



Australian Government

MARB4006A Undertake maintenance of 240 to 440 voltage alternating current electrical systems

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 perform establish, organise and implement a preventative and reactive maintenance program and capabilities on 240 to 440 voltage alternating current (AC) electrical systems on a vessel.

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.

WARNING: Relevant state/territory qualification requirements apply to persons carrying out installation, maintenance and/or repair of refrigeration equipment, especially with regard to preventing the escape of refrigerants into the atmosphere and to electrical work.

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 Regulatory and organisational requirements for <i>electrical system</i> maintenance program are identified and followed1.2 Specifications, diagrams and organisational procedures for electrical systems are checked for recommended maintenance1.3 <i>Special requirements for electrical system maintenance</i> are separated from adjustment and day-to-day maintenance schedules1.4 Maintenance system goals for electrical systems are outlined1.5 Maintenance plan and related work schedule for electrical systems are developed according to regulatory requirements and safety management system (SMS) |
| 2 Establish maintenance systems | <ul style="list-style-type: none">2.1 Maintenance costs are identified and quantified2.2 Interruptions, processes and procedures are documented2.3 Internal and external maintenance providers are specified2.4 Maintenance plan is prepared to minimise negative impacts on production, costs, waste and 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 from 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 and scheduling of resource availability3.4 Team members with required competencies are allocated to maintenance activities3.5 <i>Consumables and equipment</i> are secured to meet work plan requirements3.6 Externally sourced equipment, consumables and expertise are located and procured3.7 Contingency plans are prepared |

- 3.8 Maintenance schedules and procedures are effectively communicated to 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 system 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 timeframe
- 5 Perform planned maintenance activities**
 - 5.1 WHS/OHS risk control measures and procedures for carrying out work are followed
 - 5.2 Maintenance schedule and process compliance requirements are confirmed and work is appropriately sequenced according to job specification
 - 5.3 Appropriate person/s are consulted to ensure work is coordinated effectively with others
 - 5.4 Resources needed to conduct maintenance are obtained according to organisational procedures and are checked against job requirements
 - 5.5 Tools, equipment and testing devices needed to conduct maintenance are obtained according to organisational procedures and checked for correct operation and safety
 - 5.6 Live and operating system is tested or measured strictly according to WHS/OHS requirements and within established safety procedures
 - 5.7 Electrical equipment is checked as being isolated where necessary, strictly according to WHS/OHS requirements and within established safety procedures
 - 5.8 Electrical equipment to be maintained is inspected and evaluated for compliance with system specifications
 - 5.9 Non-compliant electrical equipment components are rectified or repaired according to system specifications

- 6 **Perform breakdown maintenance**
 - 6.1 *Nature of breakdown* is confirmed with appropriate personnel
 - 6.2 Extent of breakdown is evaluated and confirmed using diagnostic and troubleshooting techniques
 - 6.3 *Restrictions* are applied to operations, if necessary, and agreed to with the Master
 - 6.4 Electrical equipment is checked as being isolated where necessary, strictly according to WHS/OHS requirements and within established safety procedures
 - 6.5 Repair work is carried out according to system specifications
 - 6.6 Master is notified of completion of repair work and details are documented
 - 6.7 Nature of breakdown is confirmed with appropriate personnel
- 7 **Monitor, adjust and report on implementation of maintenance plan**
 - 7.1 Maintenance tasks are monitored to ensure they are completed according to maintenance plan and statutory survey requirements
 - 7.2 Electrical systems is 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 SMS

Required Skills and Knowledge

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

Required Skills:

- Apply safety requirements throughout work sequence including the use of personal protective equipment (PPE)
- Complete all work to specification
- Ensure correct requirements and details of maintenance of electrical systems and equipment
- Implement safe and environmentally responsible work practices in testing and maintenance activities
- Locate, interpret and apply manufacturer specifications for electrical systems and equipment
- Operate AC systems and conduct operator preventive maintenance according to manufacturer recommendations, regulations and vessel operating procedures to ensure safe operation
- Operate electrical systems and equipment according to manufacturer recommendations, regulations and vessel operating procedures to ensure safe operation
- Recognise electrical system faults and where necessary take steps to make them immediately safe
- Select and use appropriate processes, tools and equipment

Required Knowledge:

- AC systems not exceeding 440 voltage AC
- Batteries (types, care and maintenance, hazards)
- Care of electrical systems and equipment in general (fault recognition)
- Charging systems:
 - alarms/indicators
 - regulators
- Connecting batteries
- Electric systems (above 240 V AC and up to 440 V AC)
- Fault identification, location and safety implications
- Operation and maintenance of starter motors, alternators and associated equipment
- Personal safety
- Protective devices on switchboards
- Shore power connection
- Use of fuses and circuit breakers (selection of correct capacity)

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 currency of relevant WHS/OHS skills and knowledge.

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 240 to 440 voltage AC electrical 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 undertaking planned and breakdown maintenance of 240 to 440 voltage AC electrical systems
- 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.

Electrical systems may include:

- AC generators
- Alarm systems
- Batteries
- Electrical motor starting circuits
- Emergency electrical supply
- Emergency generators
- Generators
- Power and lighting
- Shore supply
- Steering gear
- Switchboards

Special requirements for electrical system maintenance may include:

- Breakdown maintenance
- Periodic inspections and surveys

Maintenance tasks may include:

- Battery maintenance
- Generator servicing
- Replacing faulty wiring
- Testing:
 - alarm systems
 - emergency generator
 - power and lighting systems

Consumables and equipment may include:

- Replacement parts
- Testing equipment
- Tools and equipment rated for electrical work

Emergency equipment may include:

- Alarm systems
- Emergency generator
- Firefighting equipment
- Lifesaving equipment
- Pump operations

Nature of breakdown may include:

- Failure of electricity generating systems
- Generator failure

Restrictions may include:

- Stopping main engine
- Stopping one generator
- Switching to emergency power

Reports may include:

- Incident reports
- Maintenance log

- Operational orders from organisation SMS
- Reports required under planned maintenance system
- Survey reports

Unit Sector(s)

Not applicable.

Competency Field

Equipment Checking and Maintenance