



Australian Government

MARB4007A Undertake maintenance of machinery, machinery systems and structural components

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 establish, organise and implement a preventative and reactive maintenance program and capabilities for machinery, machinery systems and structural components to optimise vessel operational performance.

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 Verify maintenance requirements | <ul style="list-style-type: none">1.1 Maintenance program regulatory and organisational requirements for <i>machinery, machinery systems and structural components</i> are identified and followed1.2 Technical specifications, service requirements and organisational procedures for machinery, machinery systems and structural components are checked for recommended maintenance1.3 <i>Special requirements for maintenance</i> of machinery, machinery systems and structural components are separated from normal lubrication, adjustment and day-to-day maintenance schedules1.4 Maintenance system goals for machinery, machinery systems and structural components are outlined1.5 Maintenance plan and related work schedule for machinery, machinery systems and structural components is developed |
| 2 Establish maintenance systems | <ul style="list-style-type: none">2.1 Maintenance costs are identified and quantified2.2 Processes, procedures and delays are documented2.3 Internal and external maintenance providers are specified2.4 Maintenance plan is prepared to minimise ship operation costs, waste and harm to the environment2.5 Approvals for maintenance plan are negotiated and confirmed2.6 Recordkeeping systems are developed and maintained |
| 3 Organise maintenance activities | <ul style="list-style-type: none">3.1 Schedules and rosters are checked to verify time when maintenance process may be scheduled, including optimal timing for shut down3.2 Agreement with the Master is obtained for timing of <i>maintenance tasks</i> to optimise maintenance process and minimise operational disruptions3.3 Detailed work plans are developed in line with schedules, availability of expertise, scheduling of resource availability and environmental requirements3.4 Team members with required competencies are allocated to maintenance activities3.5 <i>Consumables and equipment</i> are secured to meet work plan requirements |

- 3.6 Externally sourced equipment, consumables and expertise are located and procured
 - 3.7 Contingency plans are prepared
 - 3.8 Maintenance schedules and procedures are effectively communicated to the team
- 4 **Supervise maintenance tasks**
 - 4.1 Job specifications and maintenance tasks are communicated effectively to team members
 - 4.2 Maintenance and repair tasks are monitored to ensure they satisfy technical specifications
 - 4.3 Work health and safety (WHS)/occupational health and safety (OHS) requirements are monitored and observed at all times
 - 4.4 ***Emergency equipment*** is made available and working order of this equipment is ensured
 - 4.5 Contingencies are managed to ensure quality of work is maintained and work is completed within agreed time frame
- 5 **Perform planned maintenance activities**
 - 5.1 WHS/OHS risk control measures and procedures for carrying out work are followed
 - 5.2 Preventative maintenance is carried out in compliance with technical specifications
 - 5.3 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes
 - 5.4 Ongoing quality checks of maintenance work is undertaken according to technical specifications
 - 5.5 Work is carried out efficiently without waste of materials and damage to equipment, machinery or other services
 - 5.6 Work site is made safe according to organisational safety procedures
 - 5.7 Maintenance work is checked to verify that it conforms with technical specifications
- 6 **Perform breakdown maintenance**
 - 6.1 ***Nature of breakdown*** is ascertained and reported to appropriate personnel or authorities
 - 6.2 Maintenance records of machinery, machinery systems and structural components related to reported breakdown are reviewed for possible causes

- 6.3 Extent of breakdown is evaluated and confirmed using diagnostic and troubleshooting techniques
- 6.4 ***Restrictions are applied to operations*** where necessary and agreed to with the Master
- 6.5 Extent of repair work is ascertained from available evidence
- 6.6 Limits of repair work that can be carried out are established
- 6.7 Machinery and equipment is isolated
- 6.8 Repair work is carried out according to technical specifications
- 6.9 Master is notified of completed repair work and details are documented
- 7 **Monitor, adjust and report on implementing the maintenance plan**
 - 7.1 Execution of maintenance tasks is monitored to ensure they are completed according to maintenance plan and statutory survey requirements
 - 7.2 Machinery, machinery systems and structural components are monitored to ensure achievement of planned outcomes
 - 7.3 Costs are monitored and controlled
 - 7.4 Adjustments are made to maintenance plan to take into account failure to achieve planned outcomes
 - 7.5 Reports are completed according to maintenance plan requirements and organisational procedures
 - 7.6 Recommendations to improve maintenance plan safety, efficiency and effectiveness are implemented under regular review of safety management system
 - 7.7 Machinery, machinery systems and structural components are maintained in a clean and safe operational condition
- 8 **Carry out damage control procedures**
 - 8.1 Damage to vessel hull and watertight integrity is ascertained and monitored according to established procedures and safety regulations
 - 8.2 After hull damage, appropriate damage control measures are implemented to maintain watertight integrity and to control flooding of vessel according to vessel emergency and safety management plans

Required Skills and Knowledge

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

Required Skills:

- Complete maintenance records
- Implement safe and environmentally responsible work practices
- Manage legislative compliance and compliance records
- Plan and organise application of control techniques for hull damage
- Plan and prepare for maintenance including isolating equipment
- Read, interpret and apply:
 - manufacturer instructions including all WHS/OHS requirements and safety data sheets (SDS)/material safety data sheets (MSDS)
 - operating and service manuals
- Recognise damage to hull of small vessel and take appropriate action according to operating instructions
- Recognise faulty equipment including:
 - cooling water system corrosion
 - fuel oil contamination
 - lubricating oil contamination
- Repair pipe work
- Select and use correct tools and equipment for maintenance task
- Service valves

Required Knowledge:

- Appropriate mathematical procedures for estimating and measuring including calculating time to complete tasks
- Back-flooding and down-flooding
- Causes of vibrations and undue wear in power transmission system
- Construction, layout and subdivision requirements of a typical vessel, including freeboard and bulkhead deck, watertight compartments, weather tight compartments and bulkheads of vessel
- Costs of material, consumables and labour
- Environmental protection requirements including safe disposal of waste material, safe use and storage of chemicals, and safe handling and storage of LPG
- Environmental risks and hazards
- Inspections to be undertaken on vessel hull during slipping or dry docking
- Maintenance procedures and methodologies for:
 - batteries
 - cooling water systems including treatment
 - fuel systems including contamination

- heat exchangers
- hull maintenance including use of sacrificial anodes
- hydraulic systems
- lifesaving appliances
- lubricating oil systems including contamination
- power transmission systems
- steering systems
- starter motors, alternators and associated equipment
- Material and stress characteristics in constructing a vessel
- Methods of corrosion and how to prevent corrosion
- Organisational requirements, policies and procedures for organising maintenance programs
- Principal features of structure of a vessel
- Procedures for recording and reporting workplace information
- Types of tools and equipment, and procedures for their safe use and maintenance
- Valve types and construction

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
- 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 undertaking planned and breakdown maintenance of machinery, machinery systems and structural components 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 undertaking planned and breakdown maintenance of machinery, machinery systems and structural components
- direct observation of the candidate applying relevant

Guidance information for assessment

WHS/OHS requirements and work practices.

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.

Machinery, machinery systems and structural components may include:

- Electrohydraulic steering gear
- Engine and gearbox:
 - cooling systems
 - lubricating systems
- Engine fuel systems
- Gearbox
- Hydraulic systems including steering gear
- Pumps and pumping systems for bilge, fuel oil, freshwater and seawater systems
- Refrigeration plant and its operation
- Refrigeration system components
- Steering gear
- Transmission systems from engine output shaft to propeller
- Two- and four-stroke diesel engines

Special requirements for maintenance may include:

- Asbestos awareness
- Awareness of confined and restricted space operations
- Dry docking
- Handling refrigerant gas within regulatory requirements

Maintenance tasks may include:

- Cleaning:
 - coolers
 - filters
- Greasing
- Maintaining:
 - emergency equipment
 - firefighting and lifesaving equipment
- Oiling
- Oily water separator
- Overhauling and repairing pumps
- Scheduled survey inspections
- Topping up oils

Consumables and equipment may include:

- Cleaning chemicals
- Coolants
- Hand and power tools
- Oils and grease

- Emergency equipment may include:
- Refrigerant gas
 - Replacement parts
 - Test equipment
 - Communication equipment
 - Emergency lighting
 - Firefighting equipment
 - First aid provisions
 - Lifesaving equipment
- Nature of breakdown may include:
- Cooling water system failure
 - Engine failure
 - Exhaust systems
 - Fuel system failure
 - Gearbox failure
 - Loss of control systems
 - Lubricating systems failure
 - Power plant failure
 - Propeller and shafting arrangements
 - Pumping systems failure
 - Refrigeration plant and its operation
 - Steering gear failure
- Restrictions applied to operations may include:
- Stopping or slowing main engine
 - Switching to emergency power
- Reports may include:
- Incident reports
 - Maintenance log
 - Reports required under planned maintenance system
 - Survey reports

Unit Sector(s)

Not applicable.

Competency Field

Equipment Checking and Maintenance