



Australian Government

MARC3005A Operate and monitor marine internal combustion engines, propulsion plant and auxiliary systems

Release 1

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Modification History

Release 1

This is the first release of this unit.

This unit replaces and is equivalent to TDMMR2707B Operate and maintain marine internal combustion engines within the limits of responsibility of a Marine Engine Driver Grade 2.

Unit Descriptor

This unit involves the skills and knowledge required to safely operate marine internal combustion engines, propulsion plant and auxiliary systems on a vessel up to 750 kW.

Application of the Unit

This unit applies to engine workers in the maritime industry working as a Marine Engine Driver Grade 2 on vessels up to 750 kW or as a Marine Engine Driver Steam.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

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

- 1 **Prepare for sea**
 - 1.1 Fuels and lubricating fluids required for proposed voyage are acquired
 - 1.2 *Spares and stores* required for proposed voyage are acquired
 - 1.3 *Flammable/explosive materials* are stowed and managed according to regulatory and organisational requirements
 - 1.4 *Work health and safety (WHS)/occupational health and safety (OHS) hazards* in engine room are identified, risk assessed and corrective actions taken according to organisational practices
 - 1.5 Pre-start checks are conducted on machinery and equipment according to organisational procedures and manufacturer specifications
 - 1.6 Engines are started according to manufacturer specifications and vessel procedures
 - 1.7 Starting faults are recognised and rectified according to manufacturer specifications and fault-finding procedures
- 2 **Operate engines, propulsion plant and auxiliary systems**
 - 2.1 *Engines, propulsion plant and auxiliary systems* are operated within technical specifications
 - 2.2 Main propulsion plant and auxiliary systems are operated and monitored to ensure they are within operating limits specified by vessel procedures and manufacturer recommendations
 - 2.3 *Environmental implications* associated with operation of engine, propulsion plant and auxiliary systems are identified and controlled where possible
 - 2.4 Accidental or operational discharge of *polluting substances* are recorded according to regulatory requirements and organisational procedures
 - 2.5 Operational faults are recognised and rectified in accordance with manufacturer's specifications and fault-finding procedures
 - 2.6 *Operational records* are kept according to regulatory requirements and organisational procedures
 - 2.7 Appropriate action is taken when a malfunction or *emergency* occurs

**3 Secure vessel
after voyage**

- 3.1 Engines, propulsion plant and auxiliary systems are shut-down according to manufacturer specifications and vessel procedures
- 3.2 All damage and repairs requiring action are recorded according to organisational procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required Skills:

- Explain:
 - method of propulsion plant reversal
 - operation of marine gearboxes
 - two- and four-stroke cycles of operation
- Identify constructional parts of marine internal combustion engines
- Keep running and maintenance logs
- Manage:
 - lubricating systems and prevent pollution of marine environment
 - cooling systems
 - pumping systems and prevent pollution of marine environment
 - stowage of flammable/explosive materials and refrigerant gases
- Operate:
 - refrigeration system
 - marine internal combustion engines within technical specifications
- Operate main propulsion plant and auxiliary systems within recommended parameters
- Operate and maintain steering systems
- Prepare vessel and machinery for sea
- Recognise and rectify operational faults
- Secure vessel and machinery after voyage

Required Knowledge:

- Bilge pumping for vessels with several compartments
- Common faults:
 - in steering gear
 - of deck machinery
- Construction of heat exchangers
- Controllable pitch propellers (CPP) construction and operation
- Coolant circulation and thermostats
- Correct pressure and flow conditions
- Corrosion prevention
- Cross connections between:
 - bilge/ballast/seawater systems and fire main
 - seawater systems and bilge systems

- Dangers associated with:
 - back-flooding and methods to prevent back-flooding
 - LPG and petrol vapours
 - refrigerant gas leaks in confined spaces
- Diesel engine:
 - construction
 - operation
 - fuel injection, timing and control equipment
- Dry sump and wet sump lubrication systems and components
- Electrohydraulic steering gear
- Emergency steering
- Engine:
 - protection arrangements
 - performance and reasons for lack of performance
 - watchkeeping duties
- Environmental responsibilities , regulations and legislative requirements
- Gearbox fault identification and emergency operation
- Governor operation
- Hazards of refrigerants
- Heat exchanger, keel cooler and raw water cooling systems
- Lubrication and cooling:
 - of gearboxes
 - effects
- Lubricating oil system faults
- Method of propulsion plant reversal including CPP
- Preparations and checks necessary before sailing
- Pump capabilities and requirements for priming
- Refrigeration system and components
- Reverse/reduction gearbox operation
- Routine for operating and maintaining steering systems
- Seawater circulating systems
- Securing vessel after voyage
- Ship side valves
- Shutting down machinery
- Spares and stores required for proposed voyage
- Storage of LPG cylinders
- Testing:
 - steering gear

- LPG detectors
- Turbo charging and supercharging arrangements
- Types and operation of deck machinery including basic hydraulic systems
- Types of:
 - gear trains
 - pumps and safety devices

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, the required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the Elements, Performance Criteria, Required Skills, Required Knowledge and include:

- being aware of own ability and limits to rectify irregularities and faults
- implementing workplace environmental and waste management procedures correctly.

Context of and specific resources for assessment

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

Resources for assessment include access to:

- industry-approved marine operations site where operating marine internal combustion engines, propulsion plant and auxiliary systems on a vessel up to 1500 kW can be conducted
- tools, equipment and personal protective equipment currently used in industry
- relevant regulatory and equipment documentation that impacts on work activities
- range of relevant exercises, case studies and/or other simulated practical and knowledge assessments
- appropriate range of relevant operational situations in the workplace.

In both real and simulated environments, access is required to:

- relevant and appropriate materials and equipment
- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals.

Method of assessment

Practical assessment must occur in an:

- appropriately simulated workplace environment and/or
- appropriate range of situations in the workplace.

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate to this unit:

- direct observation of the candidate operating marine internal combustion engines, propulsion plant and auxiliary systems on a vessel up to 1500 kW
- direct observation of the candidate applying relevant

WHS/OHS requirements and work practices.

**Guidance information for
assessment**

Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

In all cases where practical assessment is used it should be combined with targeted questioning to assess Required Knowledge.

Assessment processes and techniques must be appropriate to the language and literacy requirements of the work being performed and the capacity of the candidate.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below.

Spares and stores may include:

- Cleaning products and materials
- Grease
- LPG
- Machinery spare parts
- Oils
- Paint
- Refrigeration gas
- Tools, hand and power

Flammable/explosive materials must include:

- Liquid fuels
- LPG
- Refrigerant gas
- Heavy objects securely lashed
- Leaking fuel
- Loose machinery guards
- Slippery decks

Work health and safety (WHS)/occupational health and safety (OHS) hazards may include:

- Auxiliary equipment and associated spaces
- Cooling systems
- Fuel systems
- Gearbox
- Lubricating systems
- Marine two- and four-stroke:
 - diesel engines
 - petrol engines
- Propeller and immediate shafting alignment
- Pumping systems
- Refrigeration systems
- Steering systems
- Sterndrive and water jet drive units

Engines, propulsion plant and auxiliary systems may include:

Environmental implications may include:

- Accidental release of refrigeration gas
- Excessive noise
- Exhaust emissions
- Loss of fuel and oil overboard

Polluting substances may include:

Operational records may include:

Emergencies may include:

- Pumping bilges
- Chemicals
- Oils
- Refrigeration gases
- Sewage
- Ballast log
- Maintenance logs
- Oil record book
- Running logs
- Emergency steering
- Failure of the main engine
- Fire
- Flooding

Unit Sector(s)

Not applicable.

Competency Field

Equipment Operations