



Australian Government

MARL007 Demonstrate basic knowledge of marine electrical systems

Release: 1

MARL007 Demonstrate basic knowledge of marine electrical systems

Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to operate alternators, generators and control systems to supply shipboard electrical power on board 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.

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| 1 Explain hazards and isolation procedures associated with live electrical components | 1.1 | Effects of electricity on the human body are outlined |
| | 1.2 | Procedure to be taken in the event of a person suffering an electric shock is clarified |
| | 1.3 | Correct procedure for isolating an electrical circuit is clarified |
| | 1.4 | Electrical hazards in a vessel at sea or port are identified |
| 2 Explain basic operation of and | 2.1 | Functional and operational requirements for a marine high voltage system are detailed |

hazards associated with marine high voltage installations	2.2	Safety procedures required when working in high voltage environments are outlined
	2.3	Procedure for assisting suitably qualified personnel to carry out maintenance and repair of high voltage switchgear of various types is outlined
3 Explain principles of power generation and transmission in AC and DC circuits	3.1	Excitation methods used to produce alternating current (AC) and direct current (DC) voltages are outlined
	3.2	Basic voltage control of generated AC voltages is outlined
4 Outline key features of basic electrical diagrams used on vessels	4.1	Types of diagrams used to depict electrical systems on ships are outlined
	4.2	Electrical symbols used in basic electrical diagrams are identified
	4.3	Electrical devices used in basic electrical circuits are clarified
5 Use common electrical measuring and testing instruments	5.1	Different types of multimeters are used appropriately
	5.2	Functions of insulation and ‘tong’ testers are explained
	5.3	Safety requirements when using test equipment are applied
6 Rectify basic electrical faults	6.1	Fault situation is determined by appropriate questioning of client or operator
	6.2	Safe working practices are demonstrated when carrying out fault-finding work
	6.3	Basic common faults of equipment and techniques used to find faults are outlined
	6.4	Knowledge of various types of basic common faults of circuits and techniques is used to find faults
	6.5	Basic common faults in electrical equipment are identified and rectified
7 Outline basic components and layout of a marine electrical switchboard	7.1	Layout of a typical three wire insulated electrical system is sketched
	7.2	Interconnections between main switchboard, emergency switchboard and shore supply are explained
	7.3	Procedure for changing over to emergency switchboard for testing or during loss of mains power is outlined

	7.4	Safety features on a typical marine switchboard are identified
8 Explain operation of shipboard alternators	8.1	Types and construction methods of alternators used on a marine vessel are outlined
	8.2	Principles of operation of a marine type alternator are outlined
	8.3	Relationship is shown between voltage and speed in regulation of alternator
	8.4	Operational characteristics of a marine alternator are outlined
	8.5	Excitation and automatic voltage regulation systems used with marine alternators are clarified
9 Explain procedures for paralleling of alternators	9.1	Process of measuring voltage, frequency and phase angle is outlined
	9.2	Automatic and manual procedures for synchronising and paralleling marine alternators, including machines of different capacities are clarified
	9.3	How two machines can be adjusted to share kVAR and kW loads is confirmed
	9.4	Process of removing an alternator from the bus is outlined

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.

Electrical hazards include one or more of the following:

- electric shock
- electrical fire
- moving and rotating electrical equipment
- non-compliance with safe working procedures
- over-speed of electrical machinery
- poor housekeeping procedures
- using equipment beyond safe working limits

Unit Mapping Information

This is a new unit. This unit is equivalent to MARL5009A Demonstrate basic knowledge of marine electrical 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 MARL007 Demonstrate basic knowledge of marine electrical systems

Modification History

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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:

- assessing own work outcomes and maintaining knowledge of current codes, standards, regulations and industry practices
- explaining basic principles of alternators, generators and control systems
- identifying and interpreting numerical and graphical information in electrical diagrams and specifications for a commercial vessel
- identifying and suggesting ways of rectifying electrical hazards and emergency situations on a vessel
- identifying methods, procedures and materials needed for operating, maintaining and repairing basic marine electrical 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 written information related to electrical circuitry and components on commercial vessels
- using electrical measuring and testing instruments.

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:

- AC/DC voltage
- alternators:
 - construction
 - characteristics
 - synchronised operation
- electrical:
 - safe working practices
 - measuring and testing instruments
 - symbols, basic electrical diagrams/circuits
- marine electrical systems:

- switchboards
- instrumentation
- earthing
- phase angle, power factor and current flow
- procedures for dealing with hazards and emergencies
- resistance, inductance and capacitance
- switchboards and protection:
 - purpose
 - testing and maintenance
 - equipment removal
- work health and safety (WHS)/occupational health and safety (OHS) legislation and policies.

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