



Australian Government

MARL006 Demonstrate basic knowledge of marine diesel engines and systems

Release: 1

MARL006 Demonstrate basic knowledge of marine diesel engines and systems

Modification History

Release 1. New unit of competency.

Application

This unit involves the knowledge required to operate and maintain marine diesel engines and systems on a commercial vessel.

This unit applies to people working in the maritime industry as a Marine Engineering Watchkeeper on commercial vessels greater than 750 kW or as an Engineer Class 3 Near Coastal.

This unit has links to legislative and certification requirements.

Pre-requisite Unit

Not applicable.

Competency Field

L - Marine Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1 Outline stages of combustion in two-stroke and four-stroke cycle diesel engines	1.1	Two-stroke and four-stroke cycle diesel engines are compared and contrasted
	1.2	Methods and diagnostic information used in determining engine combustion characteristics are specified
	1.3	Diagnostic information is used to identify and interpret common combustion faults and to produce typical diagrams for analysing faults
2 Explain means of pressure- charging	2.1	Pressure-charging principles and their influence on engine design and waste heat recovery are explained

diesel engines	2.2	Different methods of pressure-charging diesel engines are clarified
	2.3	Emergency isolation procedures used when pressure-charging diesel engines are clarified
3 Explain operation of diesel engine governors	3.1	Governing principles, common governor types and related controls are outlined
	3.2	Different requirements for governing diesel engines for propulsion and power generation are explained
	3.3	Problems of mismatched engine sizes/prime mover types when sharing common loads are outlined
4 Explain properties of materials used in construction of engine components	4.1	Properties of materials used in construction of engine components are specified
	4.2	Dynamic stresses and loads, materials and service limitations of engine components are outlined
	4.3	Construction and operating cycle forces of diesel engine components are outlined
	4.4	Relationship between critical speed, use of detuners/dampers and materials in engine components is clarified
5 Explain safe working practices associated with diesel engines during maintenance, repair and operation	5.1	Safe practices for isolating propulsion and power generation diesel engines prior to work commencement are confirmed
	5.2	Safety protective clothing to be used during all aspects of diesel maintenance is identified
	5.3	Hazards associated with working on diesel engines and systems including working in enclosed spaces are identified
	5.4	Correct procedures for using hydraulic tools and high-pressure fuel injection test equipment are clarified
	5.5	Purpose, operation and maintenance of safety interlocks and protective cut-outs of engine manoeuvring systems is determined
6 Explain procedures for preventing and responding to crankcase and airline explosions,	6.1	Causes, symptoms and means of preventing and extinguishing uptake and economiser fires are outlined
	6.2	Risks of continued service with an isolated waste heat unit are assessed

and scavenge and uptake fires

- 6.3 Causes, symptoms, methods of extinguishing and prevention of scavenge fires are evaluated
- 6.4 Causes and hazards associated with starting airline explosions are identified
- 6.5 Protective devices fitted to air starting systems to minimise risk of explosion, and routine inspection and maintenance required are detailed
- 6.6 Causes and ways of preventing crankcase explosions in both diesel and dual-fuel engines are outlined
- 6.7 Procedure to be taken in the event of an early warning of a hazardous crankcase atmosphere and required procedure to be followed after engine has stopped are clarified

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Specifies different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Diagnostic information includes one or more of the following:

- engine efficiency
- fuel consumption
- temperature
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Common combustion faults include one or more

- engine cylinder fuel supply
- lack of total combustion

of the following:

Methods of pressure-charging diesel engines include one or more of the following:

- exhaust gas turbo charging
- positive displacement engine-driven blowers
- under-piston assistance

Diesel engine components include one or more of the following:

- bedplates
- camshafts
- crankshafts
- cross-heads
- cylinder heads
- exhaust valves
- frames
- fuel injectors
- fuel pumps
- liners
- pistons
- tie-rods for two- or four-stroke engines
- turbochargers
- valves and rocker gear

Hazards include one or more of the following:

- acids
- chemicals
- defective or bypassed machinery protective devices
- defective or inappropriately adjusted exhaust systems
- enclosed spaces
- flammable liquids under pressure
- hydrocarbons
- lifting heavy components both unaided and with lifting gear
- leaking oil and fuel

Causes include one or more of the following:

- airlock in feed water system
- cleanliness of economiser tubes
- failure of economiser feed pump
- loss of feed-water supply

Unit Mapping Information

This is a new unit. This unit is equivalent to MARL5008A Demonstrate basic knowledge of marine diesel engines and systems.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2>

Assessment Requirements for MARL006 Demonstrate basic knowledge of marine diesel engines and systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least one occasion and include:

- accessing diagnostic information related to marine diesel engines and systems
- assessing own work outcomes and maintaining knowledge of current codes, standards, regulations and industry practices
- explaining basic operation of marine diesel engines and systems
- identifying and applying relevant solutions for addressing problems associated with marine diesel engines and systems
- identifying and interpreting diagnostic information, and performing mathematical calculations related to operating, maintaining and repairing marine diesel engines and systems
- identifying methods, procedures and materials needed for operating, maintaining and repairing marine diesel engines and systems
- imparting knowledge and ideas through verbal, written and visual means
- providing accurate and reliable information
- providing appropriate level of detail in responses
- reading and interpreting manuals, technical specifications, safety data sheets/material safety data sheets and manufacturer guides related to operating, maintaining and repairing marine diesel engines and systems.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- basic principles of diesel engine operation
- components of diesel engines
- crankcase and air-line explosions, scavenge and uptake fires
- diesel engine
- diesel engine:
 - lubrication systems
 - propulsion and power generation
- manoeuvring systems of diesel engines

- pressure-charging diesel engines, including common service faults, actions to rectify faults, emergency operation and isolation procedures
- properties and characteristics of fires
- safe working practices associated with diesel engines during operation, maintenance, and repair
- starting methods of diesel engines
- work health and safety (WHS)/occupational health and safety (OHS) legislation, policies and procedures.

Assessment Conditions

Assessors must satisfy National Vocational Education and Training Regulator (NVR)/Australian Quality Training Framework (AQTF) assessor requirements.

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated workplace operational situations that reflect workplace conditions.

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

Resources for assessment must include access to:

- tools, equipment, machinery, materials and personal protective equipment currently used in industry
- applicable documentation such as legislation, regulations, codes of practice, workplace procedures and operational manuals
- range of relevant exercises, case studies and/or simulations.

Links

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