



Australian Government

MARM011 Calculate, assess and report on vessel trim and stability

Release: 1

MARM011 Calculate, assess and report on vessel trim and stability

Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to assess and report on vessel trim and intact stability as part of the survey function. It is limited to undertaking practical stability tests, simplified stability calculations, reporting inclining experiments and consideration of damage stability implications.

This unit applies to people working in the maritime industry as a domestic commercial vessel marine surveyor and may form part of accreditation requirements for surveyors under Australian legislation.

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

Pre-requisite Unit

Not applicable.

Competency Field

M – Marine Surveying

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 Plan and prepare stability testing

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|-----|---|
| 1.1 | Applicable stability criteria for class of vessel and its operations are identified and confirmed against regulatory requirements |
| 1.2 | Differences between Uniform Shipping Laws (USL) and National Standard for Commercial Vessels (NSCV) standards for assessing stability are identified and applied to survey plan as required |

- 1.3 Information and data is used to establish and verify stability characteristics required for safe operation
 - 1.4 Types of stability related hazards that may occur during all types of operations are identified
 - 1.5 Range of intended and/or likely vessel loading conditions are accurately identified and their impact on stability is assessed
- 2 Calculate vessel trim and stability**
 - 2.1 Simplified stability calculations are performed to assess compliance with applicable stability criteria
 - 2.2 Stability assessment methods for equivalent solutions are applied as necessary according to regulatory requirements
 - 2.3 Trim, draughts and freeboard are measured accurately to safely and efficiently allow assessment of compliance with criteria
 - 2.4 Effects of weight distribution that may compromise vessel safety are included in stability assessment
 - 2.5 Computer-based stability programs are used as appropriate to assist with assessing compliance
 - 2.6 Results are recorded and verified to confirm compliance
 - 2.7 Appropriate methods are used to ensure vessel is not put at risk during assessment
- 3 Apply tests, assessments and theories to confirm compliance**
 - 3.1 Tests and assessments that could assist to confirm stability compliance are verified and carried out according to safety instructions
 - 3.2 Small angle stability theories are used to establish metacentric height (GM) through transverse movement of weights across vessel deck
 - 3.3 Causes of inaccuracies and limitations of assumptions in tests, assessments and theories are interpreted accurately and considered in stability assessment report
- 4 Identify other impacts on stability calculations**
 - 4.1 Types and effects of damage on vessel stability are identified and considered according to regulatory requirements
 - 4.2 Damage stability considerations are accurately identified and effect of damage is correctly quantified
 - 4.3 Operational impact on stability is identified and considered

		in compliance assessment
	4.4	Vessel safety management plan is reviewed to ensure known or likely impacts on stability are included
5 Document and report findings	5.1	Records are maintained and reports are prepared according to regulatory and organisational guidelines
	5.2	Survey report is completed according to regulatory requirements

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.

Applicable stability criteria includes one of the following:	• NSCV guidelines • USL Code
Regulatory requirements include one of the following:	• Marine Safety (Domestic Commercial Vessel) National Law • NSCV
Information and data include one or more of the following:	• cargo information • load lines • means to: • sound tanks • read draught marks • stability book
Tests and assessments include one or more of the following:	• buoyancy and stability after flooding • freeboard • lightship measurement • practical inclining • roll period test • simplified stability tests • stability proof test

Types and effects of damage include one or more of the following:

- added mass
- flooding
- large amounts of water on deck
- lost buoyancy

Stability considerations include one or more of the following:

- ballast management
- closing openings
- damage control measures to maintain, stabilise or restore watertight integrity of hull
- distribution of load on a vessel
- positioning of stowage and lashing of cargo, stores and equipment
- taking action to avoid or minimise cargo shift
- taking precautions when using lifting equipment and other associated equipment

Operational impact includes one or more of the following:

- ballast
- cargo
- crew movement
- cross connections
- lifting gear (including cranes on deck)
- passengers and passenger movements
- towing
- vessel mooring arrangements
- wind/ice and other weather constraints

Unit Mapping Information

This unit replaces and is equivalent to MARM5001A Calculate, assess and report on vessel trim and stability.

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 MARM011 Calculate, assess and report on vessel trim and stability

Modification History

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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 and performance criteria.

Analysing, planning and assessing trim and stability should be conducted for at least five different vessels varying in size and operational limits and include:

- accessing and interpret a variety of information
- analysing information and data
- anticipating and solving problems that may occur in calculations
- applying relevant work health and safety/occupational health and safety (WHS/OHS) requirements and work practices
- calculating trim and stability using statutory formula and criteria
- carrying out and reporting on at least three inclining experiments and three lightship measurements
- carrying out a range of different stability tests and assessments
- collating and preparing required documentation
- collecting and accurately interpreting valid and reliable data and/or regulations
- developing effective planning documents
- ensuring behaviour reflects relevant current legislative and regulatory requirements
- identifying and correcting causes of erratic or excessive deviation in mass movements during an inclining experiment
- identifying gaps in data and sourcing additional information
- identifying hazards, assessing risks, and developing and implementing risk treatment options
- liaising with relevant people to obtain information
- reading and accurately interpreting vessel specifications and design drawings
- relating effectively to people from a range of social, cultural and ethnic backgrounds
- resolving conflict and negotiating effectively
- selecting and using appropriate equipment
- undertaking ballast management
- undertaking research
- using calculation and stability software.

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:

- application of vessel construction principles and stability assessments applicable to a wide range of operational contexts
- calculations and formulas related to determining vessel trim and stability
- cargo loading and impact on stability
- configuration and subdivision requirements of a typical vessel including:
 - collision bulkhead
 - down flooding
 - deck edge immersion
 - freeboard and bulkhead deck
 - watertight compartments
 - weather tight compartments
 - vessel bulkhead
- correct identification and use of equipment and data required for stability tests and calculations
- damage control measures designed to maintain, stabilise or restore hull watertight integrity
- definition of intact stability
- distribution of load on a vessel
- implications and management of free surface effect
- information and data requirements, and statutory documents such as stability book, safety management plans, certificate of operation, vessel history
- naval architectural theory to the level necessary to carry out stability assessments for a range of domestic commercial vessels surveyor is intending to survey
- procedures for:
 - carrying out an inclining experiment
 - determining weights to be added or subtracted from calculated displacement to determine lightship displacement
 - maintaining vessel security and stability
 - measuring draughts and or freeboard to determine displacement of a vessel i.e. carrying out a lightship measurement
- recordkeeping requirements
- regulatory requirements for:
 - calculating vessel stability
 - surveying vessels
 - vessel compliance to trim and stability
- requirements for conducting a load line survey
- risk management
- safety management procedures and precautions when determining vessel trim and stability

- simplified stability criteria as outlined in NSCV Part C6A and C6C
- survey report requirements
- theories relating to damage stability and precautions to be taken to ensure down-flooding or progressive flooding does not occur
- typical problems and solutions related to vessel trim and stability
- types of simplified stability tests
- WHS/OHS legislation, policies and procedures.

Assessment Conditions

Assessors must satisfy National Vocational Education and Training Regulator (NVR)/Australian Quality Training Framework (AQTF) assessor requirements.

Assessment must satisfy the National Vocational Education and Training Regulator (NVR)/Australian Quality Training Framework (AQTF) standards.

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 these are not available, in simulated workplace operational situations or an industry-approved marine operations site that replicates workplace conditions, where calculating, assessing and reporting on vessel trim and stability can be conducted

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 to assess a vessels trim and intact stability.

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

Links

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