



**Australian Government**

# **MARA6001A Manage stability of a vessel 500 gross tonnage or more**

**Release 1**

# **MARAF001A Manage stability of a vessel 500 gross tonnage or more**

## **Modification History**

Release 1

This is the first release of this unit.

This unit replaces and is equivalent to TDMMA1007B Control trim, stability and stress.

## **Unit Descriptor**

This unit involves the skills and knowledge required to control trim, stability and stress within safe limits at all times on a vessel 500 gross tonnage or more.

## **Application of the Unit**

This unit applies to people working in the maritime industry as a Master Unlimited.

## **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

- |   |   |
|---|---|
| <b>1 Manage vessel trim under normal operating conditions</b> | <p>1.1 Stability analysis and weight distribution planning are conducted at a time frequency and scope appropriate to the proposed nature of the voyage and vessel operation</p> <p>1.2 Weight distribution is arranged to maintain vessel within acceptable stability limits for the anticipated operational situations likely to be experienced during the voyage</p> <p>1.3 <i>Calculations</i> are made to determine the draught and centre of gravity of vessel after adding, removing or shifting weight</p> <p>1.4 Factors affecting the stability and trim of vessel are identified and allowances are made in calculations</p> <p>1.5 Trim, draughts and list of vessel are controlled as required to ensure they are suitable to progress all anticipated vessel operations</p> |
| <b>2 Control vessel stability when compartment is flooded</b> | <p>2.1 <i>Damage to vessel and nature of flooding</i> of compartments is assessed</p> <p>2.2 Effect upon vessel stability of flooded and flooding compartments is evaluated</p> <p>2.3 <i>Suitable strategy</i> for maintaining or restoring trim and stability is devised</p> <p>2.4 Where stress limits of the vessel are exceeded as a consequence of damage and/or flooding, appropriate action is initiated to ensure safety of personnel, including where necessary abandoning the vessel</p>   |
| <b>3 Manage stress conditions of the vessel</b>               | <p>3.1 Stress levels of the vessel are assessed according to manufacturer specifications</p> <p>3.2 Stability of the vessel is monitored at a frequency and scope relevant to vessel operations and is sufficient to enable stress and stability to be maintained within acceptable limits at all times</p> <p>3.3 Appropriate action is taken where weight distribution has or could exceed acceptable safety limits</p>   |
| <b>4 Maintain records of stability management</b>             | <p>4.1 <i>Data and information</i> related to stability management is accurately recorded</p> <p>4.2 Data and information related to stability management is filed and stored according to organisational procedures</p>  |

## Required Skills and Knowledge

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

### Required Skills:

- Apply IMO recommendations concerning vessel stability
- Determine stability and trim requirements for docking or slipping the vessel
- Determine the effect on trim and stability of vessel in the event of damage to and consequent flooding of a compartment, and countermeasures to be taken
- Interpret and apply information on the fundamental principles of vessel construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability
- Maintain stability and stress conditions within safe limits at all times
- Use automatic data-based equipment

### Required Knowledge:

- Causes and repercussions of a heeling vessel
- Effects of density of sea water on the draught and freeboard of a vessel
- Features of the load-line and draught marks of a vessel and procedures for carrying out related calculations
- Fundamental principles of ship construction and the theories and factors that impact on trim and stability, and measures necessary to preserve trim and stability
- IMO recommendations concerning vessel stability
- Levelling arrangements for damaged side compartments
- Principles of synchronous rolling and methods for its control
- Principle stresses that act on the structure of a vessel, including panting and pounding
- Procedures for calculating the required load distribution to achieve the desired trim
- Typical problems related to the control of trim and stability for vessels of 500 gross tonnage and more
- Work health and safety (WHS)/occupational health and safety (OHS) requirements and work practices

## 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:

- attention to appropriate level of detail in recordkeeping
- producing accurate and reliable documentation.

### **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 or simulation where managing stability of a vessel of 500 gross tonnage or more may be demonstrated
- 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 managing stability of a vessel of 500 gross tonnage or more
- 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.

- |                                 |   |
|---------------------------------|---|
| Calculations must include:      | <ul style="list-style-type: none"> <li>• Calculating required load distribution to achieve desired trim</li> <li>• Calculations for change of draught, trim and heel when entering different water densities and to bilging of compartments</li> <li>• Centre of gravity of a vessel using an inclining experiment and effect of suspended weights</li> <li>• Changes to draught, trim and heel due to adding or removing fuel, ballast or cargo</li> <li>• Determining required correction for height of centre of gravity (kg) for free surface effect</li> <li>• Determining values of righting lever and construction of righting lever curves</li> <li>• Displacement, wetted surface, form coefficients, tonne per centimetre immersion, application of Simpson's rules to first and second moments of area, centroids and centres of pressure</li> <li>• Effect on stability of dry docking and grounding</li> <li>• Hydrostatic stability of a vessel</li> <li>• Moment of statical stability at small angles of heel</li> <li>• Transverse and longitudinal stability using hydrostatic data</li> <li>• Vessel centre of gravity, centre of buoyancy and metacentre</li> </ul> |
| Factors may include:            | <ul style="list-style-type: none"> <li>• Dry docking</li> <li>• Excessive trim</li> <li>• Free surface of a liquid</li> <li>• Grounding</li> <li>• Handling of heavy weights</li> <li>• Large swell conditions</li> <li>• Shift of cargo</li> <li>• Wind heel</li> </ul>  |
| Damage to vessel may include:   | <ul style="list-style-type: none"> <li>• Damage caused by incorrectly lashed or secured cargo</li> <li>• Damage caused by incorrectly stowed cargo</li> <li>• Damage to cargo handling equipment by exceeding safe working limits</li> </ul>  |
| Nature of flooding may include: | <ul style="list-style-type: none"> <li>• Flooding due to collision or grounding</li> <li>• Ingress of sea water through hatch covers</li> </ul>   |
| Suitable strategy may include:  | <ul style="list-style-type: none"> <li>• Addition of ballast</li> <li>• Temporary damage repairs</li> </ul>   |
| Data and information may        | <ul style="list-style-type: none"> <li>• Cargo handling equipment</li> <li>• Instructions of relevant maritime authorities</li> </ul>   |

include:

- Manufacturer instructions and procedures
- Organisational cargo handling procedures
- Relevant Australian and international standards and regulatory requirements
- Relevant WHS/OHS legislation
- Vessel and shore safety checklists
- Vessel Cargo Securing Manual
- Vessel log
- Vessel Register of Materials Handling Equipment

### **Unit Sector(s)**

Not applicable.

### **Competency Field**

Handling cargo and vessel stability