



Australian Government

Department of Education, Employment and Workplace Relations

TDMMB1607B ORGANISE SAFE MAINTENANCE AND REPAIR PROCEDURES ON VESSELS OF OVER 750 KW PROPULSION POWER

Release: 1

TDMMB1607B ORGANISE SAFE MAINTENANCE AND REPAIR PROCEDURES ON VESSELS OF OVER 750KW PROPULSION POWER

Modification History

Not applicable.

Unit Descriptor

UNIT DESCRIPTOR:

This unit involves the skills and knowledge required to organise safe maintenance and repair procedures within the limits of responsibility of a Marine Engineer Class 2 on a commercial vessel powered by main propulsion machinery of 750 kW propulsion power or above. This covers the knowledge and skills to work as:

- **Chief Engineer on vessels between 750 kW and 3,000 kW propulsion power**
- **First Engineer (Second Engineer for STCW 95 Code) on steam vessels over 750 kW propulsion power.**

Application of the Unit

Application of the unit	The unit has application in qualifications for Chief Engineer on a vessel between 750 kW and 3,000 kW propulsion power and a First Engineer on a vessel over 750 kW propulsion power operating in international waters, i.e. Advanced Diploma of Transport&Distribution(Marine Engineering Class 2).
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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.
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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 Plan and organise safe maintenance and repair procedures	. a Shipboard maintenance and repair requirements and goals are identified and defined as per marine practice and planned maintenance procedures b Maintenance and repair operations and functions are correctly planned using appropriate project planning and management techniques c Maintenance resources and personnel are assigned to achieve established maintenance and repair requirements and goals as per company procedures
2 Plan and prepare for classification and statutory machinery surveys	a Classification society and statutory surveys are planned and prepared as per regulatory and class and statutory requirements b Compartments are prepared and gas freed as required for survey in accordance with established procedures and safe working practices

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ELEMENT	PERFORMANCE CRITERIA
2 Plan and prepare for classification and statutory machinery surveys (continued)	- c Regions of vessel requiring routine shipboard close-up inspection and maintenance are carried out as per classification society hull life extension programs - d Inspection, survey repair and maintenance of hull work, propellers and shafting are analysed and planned as per regulatory and survey requirements - e Dry docking, in-water hull cleaning and vessel lay-up are planned as per established marine practice and regulatory/survey requirements
3 Monitor the completion of shipboard maintenance and repair activities	- a Shipboard preventative maintenance procedures are organised and completed in accordance with the limits of responsibility - b Appropriate response is organised to reported faults and damage to the vessel and its equipment in accordance with vessel procedures and established engineering management practice - c Inspections of completed maintenance and repair work are carried out as per vessel survey requirements and established engineering practice - d Vessel's internal communication system is used as per procedures
4 Lead engine room personnel to achieve planned maintenance goals	- a Maintenance goals and job functions are clearly defined and communicated to engine room personnel - b Engine room personnel are motivated to achieve planned maintenance goals using established leadership methods - c Maintenance performance standards for engine room personnel are set, monitored and improved in as per

	established practice and procedures d Effective decision making and problem solving techniques are applied to engine room maintenance and personnel problems e Conflicts between engine room personnel are resolved using established conflict resolution procedures
5 Complete maintenance and repair documentation	a Correct records are made relating to the organisation and inspection of maintenance and repair operations and machinery failure incidents b All maintenance and repair documentation is completed in accordance with survey and company requirements, and class and statutory regulations
6 Establish safety management and hazard control strategies	a Safety management strategies for shipboard maintenance and repair operations are developed and implemented in accordance with class, regulatory requirements and company procedures

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6 Establish safety management and hazard control strategies (continued)	b Maintenance and repair hazards are identified and appropriate strategies established to minimise or eliminate risk to personnel, vessel and the environment c Implementation of safety, hazard minimisation and pollution control procedures and regulations are monitored in accordance with regulatory requirements and company procedures d Procedures and precautions are correctly applied to reduce the risk of scavenge and uptake fires, and starting air-line, crankcase and gearbox explosions and other dangerous conditions e Procedures and precautions necessary for entry into a pump room or other confined spaces on a vessel are established and
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communicated to relevant engine room crew

- f Personnel are trained and action is organised in the event of a machinery failure or emergency to secure the machinery and the vessel and maintain the safety of the vessel and persons involved

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Required Skills and Knowledge

REQUIRED KNOWLEDGE

This describes the knowledge required for this unit.

- 1 Relevant sections of IMO STCW 95 Code and AMSA Marine Orders applicable to the management of shipboard machinery maintenance and repair operations on vessels between 750 kW and 3,000 kW propulsion power
- 2 Relevant OH&S legislation, policies and procedures
- 3 Established engineering management practice for organising and inspecting the maintenance and repair of marine machinery, structures and equipment, including personnel management and training requirements
- 4 Engineering project scheduling and planning methods, including the use of GANTT charts and CPM/PERT network techniques
- 5 Functions and responsibilities of the engine room personnel for survey, maintenance and repair operations on board a vessel of typically 750 kW propulsion power or more
- 6 Established staff leadership and motivational principles and techniques, including conflict resolution procedures
- 7 Operational characteristics and performance specifications for the different types of shipboard machinery and equipment usually found on a vessel between 750 kW and 3,000 kW propulsion power
- 8 Procedures for carrying out shipboard machinery testing, troubleshooting and repair as part of routine maintenance procedures to ensure compliance with the company and survey requirements and established safety rules and regulations
- 9 Planned maintenance systems and procedures for the condition monitoring of machinery, structures and equipment, including responsibilities and requirements covered by various forms of vessel survey
- 10 Planning and operational procedures for dry docking and refloating, in-water cleaning and survey, and vessel lay-up
- 11 Procedures for the initiation and coordination of temporary and permanent repair

REQUIRED KNOWLEDGE

and/or replacement procedures on board vessels at sea, alongside and in dry dock

REQUIRED KNOWLEDGE

- 12 Procedures for the testing of boiler water, machinery cooling water and lubricating oil
- 13 Principal features of vessel construction and principles of transverse and longitudinal stability
- 14 Purpose and content of material safety data sheets
- 15 A basic understanding of the properties, characteristics and application of materials and structures typically used in the construction of a vessel between 750 kW and 3,000 kW propulsion power and its associated operational machinery and a basic knowledge of the properties and characteristics of liquids, fuels, lubricants, gases and vapours used on board a vessel
- 16 The nature and causes of typical shipboard machinery/equipment malfunctions and the available methods for their detection and repair, including machinery malfunction fault finding techniques

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REQUIRED SKILLS

This describes the basic skills required for this unit.

- 1 Communicate effectively with other personnel when organising safe maintenance and repair procedures
- 2 Interpret and follow safe maintenance and repair procedures on a vessel
- 3 Read and interpret machinery performance readings and indications
- 4 Read and interpret vessel and machinery specifications, machinery design drawings, machine drawings, operational manuals, specifications and electrical and control circuit diagrams
- 5 Read and interpret material safety data sheets
- 6 Provide leadership to other shipboard personnel when organising safe maintenance and repair procedures
- 7 Solve problems that can occur when detecting and identifying the cause of machinery malfunctions and repair faults on a vessel, take appropriate remedial action and initiate appropriate solutions

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- 8 Carry out calculations required when organising safe maintenance and repair procedures
- 9 Adapt to differing types of equipment and systems from one vessel to another and when equipment and systems are changed
- 10 Monitor the storage and care of hand, power and special tools and instruments needed when detecting and identifying the cause of machinery malfunctions and repairing faults

Evidence Guide

Evidence Guide

**TDMMB1607B ORGANISE SAFE MAINTENANCE AND REPAIR
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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 Organise and plan survey, maintenance and repair operations - b Lead and motivate the engine room staff to the achievement of maintenance and repair goals - c Monitor and inspect maintenance and repairs within limits of responsibility - d Establish and implement a safety management strategy for maintenance and repair operations within limits of responsibility - e Identify typical machinery maintenance and repair problems and hazards and establish appropriate hazard control strategies - f Communicate effectively with others during the organisation of maintenance and repair operations, including effective use of internal communication systems
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**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 planning and organising survey, maintenance and repair operations
 - 2 assessing operational performance of shipboard machinery and equipment
 - 3 identifying shipboard machinery malfunctions and faulty plant and equipment and initiating appropriate action to minimise any damage and pollution that could be caused
 - 4 monitoring and inspecting shipboard machinery maintenance and repairs
 - 5 identifying and evaluating machinery maintenance and repair problems and determining appropriate courses of action
 - 6 establishing safety management strategies relevant to mechanical and electrical machinery and equipment maintenance and repair operations
 - 7 completing machinery maintenance and repair documentation and records
 - 8 organising and training personnel
- c Shows evidence of application of relevant workplace procedures, including
 - 1 relevant sections of IMO STCW 95 Code and AMSA Marine Orders

Evidence Guide (continued)

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2 Evidence required for demonstration of consistent performance (continued)	2 OH&S regulations and hazard prevention policies and procedures 3 safety management system procedures and work instructions on the checking and repair of shipboard machinery 4 managing machinery and equipment security procedures and housekeeping processes 5 managing waste, pollution and recycling management processes - d Action is taken promptly to report and/or rectify machinery malfunctions, non-conformities, accidents, hazardous occurrences and safety incidents in accordance with regulations, company procedures and the ISM Code - 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 among crew and others
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 practical and theoretical assignments, exercises, case studies and other assessments that demonstrate the skills and knowledge to organise the maintenance and repair of structures, machinery and equipment typically found on a vessel between 750 kW and 3,000 kW propulsion power; and/or - b organise surveys, maintenance and repair operations in a range of operational situations on a commercial or training vessel between 750 kW and 3,000 kW propulsion power
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Range Statement

Range Statement

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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 mandatory rules and regulations and IMO Conventions and Codes, including the relevant sections of the AMSA Marine Orders, and ensuring that applicable codes, guidelines and standards recommended by IMO, the classification societies and maritime industry organisations are taken into account
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b. Work is performed:	1 relatively independently under broad operational requirements, with accountability for self and others in achieving the prescribed outcomes within the limits of responsibility
c. Work involves:	1 the application of management principles to the organisation of the maintenance and repair of the hull, structures, machinery and equipment typically found on a vessel of 750 kW propulsion power or more across a wide and often unpredictable variety of operational contexts. Contribution to the development and implementation of a broad plan or strategy for shipboard machinery maintenance and repair is required and accountability and responsibility for self and others in achieving the outcomes is involved
d. Work requires:	1 significant judgement in planning, engineering and leadership functions related to shipboard maintenance and repair operations and procedures within the limits of responsibility. This includes management, training and control of personnel, analysis of the situation and decision making

2. WORKSITE ENVIRONMENT

a The hull, structures, machinery and equipment to be maintained may include:	1 that typically found on any Australian or international commercial vessels between 750 kW and 3,000 kW propulsion power
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Range Statement (continued)

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VARIABLE	SCOPE

b Maintenance and repair operations may be carried out:	1 by day or night in both normal and emergency situations 2 under any permissible conditions of weather 3 while underway 4 during berthing and unberthing operations 5 while anchored or moored
c Maintenance and repair operations may be carried out on all main, auxiliary and ancillary machinery, including:	1 steam, diesel, diesel electric and gas turbine propulsion systems and controls 2 electrical systems and controls, including prime movers 3 batteries, transformers, switchboards, distribution systems, lighting systems 4 steering gear, stabilisers, bow thrusters, rudders 5 fluid power systems and controls 6 deck machinery 7 pumps and pumping systems 8 auxiliary systems and controls, including - i fresh and salt water cooling systems - ii lubricating oil cooling systems - iii fuel, oil, gas, coal - iv air starting - v lubrication - vi bilge and ballast system, oily water separator - vii refrigeration and air-conditioning plant and equipment - viii on-board air compressors and compressed air and control air systems - ix waste management and pollution control systems as per the MARPOL Convention

- x evaporators
- xi inert gas generator
- xii cargo pumps, tank washing machines and associated systems
- xiii purifiers and clarifiers
- xiv heaters
- xv sewage plant
- xvi fixed firefighting installations and fire control systems
- xvii auxiliary boilers and waste heat generators

Range Statement (continued)

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VARIABLE	SCOPE
c Maintenance and repair operations may be carried out on all main, auxiliary and ancillary machinery, including: (continued)	- xvii lifesaving appliances - i - xix maintenance to hull and vessel side valves - xx anchoring and mooring equipment - xxi maintenance of plant associated with the carriage of dangerous goods
d Organisation of maintenance and repair operations may include:	1 development of maintenance and repair plans 2 planning and organisation of statutory and classification society surveys 3 training, leading and motivating engine room crew 4 monitoring and inspection of maintenance work

	5 development and implementation of maintenance and repair safety management procedures and hazard minimisation strategies 6 completion of running logs and maintenance reports
e Propulsion plant configurations may include:	1 low speed, medium and high speed diesel propulsion 2 Stern tube bearing 3 CPP 4 direct drive shaft 5 diesel electric 6 steam 7 gas turbine 8 reduction gears 9 thrust blocks, detuners and shaft bearings
f Emergencies may include:	1 loss of propulsion 2 loss of electrical power 3 loss of steering 4 flooding of engine room 5 fire or explosion in engine room 6 loss of refrigeration

Range Statement (continued)**TDMMB1607B ORGANISE SAFE MAINTENANCE AND REPAIR
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VARIABLE	SCOPE
f Emergencies may include: (continued)	7 loss of water making ability 8 fuel oil, lubrication oil, steam and gas leaks 9 overheating and overspeed of machinery, governors, emergency trips
g Testing and repair equipment may include:	1 meters, gauges and electronic instrumentation 2 computer displays of performance parameters 3 hand tools, such as spanners, soldering irons, pliers, cutters, screwdrivers, hacksaws, etc. 4 greasing and lubrication tools 5 electric power tools, such as grinders, lathes, drills, etc. 6 pneumatic power tools, such as grinders, sanders, drills, etc. 7 welding equipment 8 block and tackle and portable and manual lifting equipment and jacks 9 protective clothing and equipment such as: - i eye and ear protection - ii safety boots and helmet - iii dust and fume masks - iv boilersuit/overalls

h Maintenance and repair hazards may include:	1	moving heavy loads using unsafe lifting procedures
	2	unsecured machinery, components or repair equipment
	3	slippery deck
	4	welding equipment
	5	sharp tools and implements
	6	power tools
	7	moving and rotating machinery
	8	flammable liquids, vapours and fuel
	9	faulty machinery equipment handling equipment and lifting gear
	10	using equipment beyond safe working limits
	11	poor housekeeping procedures
	12	non-compliance with safe working procedures
	13	electrical wiring and systems
	14	faulty earthing on systems and equipment

Range Statement (continued)

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h Maintenance and repair hazards may include: (continued)	15	hot pipes and valves (steam, fuel oil, lubricating oil)
	16	cold pipes and valves (refrigeration and liquefied gas cargoes)
	17	working at heights
	18	noxious and dangerous cargoes

i Documentation and records may include:	1 ISM Code safety management system plans, procedures, checklists and instructions 2 vessel's and company's planned maintenance system, repair procedures and instructions 3 machinery and vessel manufacturer's specifications, instructions and recommended procedures 4 maintenance log, running sheets and records, including computer database of running information and maintenance records where relevant 5 vessel's survey procedures and instructions as they relate to shipboard machinery 6 relevant sections of national and international regulations, IMO Conventions and Codes, including AMSA Marine Orders and classification society rules dealing with shipboard machinery maintenance and repair 7 instructions of relevant maritime authorities and classification societies concerning shipboard machinery maintenance and repair
j Applicable legislation, regulations and codes may include:	1 sections of national and international regulations, IMO Conventions and Codes, including AMSA Marine Orders and classification society rules related to maintenance and repair operations and surveys on vessels 2 relevant international, Commonwealth, State and Territory OH&S legislation 3 relevant international, Commonwealth, State and Territory engineering practice standards

Unit Sector(s)

Not applicable.

Field

Field B Equipment Checking and Maintenance

Relationship to other units

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