



Australian Government

MARC4005A Operate marine internal combustion engines and associated systems up to 1500 kW

Release 1

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Modification History

Release 1

This is the first release of this unit.

Unit Descriptor

This unit involves the skills and knowledge required to operate a marine internal combustion engine and associated systems up to 1500 kW according to technical specifications and safe operating limits.

Application of the Unit

This unit applies to engine workers in the maritime industry working as a Marine Engine Driver Grade 1 on vessels up to 1500 kW.

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

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|--|---|
| 1 Prepare for operation | <ul style="list-style-type: none">1.1 Risks to self, others and the environment are identified according to organisational procedures1.2 Routine pre-operational checks of marine internal combustion engines and associated systems are completed prior to use according to manufacturer specifications and organisational procedures |
| 2 Operate marine internal combustion engines and associated systems | <ul style="list-style-type: none">2.1 Suitable personal protective equipment is selected and used according to organisational procedures2.2 Marine internal combustion engines and associated systems are operated in a safe and controlled manner2.3 Performance of marine internal combustion engines and associated systems operations is monitored2.4 Adverse sea and weather conditions that may impact on operating marine internal combustion engines and associated systems are identified and operational practices are adjusted to maintain safety of vessel and personnel2.5 Faults or malfunctions are identified and recorded according to organisational procedures2.6 Faults or malfunctions are rectified where possible and corrective actions are taken and recorded according to organisational procedures2.7 Restrictions are applied to operations if necessary and are agreed to with the Master2.8 Procedures to be undertaken in of emergencies are recognised and implemented |
| 3 Complete operations | <ul style="list-style-type: none">3.1 Shut-down procedures are conducted according to manufacturer instructions and organisational procedures3.2 Operational records are completed according to organisational procedures |

Required Skills and Knowledge

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

Required Skills:

- Carry out necessary calculations associated with managing marine internal combustion engines and associated systems including calculating:
 - areas and volumes of various shapes and circumference of circles
 - calibration tables
 - lubricating oil and fuel oil consumption, rate of fuel consumption (RFC), specific fuel consumption (SFC), effects on RFC and fuel requirements due to change in vessel speed or voyage deviations
 - relationship between vessel speed and fuel consumption, including the meaning of economical RPM and its application
 - tank capacities and pumping capacities for filling and emptying
- Maintain records of operating and maintaining marine internal combustion engines and associated systems, and any related safety incidents
- Read and interpret:
 - manufacturer instructions for operating marine internal combustion engines and associated systems
 - maritime regulations, rules and instructions
- Read and monitor various gauges and instruments to evaluate the performance of marine internal combustion engines and associated systems
- Recognise problems that may occur with marine internal combustion engines and associated systems, and take appropriate preventative and remedial action
- Recognise when performance of marine internal combustion engines and associated systems is unsatisfactory or outside of specified limits and take appropriate action

Required Knowledge:

- Characteristics of marine internal combustion engines and associated systems including operational limits
- Control systems
- Cooling water system and components
- Crankcase explosions and appropriate preventative and remedial action and solutions
- Dangers associated with operating shipboard marine internal combustion engines and associated systems, and related hazard prevention strategies
- Engine protection arrangements
- Force diagrams
- Fuel system including pumps and injectors
- Lubricating oil systems and components

- Materials and construction techniques of marine internal combustion engines and associated systems
- Methods for controlling and managing the operation of shipboard marine internal combustion engines and associated systems
- Pollution control measures under relevant local, state, territory and commonwealth legislation
- Problems associated with marine internal combustion engines and associated systems, and appropriate preventative and remedial action and solutions
- Procedures for monitoring and evaluating performance of marine internal combustion engines and associated systems
- Relationship between vessel speed and fuel consumption, including the meaning of economical RPM and its application
- Relevant sections of state and territory maritime regulations and NSCV
- Relevant work health and safety (WHS)/occupational health and safety (OHS) legislation and policies
- Requirements under MARPOL Convention for emission control from internal combustion engines
- Sequence of required action when there is a major fault on main propulsion engine
- Technological changes in engine and control system designs
- Turbocharging systems

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:

- attention to appropriate level of detail in recordkeeping
- being aware of own ability and limits to rectify irregularities and faults
- awareness of surroundings and changes to these surroundings.

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 and associated systems 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 and associated systems 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.

Associated systems must include:	• Air start • Control systems • Cooling system • Dual fuel systems • Exhaust systems • Lubrication systems
Monitored may include:	• Conducting performance tests • Reading gauges and instruments • Responding to alarms
Emergencies must include:	• Explosion • Failure or major fault in propulsion engines and associated control systems • Fire • Loss of: • bridge control • electrical supply • propulsion power • steering • Major breakdowns
Operational records must include:	• Log books • Maintenance records • Operational orders from organisational safety management system • Plant and equipment manufacturer instructions and recommended procedures • Relevant maritime authorities documentation relating to operating marine internal combustion engines and associated systems

Unit Sector(s)

Not applicable.

Competency Field

Equipment Operations