members of vessel hull are identified3.4 Importance of maintaining integrity of principal strength members is explained |
| 4 Identify materials used in hull construction | <ul style="list-style-type: none">4.1 Types of materials used in hull construction are identified4.2 Properties of high tensile steel are defined4.3 Types of steel used in hull construction are identified4.4 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 Loadlines 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
- 14.7 Reasons for using cathodic protection systems are clarified

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required Skills:

- Access online information on ship construction
- Assess own work outcomes and maintain knowledge of current codes, standards, regulations and industry practices
- Explain basic concepts of ship construction
- Identify and determine appropriate ways of responding to problems associated with ship construction
- Identify relevant methods and procedures such as procedures for painting commercial vessels
- Identify, interpret and process numerical and graphical information related to ship construction
- Impart part knowledge and ideas through verbal, written and visual means
- Read and interpret technical guides, manuals and information relevant to ship construction

Required Knowledge:

- Bottom structure and the forepeak and afterpeak of vessels
- Bow and stern forces
- 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
- Work health and safety (WHS)/occupational health and safety (OHS) legislation and policies

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, the required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the Elements, Performance Criteria, Required Skills, Required Knowledge and include:

- providing accurate and reliable information
- providing appropriate level of detail in responses.

Context of and specific resources for assessment

Performance is demonstrated consistently over time and in a suitable range of contexts.

Resources for assessment include access to:

- industry-approved marine operations site where basic knowledge of ship construction can be demonstrated
- technical reference library with current publications on commercial shipping
- tools, equipment and personal protective equipment currently used in industry
- relevant regulatory and equipment documentation that impacts on work activities
- range of relevant exercises, case studies and/or other simulated practical and knowledge assessments
- appropriate range of relevant operational situations in the workplace.

In both real and simulated environments, access is required to:

- relevant and appropriate materials and equipment
- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals.

Method of assessment

Practical assessment must occur in an:

- appropriately simulated workplace environment and/or
- appropriate range of situations in the workplace.

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate to this unit:

- direct observation of the candidate demonstrating basic knowledge of ship construction
- direct observation of the candidate applying relevant WHS/OHS requirements and work practices.

Guidance information for

Holistic assessment with other units relevant to the industry

assessment

sector, workplace and job role is recommended.

In all cases where practical assessment is used it should be combined with targeted questioning to assess Required Knowledge.

Assessment processes and techniques must be appropriate to the language and literacy requirements of the work being performed and the capacity of the candidate.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below.

Terms to describe size and shape of vessels may include:

- Breadth
- Camber
- Draught
- Flare
- Length
- Rake
- Rise of floor
- Sheer

Terms to describe size or cargo carrying capacity of vessels may include:

- Deadweight
- Gross register tonnage
- Gross tonnage
- Net register tonnage
- Net tonnage

Terms to describe effects of forces exerted on hull may include:

- Hogging
- Racking
- Sagging
- Still water bending moment

Openings may include:

- Cables
- Piping
- Trunking
- Watertight door

Surface preparation may include:

- Degreasing
- Sand blasting
- Shot blasting
- Ultra high pressure water jetting
- Wet blasting

Areas may include:

- Ballast tanks
- Cargo tanks
- Freshwater tanks
- Superstructures
- Underwater areas
- Weatherdecks

Unit Sector(s)

Not applicable.

Competency Field

Marine Engineering