



**Australian Government**

# **MARL6010A Demonstrate basic knowledge of ship operation and maintenance**

**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 ensure that vessels comply with regulatory and survey requirements as well as maintenance and repair procedures associated with satisfying maintenance of Class.

## **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

### 1 Identify regulatory environment for shipping operations

- 1.1 Function of the International Maritime Organisation (IMO) is outlined, how recommendations are adopted through maritime legislation is explained and areas of exemption for local and international shipping are identified
- 1.2 **International maritime law** embodied in international agreements and conventions is identified
- 1.3 Application of the International Labour Organization (ILO) Convention to dockyard and shipboard practices is explained
- 1.4 Flag State responsibilities are explained
- 1.5 Purpose of the Navigation Act, Marine Notices, Marine Orders, Port State Control and other methods of implementing international agreements and conventions is clarified
- 1.6 Purpose of insurance underwriters and Protection and Indemnity (P & I) Clubs is clarified
- 1.7 Function of Classification Societies and their involvement with Flag States with Memorandum of Agreement is outlined
- 1.8 ISM Code is applied to ship operation and maintenance
- 1.9 Requirement for crew training for emergency response, administration, operation and maintenance to STCW requirements is explained

### 2 Prepare for surveys

- 2.1 **Areas covered by classification surveys** are identified
- 2.2 Reasons for class withdrawal are clarified and condition of class are explained
- 2.3 Continuous, alternative and special surveys, terms of survey and survey frequency are outlined

- 2.4 Differentiation is made between planned maintenance and condition monitoring for machinery
- 2.5 Safe practices for preparing compartments for survey, including pressure testing are identified
- 2.6 Tail shaft surveys are outlined and planned
- 2.7 Pressure vessels and boiler surveys outlined and planned
- 2.8 Machinery and hull layup methods are specified

### **3 Explain survey requirements**

- 3.1 Statutory survey requirements for convention and non-convention vessels are identified
- 3.2 Documentation and records essential for compliance with statutory surveys, legislation and measures are identified to ensure protection of the marine environment and safety of life at sea
- 3.3 Load line measurements and freeboard assignment are explained
- 3.4 Conditions of freeboard assignment, tests, common faults and repairs are identified
- 3.5 Maintenance and repair responsibilities are identified to satisfy safety construction surveys
- 3.6 Common defects, tests and preparations are identified to satisfy safety equipment surveys
- 3.7 MARPOL survey requirements, including precautions to be taken to prevent pollution of the marine environment are clarified and how compliance with MARPOL is fully observed is explained
- 3.8 Survey requirements for safety radio, tanker certificates of fitness, passenger ship and safety certificate are clarified
- 3.9 Port State Control is explained
- 3.10 Substandard ship and factors causing ship

- detention are identified
- 4 Assess influences on vessel stability**
- 4.1 Basic theories and factors affecting trim and stability as well as measures necessary to preserve trim and stability are explained
  - 4.2 IMO recommendations concerning ship stability are identified
  - 4.3 Influences causing change of centre of gravity are explained and action to be taken in the event of partial loss of intact buoyancy, free surface and Angle of Loll is specified
  - 4.4 Consequences of cargo movement, including bulk and deck cargo is outlined
  - 4.5 Stability documentation required for different ship types to satisfy survival of life at sea (SOLAS) is identified
  - 4.6 Intact and damage stability criteria are explained
  - 4.7 Damage control procedures and assessment following collision or grounding are specified to ensure watertight integrity of a ship is according to accepted practice
  - 4.8 Stability requirements for routine dry-docking are identified
- 5 Outline procedures for maintenance and repairs of hull, pumping systems, propellers, machinery and other items satisfying maintenance of Class**
- 5.1 Properties and repair techniques are identified for ordinary and high tensile hull grades of steel including underwater repair work
  - 5.2 Means of ***minimising and controlling both internal and external hull corrosion*** are identified
  - 5.3 Repair techniques for various propeller materials are outlined
  - 5.4 Drainage arrangements and connections to ***other systems of spaces outside the engine room*** are explained
  - 5.5 Ballast main connections to fore and after peak tanks are outlined and procedure for filling and

- emptying tanks is clarified
- 5.6 Means of testing performance of ***shipboard pumping systems*** is identified
  - 5.7 Common faults and ways of assessing condition of shipboard pumping systems are determined
  - 5.8 Machinery condition monitoring and planned maintenance systems are identified
  - 5.9 Hull life extension surveys and enhanced survey requirements for tankers and bulkships are outlined
- 6 Explain function of IMDG Code**
- 6.1 IMDG Code is applied to prepare action plans for emergency situations
  - 6.2 Common hazards of shipboard enclosed spaces are identified and suitable strategies, including compartment re-entry, following extinction of fire, are planned
  - 6.3 Methods of testing enclosed space atmospheres are identified and limits of exposure to common hazards confirmed
  - 6.4 Requirements of ordering and taking bunkers as well as discharging to shore side reception facilities, are specified
- 7 Outline dry-dock and in-water bottom survey responsibilities of engineering staff**
- 7.1 Procedures for planning and implementing dry-docking and in-water bottom surveys are clarified
  - 7.2 Responsibilities for engineering personnel associated with planning and implementing dry-docking and in-water bottom surveys are detailed
  - 7.3 Dry-dock and in-water hull cleaning methods are compared and contrasted
  - 7.4 Dry-dock refloating criteria and responsibilities of engineering staff are outlined
  - 7.5 Preservation and maintenance requirements for extended layup of vessel, and inspection and

- tests required on reactivation are outlined
- 8 Outline maintenance, repair and safe working practices associated with lifting and life saving equipment**
- 8.1 Safe working practices applicable to cranes, chain blocks, items of loose gear and other lifting equipment are identified
  - 8.2 Safety and protective devices used in conjunction with lifting gear are identified
  - 8.3 Means of testing and adjusting lifting gear are confirmed
  - 8.4 Legislative and regulatory requirements for inspection, storage and maintenance of lifting gear are outlined
  - 8.5 Purposes and procedures involved in annual and quadrennial surveys of cargo gear are clarified
  - 8.6 Procedures for SWL and proof load tests, including lifeboat launching gear are clarified
  - 8.7 Safe working practices applicable to rigging and lifting **heavy items** during maintenance and repair are identified
  - 8.8 Installation, operation, maintenance of lifesaving appliances and launching equipment is outlined
  - 8.9 Safety and protective devices associated with lifesaving appliances and launching equipment are confirmed
- 9 Outline operation of an inert gas system for a tanker**
- 9.1 Construction, operation and maintenance of individual components of inert gas system (IGS) are explained
  - 9.2 Mandatory controls, alarms and cut-outs are identified
- 10 Apply leadership and management skills**
- 10.1 Shipboard personnel management and training requirements are explained in relation to engineering operations
  - 10.2 Procedures for managing personal and crew workload in relation to marine engineering functions are clarified

- 10.3 Effectiveness of resource management in relation to engineering functions is assessed
- 10.4 Decision-making techniques appropriate to engineering functions are explained
- 10.5 Processes for developing, implementing and maintaining standard operating procedures relevant to marine engineering functions are explained

## Required Skills and Knowledge

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

### Required Skills:

- Access information required to undertake duties in routine and emergency situations
- Assess own work outcomes and maintain knowledge of current codes, standards, regulations and industry practices
- Explain concepts of ship operation and maintenance
- Identify and determine appropriate ways of responding to malfunctions and emergency situations in daily operations
- Identify methods and procedures needed to implement dry-docking and other duties on commercial vessels
- Identify, interpret and process numerical and graphical information required to undertake duties in routine and emergency situations
- Impart knowledge and ideas through verbal, written and visual means
- Read and interpret written instructions, procedures and information relevant to duties of a Marine Engineer Class 2

### Required Knowledge:

- Centre of gravity
- Classification societies
- Dry-dock and in-water bottom surveys
- Enclosed spaces
- Flag State responsibilities
- IMDG code
- Inert gas system for tankers
- Key international and Australian standards relating to shipping
- Key shipping authorities and organisations
- Leadership and management techniques
- Maintenance and repairs of lifting and life saving equipment
- Maintenance and repairs of hull, pumping systems, propellers, machinery and other items satisfying maintenance of class
- Maintenance, repair and safe working practices associated with lifting and life saving equipment
- Maritime communication techniques
- Port State Control
- Regulatory environment for shipping operations
- SOLAS

- Survey requirements
- Types of ships and key features of ships
- Vessel stability
- 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:

- ensuring currency of relevant legislative and regulatory knowledge
- 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 operation and maintenance can be demonstrated
- technical reference library with current publications on ship operation and maintenance
- 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 operation and maintenance
- direct observation of the candidate applying relevant WHS/OHS requirements and work practices.

### **Guidance information for assessment**

Holistic assessment with other units relevant to the industry 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.

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International maritime law may include:                                           | <ul style="list-style-type: none"><li>• ASM Code</li><li>• Certificates and other documents to be carried on board ships by international conventions</li><li>• International Convention for the Prevention of Pollution from Ships</li><li>• International Convention for the Safety of Life at Sea 1974</li><li>• International Convention on Load Lines 1966</li><li>• International Health Regulations</li><li>• international instruments affecting safety of ships, passengers, crew or cargo</li><li>• STCW</li></ul> |
| Areas covered by classification surveys may include:                              | <ul style="list-style-type: none"><li>• Automation</li><li>• Boilers/pressure vessels</li><li>• Cargo gear</li><li>• Hull</li><li>• Machinery</li><li>• Specific notations</li><li>• Tail shaft</li></ul>                                                                                                                                                                                                                                                                                                                    |
| Minimising and controlling both internal and external hull corrosion may include: | <ul style="list-style-type: none"><li>• Cathodic protection</li><li>• Coating systems</li><li>• Surface preparation techniques</li></ul>                                                                                                                                                                                                                                                                                                                                                                                     |
| Other systems of spaces outside the engine room may include:                      | <ul style="list-style-type: none"><li>• Holds</li><li>• Pump rooms</li><li>• Spaces forward of the collision bulkhead</li></ul>                                                                                                                                                                                                                                                                                                                                                                                              |
| Shipboard pumping systems may include:                                            | <ul style="list-style-type: none"><li>• Ballast systems</li><li>• Bilge systems</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Heavy items may include:                                                          | <ul style="list-style-type: none"><li>• Hatches</li><li>• Stern doors</li><li>• Other large movable structures</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                     |

## Unit Sector(s)

Not applicable.

## **Competency Field**

Marine Engineering