



Australian Government

Department of Education, Employment and Workplace Relations

**TDMMR2107B OPERATE AND
MAINTAIN ENGINES, MACHINERY
AND AUXILIARY POWER SOURCES
ON VESSELS OF LESS THAN 3,000 KW
PROPULSION POWER**

Release: 1



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Modification History

Not applicable.

Unit Descriptor

UNIT DESCRIPTOR:

This unit involves the skills and knowledge required of an Engineer Class 3 to operate and carry out basic routine maintenance on engines, machinery and auxiliary power systems on a commercial vessel less than 3,000 kW propulsion power operating within offshore limits.

Application of the Unit

Application of the unit	The unit has applications in the qualification for a Marine Engine Driver Grade 3 as per relevant sections of Part D of the National Standard for Commercial Vessels (NSCV), i.e. Diploma of Transport&Distribution (Coastal Marine Engineering - Engineer Class 3).
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Licensing/Regulatory Information

Licensing/legislative requirements	The unit is consistent with the relevant sections of State and Territory maritime regulations and NSCV/USL Code.
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Pre-Requisites

Not applicable.

Employability Skills Information

Not applicable.

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

ELEMENT	PERFORMANCE CRITERIA
. 1 Operate engines and auxiliary power systems	. a Engines, machinery and auxiliary power systems are prepared, started, and shut down as per manufacturer's instructions and established marine practice b Engines, machinery and auxiliary power systems are operated within specified limits in accordance with established procedures and manufacturer's instructions and specifications and within limits of responsibility of an Engineer Class 3 c Records of performance of engines, machinery and auxiliary power systems are maintained on running sheets and operations log/databases as per procedures
2 Carry out basic routine checking and maintenance procedures on engines, machinery and auxiliary power systems	a The performance of engines, machinery and auxiliary power systems is monitored in accordance with vessel's survey requirements and manufacturer's instructions and within limits of responsibility of an Engineer Class 3 b Preventative and remedial maintenance programs are carried out as per standard procedures, vessel's survey requirements and manufacturer's instructions and within limits of responsibility of an Engineer Class 3 c Poor performance and faulty operation are identified and appropriate action initiated to report or rectify problems within the limits of responsibility and in accordance with procedures

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ELEMENT	PERFORMANCE CRITERIA
2 Carry out basic routine checking and maintenance procedures on engines, machinery and auxiliary power systems (continued)	- d Routine service checks and procedures are followed to maintain the serviceability of engines, machinery and auxiliary power systems in accordance with manufacturer's instructions - e Maintenance and service records are completed as per manufacturer's instructions and vessel's procedures
3 Follow safety and hazard control procedures	- a Safety, hazard minimisation and pollution control procedures and national and international regulations are followed at all times - b Operational and maintenance hazards are identified and action is taken to minimise or eliminate risk to personnel, vessel and the environment - c Where relevant, procedures and precautions necessary for entry into confined spaces on a vessel are correctly followed - d Action is taken in the event of failure or emergency to isolate and secure the engines, machinery and auxiliary power systems and maintain the safety of the vessel and persons involved - e Vessel's emergency and contingency plans are followed in the event of a failure or emergency involving internal combustion engines or the propulsion system

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Required Skills and Knowledge

REQUIRED KNOWLEDGE

This describes the knowledge required for this unit.

- 1 Applicable sections of relevant maritime regulations
- 2 Relevant OH&S and pollution control legislation and codes of practice
- 3 Types of engines and propulsion systems used on vessels up to 3,000 kW propulsion power, including their principal features and operating characteristics
- 4 Procedures for the operation and routine maintenance of engines, machinery and auxiliary power systems on vessels up to 3,000 kW propulsion power, including:
 - a fitting
 - b machining
 - c gas cutting and welding
 - d arc welding
 - e workshop practice

REQUIRED KNOWLEDGE

- 5 Mathematical techniques to solve basic engineering and maintenance problems related to the operation and maintenance of engines and machinery and auxiliary power sources on vessels of less than 3,000 kW propulsion power
- 6 Basic properties of liquids and gases commonly used on board vessels of less than 3,000 kW propulsion power
- 7 Precautions that must be taken to minimise danger of fire or explosion
- 8 Elementary principles, care and management of auxiliary power sources (steam and motor), including boilers and their fittings
- 9 Alignment of machinery and machinery parts
- 10 Elementary principles and care and management of the various types of auxiliary pumps and pumping and piping systems and other shipboard auxiliaries
- 11 Gauges and meters used to monitor and measure performance of engines and machinery and auxiliary power sources on vessels of less than 3,000 kW propulsion power
- 12 The basic principles of engine cooling, fuel and lubricating systems, including fuel consumption
- 13 The basic principles of air compressors, their care and maintenance
- 14 The basic principles of operation and safety of boilers, steam and feed systems, steam engines and turbines.
- 15 The colour coding system used for electric conductors
- 16 Basic principles of preventative and remedial maintenance
- 17 Basic principles of the operation and maintenance of two and four stroke compression ignition engines, including causes of scavenge fires and crankcase explosions
- 18 The causes, effects of, and methods of detection of boiler water contamination

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- 19 The basic principles and procedures for the care and management of boiler, fuel, air and feed
- 20 Hazard control precautions and procedures relevant to the operation and routine maintenance of engines, machinery and auxiliary power systems
- 21 Typical problems related to the operation and maintenance of engines, machinery and auxiliary power systems on vessels and appropriate diagnostic action and related solutions
- 22 Maritime communication techniques needed during the operation and maintenance of engines, machinery and auxiliary power systems on vessels
- 23 Maintenance records that must be maintained on a vessel to meet the requirements of the company and regulatory authorities

REQUIRED SKILLS

This describes the basic skills required for this unit.

- 1 Use communication skills required when operating and maintaining engines and machinery and auxiliary power sources on vessels of less than 3,000 kW propulsion power
- 2 Read and interpret maintenance and service manuals and instructions and equipment specifications and drawings for equipment and machinery, including all required OH&S procedures and precautions
- 3 Read and interpret material safety data sheets
- 4 Read and interpret machinery performance readings and indications
- 5 Complete any required operational and maintenance records
- 6 Provide leadership to other crew members when operating and maintaining engines and machinery and auxiliary power sources on vessels of less than 3,000 kW propulsion power
- 7 Work safely and collaboratively with others when operating and maintaining engines and machinery and auxiliary power sources on a vessel
- 8 Plan and organise the operation of and maintenance of engines and machinery and auxiliary power sources on a vessel of less than 3,000 kW propulsion power
- 9 Monitor the selection and use of relevant tools and equipment as per instructions
- 10 Recognise faulty equipment and take appropriate action as per operating instructions

- 19 The basic principles and procedures for the care and management of boiler, fuel, air and feed
- 11 Recognise routine problems when operating and maintaining engines and machinery and auxiliary power sources on a vessel of less than 3,000 kW propulsion power and take appropriate action
- 12 Adapt to differences in vessels, equipment and machinery and operating and servicing procedures
- 13 Monitor that all safety precautions and procedures are followed when operating and maintaining engines and machinery and auxiliary power sources on a vessel of less than 3,000 kW propulsion power

Evidence Guide

Evidence Guide

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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 Operate engines, machinery and auxiliary power systems on a vessel of up to 3,000 kW propulsion power within limits of responsibility of an Engineer Class 3 - b Carry out preventative and remedial maintenance on engines, machinery and auxiliary power systems on vessels up to 3,000 kW propulsion power within limits of responsibility of an Engineer Class 3 - c Identify problems related to the operation and maintenance of engines, machinery and auxiliary power systems and take appropriate fault-finding and corrective action falling within limits of responsibility of an Engineer Class 3 - d Exercise all required safety, environmental and hazard control precautions and procedures during operation and routine maintenance of maintenance of engines, machinery and
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	auxiliary power systems e Communicate effectively with others when operating and carrying out maintenance on engines, machinery and auxiliary power systems on a vessel
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 operating engines, machinery and auxiliary power systems on vessels up to 3,000 kW propulsion power operating within inshore limits 2 carrying out preventative and remedial maintenance on engines, machinery and auxiliary power systems on vessels up to 3,000 kW propulsion power operating within offshore limits 3 identifying and evaluating typical operational and maintenance problems and determining appropriate courses of action 4 applying safety and pollution control precautions when operating engines, machinery and auxiliary power systems on a vessel c Shows evidence of application of relevant workplace procedures, including: 1 relevant maritime regulations 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 operating and carrying out routine maintenance on engines, machinery and auxiliary power systems on a vessel

Evidence Guide (continued)

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2 Evidence required for demonstration of consistent performance (continued)	5 environmental protection procedures when carrying out maintenance operations d Action is taken promptly to report and/or rectify issues and problems identified with operating and maintaining engines, machinery and auxiliary power systems in accordance with manufacturer's instructions 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 exercises, case studies and other simulated practical and knowledge assessments that demonstrate the skills and knowledge to operate and maintain engines, machinery and auxiliary power systems on

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| | vessels up to 3,000 kW propulsion power and/or |
| b | operate and maintain engines, machinery and auxiliary power systems on an operational commercial or training vessel up to 3,000 kW propulsion power operating within offshore limits |

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 the relevant maritime regulations
b. Work is performed:	1 within broad operational requirements, with responsibility for own outputs in relation to specified quality standards and limited responsibility for others in achieving the specified quality and quantity of outcomes
c. Work involves:	1 the organisation of maintenance operations on a vessel and the application of solutions to a defined range of maintenance problems falling within limits of responsibility of an Engineer Class 3
2. WORKSITE ENVIRONMENT	

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

a Vessel may include:	1 any commercial vessel up to 3,000 kW propulsion power operating within offshore limits
b Operation and maintenance of engines and associated systems may be conducted:	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 berthed, anchored or moored 6 in dry dock
c Engines, machinery and auxiliary power systems may include:	1 low speed, medium and high speed diesel propulsion 2 stern tube bearing 3 CPP 4 direct drive shaft 5 reduction gears 6 thrust blocks, detuners and shaft bearings

Range Statement (continued)

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VARIABLE	SCOPE
c Engines, machinery and auxiliary power systems may include: (continued)	7 starting and reversing arrangements
d Maintenance may include:	1 preventative and remedial maintenance and basic repairs of engines, machinery and auxiliary power systems and related equipment and components 2 lubrication of engines, machinery and auxiliary power systems 3 routine servicing in accordance with established procedures 4 routine visual and performance checks 5 identification of poor performance or faults in the operation of engines, machinery and auxiliary power systems 6 identification of faulty equipment or fittings and arranging for repair or replacement 7 assisting contractors in repair operations
e Maintenance tools and equipment may include:	1 hand tools, including screwdrivers, spanners, wrenches 2 greasing and lubrication tools 3 lifting gear and equipment 4 protective clothing and equipment such as:

VARIABLE	SCOPE
	- i eye and ear protection - ii safety boots and helmet - iii dust and fume masks
f 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 power tools 5 moving and rotating machinery 6 flammable liquids, vapours and fuel 7 faulty machinery equipment handling equipment and lifting gear 8 using equipment beyond safe working limits

Range Statement (continued)

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VARIABLE	SCOPE
f Maintenance and repair hazards may include: (continued)	9 poor housekeeping procedures 10 non-compliance with safe working procedures

VARIABLE	SCOPE
g Documentation and records may include:	1 ISM Code safety management system operational and maintenance procedures 2 vessel's planned maintenance system, repair procedures and instructions 3 manufacturer's specifications, instructions and recommended procedures 4 maintenance records 5 vessel's safety and emergency contingency plans and procedures 6 relevant material safety data sheets 7 relevant sections of State and Territory maritime regulations, National Standard for Commercial Vessels and USL Code
h Applicable legislation, regulations and codes may include:	1 relevant sections of the State and Territory maritime regulations, National Standard for Commercial Vessels and USL Code related to the operation and maintenance of engines, machinery and auxiliary power systems on vessels up to 3,000 kW propulsion power 2 ISM Code 3 MARPOL Convention 4 relevant international, Commonwealth, State and Territory OH&S and pollution control legislation 5 relevant Australian engineering standards

Unit Sector(s)

Not applicable.

Field

Field R Carry Out Operations on Equipment and Systems

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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