



Australian Government

MARA009 Manage stability of a vessel 500 gross tonnage or more

Release: 1

MARA009 Manage stability of a vessel 500 gross tonnage or more

Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package Release 3.0.

Application

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.

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

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Not applicable.

Competency Field

A – Handling cargo and vessel stability

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Manage vessel trim under normal operating conditions

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 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
- 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
- 1.3 Calculations are made to determine the draught and centre of gravity of vessel after adding, removing or shifting weight

- 1.4 Factors affecting the stability and trim of vessel are identified and allowances are made in calculations
- 1.5 Trim, draughts and list of vessel are controlled as required to ensure they are suitable to progress all anticipated vessel operations
- 2 Control vessel stability when compartment is flooded**
 - 2.1 Damage to vessel and nature of flooding of compartments is assessed
 - 2.2 Effect upon vessel stability of flooded and flooding compartments is evaluated
 - 2.3 Suitable strategy for maintaining or restoring trim and stability is devised
 - 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 abandoning the vessel as required
- 3 Manage stress conditions of the vessel**
 - 3.1 Stress levels of the vessel are assessed according to manufacturer specifications
 - 3.2 Stability of the vessel is monitored at a frequency and scope relevant to vessel operations, sufficient to enable stress and stability to be maintained within acceptable limits at all times
 - 3.3 Appropriate action is taken where weight distribution has or could exceed acceptable safety limits
- 4 Maintain records of stability management**
 - 4.1 Data and information related to stability management is accurately recorded
 - 4.2 Data and information related to stability management is filed and stored according to organisational procedures

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.

Calculations include:	• calculating required load distribution to achieve desired trim • calculations for change of draught, trim and heel when entering different water densities and to bilging of compartments • centre of gravity of a vessel using an inclining experiment and effect of suspended weights • changes to draught, trim and heel due to adding or removing fuel, ballast or cargo • determining required correction for height of centre of gravity (kg) for free surface effect • determining values of righting lever and construction of righting lever curves • 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 • effect on stability of dry docking and grounding • hydrostatic stability of a vessel • moment of statistical stability at small angles of heel • shear force and bending moment calculations • transverse and longitudinal stability using hydrostatic data • vessel centre of gravity, centre of buoyancy and metacentre
Factors include one or more of the following:	• dry docking • excessive trim • free surface of a liquid • grounding • handling of heavy weights • large swell conditions • shift of cargo • wind heel
Damage to vessel includes one or more of the following:	• damage caused by incorrectly lashed or secured cargo • damage caused by incorrectly stowed cargo • damage to cargo handling equipment by exceeding safe working limits
Nature of flooding includes one or more of the following:	• flooding due to collision or grounding • ingress of sea water through hatch covers
Suitable strategy includes one of the following:	• addition of ballast • temporary damage repairs

Data and information includes one or more of the following:

- cargo handling equipment
- instructions of relevant maritime authorities
- manufacturer instructions and procedures
- organisational cargo handling procedures
- relevant Australian and international standards and regulatory requirements
- relevant work health and safety (WHS)/occupational health and safety (OHS) legislation
- vessel and shore safety checklists
- vessel Cargo Securing Manual
- vessel log
- vessel Register of Materials Handling Equipment

Unit Mapping Information

This unit replaces and is equivalent to MARA6001A Manage stability of a vessel 500 gross tonnage or more.

MARA6001A replaces and is equivalent to TDMMA1007B Control trim, stability and stress.

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 MARA009 Manage stability of a vessel 500 gross tonnage or more

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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:

- applying International Maritime Organization (IMO) recommendations concerning vessel stability
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements and work practices
- attending to appropriate level of detail in recordkeeping
- determining stability and trim requirements for docking or slipping the vessel
- determining 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
- interpreting and applying 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
- maintaining stability and stress conditions within safe limits at all times
- producing accurate and reliable documentation
- using automatic data-based equipment.

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:

- causes and repercussions of a heeling vessel
- effects of angle of loll including centre of buoyancy, how a ship behaves at the angle of loll, inherent dangers, corrective action and the difference between a loll and a list
- 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
- principle stresses that act on the structure of a vessel, including panting and pounding
- principles of parametric rolling and control methods
- principles of synchronous rolling and methods for its control
- 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
- WHS/OHS requirements and work practices.

Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations, current at the time of assessment.

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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 this is not available, in an industry-approved marine operations site or simulation where managing stability of a vessel of 500 gross tonnage or more may be demonstrated.

Resources for assessment include access to:

- relevant documentation including workplace procedures, regulations, codes of practice and operation manuals
- 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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