



Australian Government

Department of Education, Employment and Workplace Relations

TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL

Revision Number: 1

TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL

Modification History

Not applicable.

Unit Descriptor

UNIT DESCRIPTOR:

This unit involves the skills and knowledge required of a Watchkeeper (Deck) and Master (Less than 500 GT) to determine the stability and trim of a commercial vessel, to ensure that stability conditions of the vessel comply with the intact stability criteria of the International Maritime Organisation under all conditions of loading.

Application of the Unit

Application of the unit	The unit has application in the qualifications for a Watchkeeper (Deck), Master (Less than 500 GT) and Master Class 3, i.e. Diploma of Transport&Distribution (Maritime Operations - Deck Watchkeeper) and Diploma of Transport&Distribution (Coastal Maritime Operations - Master Class 3).
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Licensing/Regulatory Information

Licensing/legislative requirements	The unit is consistent with the relevant sections of STCW 95 and Marine Orders under the Australian Navigation Act 1912, describing the role and responsibilities of a Watchkeeper (Deck).
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Pre-Requisites

Not applicable.

Employability Skills Information

Not applicable.

Elements and Performance Criteria Pre-Content

<i>Elements describe the essential outcomes of a unit of competency.</i>	<i>Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.</i>
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Determine the vessel's stress and stability for all stages of the voyage	- a Stability calculations and weight distribution planning is conducted at a time, frequency and scope appropriate to the proposed nature of the voyage or operation - b Weight distribution is designed to maintain the vessel within acceptable stability and stress limits for all stages of the voyage - c Trim, draughts and list are adjusted as required to safely and efficiently progress all vessel operations - d Stability and stress monitoring is conducted in time and scope relevant to the nature and speed of vessel operations, and sufficient enough to ensure that stress and stability remain within acceptable limits at all times - e Action taken where weight distribution is compromising vessel safety, is prompt and designed to maximise safety - f Tests and checks using computer-based stability programs or other appropriate methods are conducted at a frequency and scope that conform to manufacturer's instructions

ELEMENT	PERFORMANCE CRITERIA
1 Determine the vessel's stress and stability for all stages of the voyage (continued)	g Spurious or incorrect information from stress and stability calculations is promptly recognised and recalculated
2 Maintain records of stress and stability calculations	a Records of stress and stability calculations and action to maintain trim, stability and stress levels are maintained in accordance with company procedures and regulatory requirements

Required Skills and Knowledge

REQUIRED KNOWLEDGE

This describes the knowledge required for this unit.

- 1 Sections of the IMO STCW 95 Code and AMSA Marine Orders dealing with the seaworthiness of vessels
- 2 ISM Code and associated vessel's safety management system and procedures
- 3 Relevant OH&S and pollution control legislation and policies
- 4 Procedures for determining the stability and trim of the vessel to ensure compliance with company procedures and established safety rules and regulations
- 5 Processes for conducting tests and checks using computer-based stability programs or other appropriate methods
- 6 Requirements for maintaining records of stress and stability calculations
- 7 Theory and calculations of vessel stability and dynamics, including:
 - a computation of hydrostatic stability data of a vessel
 - b calculation of a vessel's metacentre
 - c calculation of the transverse and longitudinal stability using hydrostatic data
 - d calculation of the moment of statical stability at small angles of heel
 - e determination of the centre of gravity of a vessel using an inclining experiment
 - f determining the required correction for the height of centre of gravity for the free surface effect
 - g determination of the values of the righting lever and construction of righting lever curves
 - h calculations for change of draught and trim when entering different water densities

REQUIRED KNOWLEDGE

- 11 Principal features of the structure of a vessel
- 12 A basic understanding of the properties and application of materials used in vessel construction
- 13 Construction, layout and subdivision requirements of a typical vessel, including an understanding of freeboard and bulkhead deck, watertight compartments, weathertight compartments, the bulkhead of the vessel and collision bulkhead
- 14 Typical construction features and stress characteristics for vessels of 500 gross tonnage or more or 3,000 kW propulsion power or more
- 15 The principal stresses which act on the structure of a vessel
- 16 Effects of density of sea water on the draught and freeboard of a vessel
- 17 Features of the load-line and draught marks of a vessel and methods for performing related calculations
- 18 Maritime communication techniques needed
- 19 Problems related to the control of trim, stability and stresses of vessels and appropriate action and solutions

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REQUIRED KNOWLEDGE

REQUIRED SKILLS

This describes the basic skills required for this unit.

- 1 Communicate effectively with other personnel when determining the stability and trim of the vessel
- 2 Communicate with multilingual crew where applicable using established techniques
- 3 Read, interpret and follow relevant sections of trim and stability documentation and related procedures as they concern the determination of the stability and trim of the vessel
- 4 Read and interpret vessel specifications and design drawings
- 5 Interpret and follow all safety management procedures and precautions when determining the stability and trim of the vessel
- 6 Work collaboratively with other shipboard personnel when determining the stability and trim of the vessel
- 7 Maintain appropriate records of the outcomes of inspection and maintenance activities to ensure the seaworthiness of the vessel
- 8 Identify problems that can occur when determining the stability and trim of the vessel and take appropriate action to report and address them
- 9 Carry out calculations required when determining the stability and trim of the vessel
- 10 Adapt to differing types of vessels, conditions of loading and related standard operating procedures
- 11 Take appropriate precautions to prevent pollution of the marine environment
- 12 Select and use equipment required when determining the stability and trim of the vessel

Evidence Guide

Evidence Guide

TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL

The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

1 Critical aspects of evidence required to demonstrate competency in this unit	Assessment must confirm appropriate knowledge and skills to: - a Determine the vessel's trim and stability for all stages of the voyage - b Take appropriate action to maintain trim, stability and stresses of the vessel within safe limits - c Identify typical problems related to trim stability and stress of a vessel and the watertight integrity of the hull, and take appropriate action in conjunction with other officers and crew - c Maintain records of stress and stability calculations - d Communicate effectively with others when determining a vessel's trim and stability
2 Evidence required for demonstration of consistent performance	- a Performance is demonstrated consistently over a period of time and in a suitable range of contexts - b Consistently applies underpinning knowledge and skills when: 1 determining the vessel's trim and stability for all stages of the voyage 2 taking appropriate action to maintain trim, stability and stresses of the vessel within safe limits 3 identifying typical problems related to trim stability and stress of a vessel and the watertight integrity of the hull, and take appropriate action in conjunction with other officers and crew

Evidence Guide**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

- 4 maintaining records of stress and stability calculations
- 5 communicating effectively with others when determining a vessel's trim and stability
- c Shows evidence of application of relevant workplace procedures, including:
 - 1 relevant sections of IMO Conventions and AMSA Marine Orders
 - 2 OH&S regulations and hazard prevention policies and procedures
 - 3 standard operating procedures and work instructions
 - 4 relevant vessel manufacturer's guidelines relating to the trim, stability and stress limits of the vessel
 - 5 environmental protection procedures when pumping ballast water

Evidence Guide (continued)**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

2 Evidence required for demonstration of consistent performance (continued)

- d Action is taken promptly to report and/or rectify out-of-limit trim, stability and stresses of the vessel in accordance with manufacturer's instructions, statutory requirements and company procedures
- e Work is completed systematically with required attention to detail
- f Recognises and adapts appropriately to cultural differences in the workplace, including modes of behaviour and interactions between crew and others

Evidence Guide (continued)**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

3 Context of assessment	- a Assessment of competency must comply with the assessment requirements of the relevant maritime regulations - b Assessment of this unit must be undertaken within relevant marine authority approved and audited arrangements by a registered training organisation: 1 As a minimum, assessment of knowledge must be conducted through appropriate written/oral examinations, and 2 Appropriate practical assessment must occur: - i at the registered training organisation; and/or - ii on an appropriate working or training vessel
4 Specific resources required for assessment	Access is required to opportunities to: - a participate in a range of exercises, case studies and other simulated practical and knowledge assessments that demonstrate the skills and knowledge to determine a vessel's trim and stability in a range of operational situations; and/or - b assist in determining a vessel's trim and stability in a range of operational situations either: - i using a simulator, meeting the requirements of Section A I/12 of the IMO STCW 95 Code, over an appropriate range of simulated loading and operational situations - ii in appropriate practical situations on an operational commercial or training vessel

Range Statement

Range Statement

TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

VARIABLE

SCOPE

1. GENERAL CONTEXT

a. Work must be carried out:	1 in compliance with the relevant sections of applicable maritime regulations
b. Work is performed:	1 relatively independently within broad operational requirements, with limited accountability and responsibility for self and others in achieving the prescribed outcomes
c. Work involves:	1 the application of vessel construction principles and stability and stress management techniques to the conduct of stress and stability calculations and action to maintain the trim, stability and stress levels of a vessel across a wide and often unpredictable variety of operational contexts. Monitoring and supervising the implementation of a broad plan or strategy for the determining and managing the stability and trim of a vessel is required
d. Work requires:	1 responsibility in the determination of the stability and trim of a vessel

2. WORKSITE ENVIRONMENT

a Vessel may include:	1 any Australian or international commercial vessel

Range Statement**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

b Stability and trim of a vessel must be maintained:	1	by day or night in both normal and emergency situations
	2	under any possible conditions of sea, weather and loading
	3	while underway
	4	during berthing and unberthing operations
	5	while anchoring or mooring
	6	when bunkering
	7	when berthed, moored or anchored
	8	when loading/unloading cargo

Range Statement (continued)**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

VARIABLE	SCOPE
c Means of maintaining the security and stability of a vessel include:	1 closing openings 2 taking precautions when using lifting equipment and associated equipment 3 position, stowage and lashing of cargo, stores and equipment 4 action to avoid or minimise cargo shift during a voyage 5 distribution of load on vessel 6 ballast management 7 measures to avoid corrosion and metal fatigue on the hull 8 damage control measures to maintain, stabilise or restore the watertight integrity of the hull

Range Statement (continued)**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

d Stability and stress parameters may include:	1 transverse stability - both dynamic and static 2 longitudinal stability 3 free surface effect 4 torsion 5 bending moments 6 shear forces 7 abnormal stability and stresses experienced in emergency and damage situations
e Documentation and records may include:	1 ISM Code safety management system plans, procedures, checklists and instructions 2 operational orders 3 IMO Conventions and Class Rules 4 AMSA Marine Orders 5 Trim and Stability Booklet 6 company procedures 7 records of trim and stability calculations 8 vessel and equipment manufacturer's instructions, specifications and recommended procedures

Range Statement (continued)**TDMMA1707A DETERMINE THE STABILITY AND TRIM OF THE VESSEL**

VARIABLE	SCOPE
e Documentation and records may include: (continued)	9 instructions of relevant maritime authorities related to the determination and maintenance of the stability and trim of vessels 10 relevant Australian and international standards
f Applicable legislation, regulations and codes may include:	1 IMO Conventions related to the determination and maintenance of the stability and trim of vessels 2 ISM Code 3 relevant sections of AMSA Marine Orders related to the determination and maintenance of the stability and trim of vessels 4 relevant international, Commonwealth, State and Territory OH&S legislation

Unit Sector(s)

Not applicable.

Field

Field MA Equipment Checking and Maintenance

Relationship to other units

Relationship to other units	The unit must be assessed in conjunction with other units that relate to the functions of the occupation(s) concerned.
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