



Australian Government

MARM4003A Assist in the survey of vessel mechanical features

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 assist in the survey of operational systems. It covers identifying the principal characteristics of vessel propulsion, steering gear system, deck machinery, pumping systems, power generation, refrigeration plant and navigational systems that require periodic surveys for regulatory requirements.

Application of the Unit

This unit applies to people working in the maritime industry as a marine surveyor assistant and forms part of requirements for the Certificate IV in Domestic Commercial Vessel Survey.

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 Follow requirements for surveying propulsion systems | <ul style="list-style-type: none">1.1 Types of <i>propulsion systems</i> used on a range of commercial vessels are accurately identified, and survey requirements are confirmed with surveyor and documented according to organisational requirements1.2 <i>Shafting systems</i> operation and maintenance principles are identified and applied to survey plan as necessary1.3 Requirements for inspecting propulsion systems and detecting faults are identified and applied during survey |
| 2 Follow requirements for surveying marine engines | <ul style="list-style-type: none">2.1 Main components of a four-stroke and two-stroke diesel engine and outboard petrol engines are identified and survey requirements are documented according to organisational requirements2.2 Diesel and outboard petrol engine operation <i>terminology</i> and principles are applied during survey, in documentation and in reports2.3 <i>Main components</i> of marine diesel engine, with its associated gearing are identified, and survey requirements are confirmed with surveyor and documented according to organisational requirements2.4 <i>Engine operating principles</i> are defined and considered in survey task where necessary2.5 Inspection tasks related to engines are defined and applied |
| 3 Follow requirements for surveying electrical systems | <ul style="list-style-type: none">3.1 Vessel batteries, starter motors and <i>power distribution systems</i> are assessed, and survey requirements are confirmed with surveyor and documented according to organisational requirements3.2 Types of <i>power generating plants</i> used on board a range of commercial vessels are identified and survey requirements are documented as necessary3.3 Alternating current (AC) and direct current (DC) generator principles of operation and operating procedures are defined and survey requirements are documented3.4 Precautions and procedures for electrical safety during inspection of electrical circuitry and equipment are adhered to according to work health and safety (WHS)/occupational health and safety (OHS) and other organisational requirements |

- 4 Follow requirements for surveying refrigeration plant**
- 4.1 Principal features and operating characteristics of **refrigeration systems** used on commercial vessels are identified and survey requirements are confirmed with surveyor, and documented according to organisational requirements
 - 4.2 **Environmental issues** and responsibilities concerning refrigeration systems are accurately identified during survey
 - 4.3 Maintenance requirements of refrigeration systems used on a range of commercial vessels are confirmed with surveyor and documented according to organisational requirements
- 5 Follow requirements for surveying vessel pumping systems**
- 5.1 Principal features and **operating characteristics of typical pumping systems** and pumping system components used on a range of commercial vessels are confirmed with surveyor and documented according to organisational requirements
 - 5.2 Inspection tasks for pumping systems are identified and applied during survey
 - 5.3 Maintenance requirements for vessel pumping systems used on a range of commercial vessels are confirmed with surveyor and documented according to organisational requirements
- 6 Follow requirements for surveying steering gear systems**
- 6.1 Principal features and operating characteristics of marine **hydraulic systems** typical of a range of commercial vessels to be inspected are identified and confirmed with surveyor, and documented according to organisational requirements
 - 6.2 Principal features and operating characteristics of typical **steering systems and components** to be inspected are identified and confirmed with surveyor, and documented according to organisational requirements
 - 6.3 Requirements for inspecting steering systems and detecting faults are applied during survey
- 7 Follow requirements for surveying deck machinery**
- 7.1 Common types of **deck machinery** typical to a range of commercial vessels are identified and confirmed with surveyor, and documented according to organisational requirements
 - 7.2 Requirements for inspecting a range of deck machinery and detecting faults are applied during survey
 - 7.3 Faults in machinery are detected, confirmed with surveyor and actions to rectify issues are agreed and documented in survey report

- 8 Follow requirements for surveying navigational systems**
- 8.1 Principal features and operational characteristics of a typical **navigational system** for size and nature of vessel are accurately identified and confirmed with surveyor, and documented according to organisational requirements
 - 8.2 Navigational equipment and systems are identified and appropriate inspection techniques are incorporated into survey plan
 - 8.3 Faults in navigational equipment and non-conforming equipment are confirmed with surveyor, and actions to rectify issues are identified and documented in survey report
- 9 Apply risk management practices for surveying fuel systems**
- 9.1 Range of fuel systems and their operational requirements are identified and confirmed with surveyor
 - 9.2 **Typical risks** associated with survey tasks for fuel systems are identified and risk minimisation strategies are applied during survey
 - 9.3 Faults and non-conforming systems are confirmed with surveyor, and actions to rectify issues are identified and documented in survey report

Required Skills and Knowledge

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

Required Skills:

- Apply risk management and risk minimisation techniques
- Carry out calculations
- Communicate effectively verbally and in writing
- Identify and follow all safety procedures and precautions
- Read and interpret safety data sheets (SDS)/material safety data sheets (MSDS) accurately
- Read and interpret:
 - instructions for auxiliary machinery and systems to be tested
 - machinery performance readings and indications
- Recognise:
 - faulty equipment on vessels to be inspected
 - routine problems that relate to auxiliary machinery and systems on domestic commercial vessels
- Work under supervision of a marine surveyor

Required Knowledge:

- Battery types, care, maintenance
- Commercial vessel classifications and survey requirements for various operational systems, and their components
- Compatibility and durability of construction materials
- Construction and layout of a typical vessel including layouts for pipework, propulsion system and installed machinery
- Environmental controls and regulations for primary, secondary or ancillary systems and their components
- Ethical behaviour and industry codes of practice
- Features and characteristics of typical faults and signs of deterioration in operational systems and components
- Features of different engine types and sizes
- Forms, causes and prevention of corrosion in a marine environment
- Insurance, liability and professional indemnity requirements for self and others
- Interaction of vessel structures and mechanical systems
- Maintaining watertight integrity
- National Standard for Commercial Vessels (NSCV) and National Standard for the Administration of Marine Safety (NSAMS)
- Operational characteristics and performance specifications for different types of marine

internal combustion engines and propulsion machinery usually found on vessels

- Principal features of fittings and machinery found on typical vessels and characteristics of engine/plant and ancillary equipment
- Procedures for:
 - checking connection, installation and mounting of machinery and components
 - reading and interpreting machinery performance readings and indications
- Purpose and content of SDS/MSDS
- Report writing requirements for a range of different survey tasks
- Safety, environmental and hazard control precautions and procedures relevant to checking and basic maintenance of fittings and machinery
- Typical problems related to inspecting and maintaining operational and navigational systems
- Typical vessel and machinery specifications, operating manuals and specifications
- WHS/OHS requirements and safe work practices

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:

- developing effective planning documents
- providing high quality reports
- ensuring behaviour reflects relevant current legislative and regulatory requirements
- ensuring currency of relevant WHS/OHS skills and knowledge
- attention to detail when completing documentation.

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 assisting with surveying operational systems 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 assisting with surveying operational systems

- 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.

- | | |
|--|---|
| Propulsion systems may include: | <ul style="list-style-type: none">• Inboard and outboard engines• Propulsion plant – prime mover (diesel engine), shaft and propellers (fixed and controlled pitch)• Schottel or similar azimuth systems• Thrusters• Water jet units |
| Shafting systems may include: | <ul style="list-style-type: none">• Gear box• Propeller• Shaft:<ul style="list-style-type: none">• seals• bearings• couplings• Stern bearing• Thrust block |
| Terminology and main components may include: | <ul style="list-style-type: none">• Bearings• Bed plate• Crankshaft drive• Cylinder block• Exhaust:<ul style="list-style-type: none">• system• valve• Filters• Flywheel• Fuel:<ul style="list-style-type: none">• injector• pump• Heat exchanger• Injector• Inlet valve• Piston• Turbo chargers |
| Engine operating principles may include: | <ul style="list-style-type: none">• Requirements for diesel engines for:<ul style="list-style-type: none">• propulsion• power generation• emergency use |
| Power distribution systems may | <ul style="list-style-type: none">• Circuit breakers |

- include:
- Distribution boards
 - Shore power changeover arrangements
- Power generating plants may include:
- Diesel engine
 - Hybrid system
 - Solar generation
 - Wind generation
- Refrigeration systems may include:
- Compressors
 - Different types of gasses
 - Evaporators
- Environmental issues may include:
- Chlorofluorocarbons (CFCs) used in refrigerants
 - Diesel and steam engines to power refrigeration, lights, pumps and other functions
 - Ozone depleting substances (ODSs)
 - Water treatment chemicals and chemicals from refrigeration equipment
- Operating characteristics of typical pumping systems may include:
- Back flooding prevention procedures
 - Drive systems, belts, clutches and motors
 - Fire, bilge and tank circulating systems
 - Standard identification markings
 - Strainers, strum and mud boxes, and foot valves
 - Use of flexible materials and hoses
 - Valve types, including their construction and maintenance
- Hydraulic systems may include:
- Electro hydraulic steering gears
 - Emergency operation in electrical or hydraulic failure
 - Preventative and remedial maintenance requirements of hydraulic systems
 - Simple hydraulic circuits
- Steering systems and components may include:
- Rudder and stock support bearings
 - Rudder construction features
 - Rudder types
 - Glands, packing and seals
 - Requirements for maintaining and testing steering and related hydraulic systems
 - Steering operation using hydraulic, cable, rod and gear
 - Tiller arm attachment
- Deck machinery may include:
- Basic hydraulic systems
 - Derricks and booms
 - Fishing gear
 - Lifting equipment

- Navigational system may include:
- Safeguards and protective devices for winches
 - Small cranes
 - Winches
 - Windlasses
 - AIS
 - Charts
 - Compass
 - GPS
 - Plotters
 - Radar
 - Sounders
- Typical risks may include:
- Fire
 - Inhalation and poisoning
 - Injury
 - Marine pollution

Unit Sector(s)

Not applicable.

Competency Field

Marine Surveying