



Australian Government

MARC4007A Operate 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 operate a 240 to 440 voltage alternating current (AC) electrical system 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.

WARNING: Relevant state/territory training and qualification requirements need to be fulfilled by any 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 Prepare for operation | 1.1 Risks to self, others and the environment are identified according to organisational procedures |
| | 1.2 Routine pre-operational checks of <i>electrical systems</i> are completed prior to use according to manufacturer specifications and organisational procedures |
| 2 Operate electrical systems | 2.1 Suitable personal protective equipment is selected and used according to organisational procedures |
| | 2.2 Electrical systems are operated in a safe and controlled manner |
| | 2.3 Performance of direct current (DC) and AC electrical systems is monitored |
| | 2.4 AC electrical demand is monitored and additional generators are paralleled or disconnected as required |
| | 2.5 Ship to shore electrical supply is connected and disconnected when required following established practices and organisational procedures |
| | 2.6 Faults or malfunctions are identified and reported according to organisational procedures |
| | 2.7 Faults or malfunctions are rectified and corrective actions are taken and recorded according to organisational procedures |
| | 2.8 Procedures to be undertaken in <i>emergencies</i> are recognised and implemented |
| 3 Complete operations and check electrical systems | 3.1 Shut-down procedures are conducted according to manufacturer instructions and organisational procedures |
| | 3.2 <i>Operational records</i> 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 electrical systems including:
 - battery ampere-hours and efficiency
 - series and parallel configuration of battery supply
 - adding resistors in series and parallel, and calculating current
- Connect to shore power
- Isolate electrical circuits
- Maintain records of operating and maintaining electrical systems, and any related safety incidents
- Monitor and evaluate performance of electrical systems
- Perform switchboard operations including the monitoring of electrical supply and procedures for paralleling generators
- Read and interpret:
 - manufacturer instructions for the operation of electrical systems
 - maritime regulations, rules and instructions
- Recognise problems that may occur with electrical systems and take appropriate preventative and remedial action
- Recognise when performance of electrical systems is unsatisfactory or outside of specified limits and take appropriate action
- Start emergency generator and supply switchboard where available
- Use hydrometer
- Use multi-meter to test for voltage and continuity

Required Knowledge:

- Battery:
 - operation
 - charging circuits and hazards associated with charging batteries
 - types, care and hazards
- Characteristics of electrical systems
- Dangers associated with operation of shipboard electrical systems and related hazard prevention strategies
- Earth detection devices
- Electrical distribution systems including emergency arrangements
- Faults associated with electrical systems and appropriate preventative and remedial action, and solutions

- Methods for managing operation of shipboard electrical systems
- Motor and alternator construction
- Motor starter circuits
- Principles of operation of various shipboard emergency systems including fire detection system, internal communications system and emergency generator
- Procedures for monitoring and evaluating performance of electrical systems
- Relevant sections of state and territory maritime regulations, NSCV and USL Code
- Relevant work health and safety (WHS)/occupational health and safety (OHS) legislation and policies
- Safety devices fitted to switchboard and other electrical systems including fuses and circuit breakers
- Sequence of required action when power unit becomes overloaded
- Shore power arrangements
- Single and three phase AC power generation

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.

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 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 operating 240 to 440 voltage AC electrical 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.

- Electrical systems must include:
- Alternators
 - Batteries and associated circuits
 - Control circuits
 - Fire detection
 - Motors
 - Starter circuits
 - Switchboard
- Emergencies must include:
- Failure of:
 - generator
 - emergency generator
 - Fire
 - Flooding
- Operational records must include:
- Log books
 - Maintenance records
 - Operational orders from the organisation's safety management system
 - Plant and equipment manufacturer instructions and recommended procedures
 - Relevant maritime authorities documentation relating to operating electrical systems

Unit Sector(s)

Not applicable.

Competency Field

Equipment Operations