



Australian Government

MARL058 Demonstrate basic knowledge of marine electrical systems

Release: 1

MARL058 Demonstrate basic knowledge of marine electrical systems

Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package.

Application

This unit involves the skills and knowledge required to operate alternators, generators and control systems to supply shipboard electrical power onboard a commercial vessel.

This unit applies to people working in the maritime industry in the capacity of:

- Electro-Technical Officer (STCW Electro-Technical Officer Unlimited)
- Engineer Class 3 Near Coastal
- Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited).

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit.

- Regulatory requirements include STCW International Maritime Organization (IMO) model course competencies and areas of knowledge, understanding and proficiency, together with the estimated total hours required for lectures and practical exercises. Teaching staff should note that timings are suggestions only and should be adapted to suit individual groups of trainees depending on their experience, ability, equipment and staff available for training.

Near Coastal Qualifications:

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Engineer Class 3 Near Coastal as defined in the Marine Order 505 (Certificates of competency - National Law) 2013.

Blue Waters Qualifications:

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Electro-Technical Officer (STCW Electro-Technical Officer Unlimited) or Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited) and to meet regulatory requirements this unit must be delivered consistent with Marine Orders and with the relevant sections of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

Pre-requisite Unit

Not applicable.

Competency Field

L - Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Explain hazards and isolation procedures associated with live electrical components

2 Explain principles of power generation and transmission in alternating current (AC) and direct current (DC) circuits

3 Outline key features of basic electrical diagrams used on vessels

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

1.1 Effects of electricity on the human body are outlined

1.2 Procedures to be taken in the event of a person suffering an electric shock are 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

2.1 Excitation methods used to produce AC and DC voltages are outlined

2.2 Basic voltage control of generated AC voltages is outlined

3.1 Types of diagrams used to depict electrical systems on ships are outlined

	3.2	Electrical symbols used in basic electrical diagrams are identified
	3.3	Electrical devices used in basic electrical circuits are clarified
4 Use common electrical measuring and testing instruments	4.1	Different types of multimeters are used appropriately
	4.2	Functions of insulation and ‘tong’ testers are explained
	4.3	Safety requirements when using test equipment are applied
5 Rectify basic electrical faults	5.1	Fault situation is determined by appropriate questioning of client or operator
	5.2	Safe working practices are demonstrated when carrying out fault-finding work
	5.3	Basic common faults of equipment and techniques used to find faults are outlined
	5.4	Knowledge of various types of basic common faults of circuits and techniques is used to find faults
	5.5	Basic common faults in electrical equipment are identified and rectified
6 Outline basic components and layout of a marine electrical switchboard	6.1	Layout of a typical three-wire insulated electrical system is sketched
	6.2	Interconnections between main switchboard, emergency switchboard and shore supply are explained
	6.3	Procedure for changing over to emergency switchboard for testing or during loss of mains power is outlined
	6.4	Safety features on a typical marine switchboard are identified
7 Explain operation of shipboard alternators	7.1	Types and construction methods of alternators used on a marine vessel are outlined
	7.2	Principles of operation of a marine type alternator are outlined

	7.3	Relationship is shown between voltage and speed in regulation of alternator
	7.4	Operational characteristics of a marine alternator are outlined
	7.5	Excitation and automatic voltage regulation systems used with marine alternators are clarified
8 Explain procedures for paralleling of alternators	8.1	Process of measuring voltage, frequency and phase angle is outlined
	8.2	Automatic and manual procedures for synchronising and paralleling marine alternators, including machines of different capacities, are clarified
	8.3	How two machines can be adjusted to share kilovolt-ampere reactive (kVAR) and kilowatt (kW) loads is confirmed
	8.4	Process of removing an alternator from the bus is outlined

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Unit Mapping Information

This unit replaces and is equivalent to MARL007 Demonstrate basic knowledge of marine electrical systems.

Links

Companion Volume implementation guide can be found in VetNet -

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

Assessment Requirements for MARL058 Demonstrate basic knowledge of marine electrical systems

Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package.

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:

- alternating current (AC)/direct current (DC) voltage
- alternators:
 - characteristics
 - construction
 - synchronised operation
- automatic control devices, including:
 - process control
 - system control
- electrical:

- measuring and testing instruments
- safe working practices
- symbols, basic electrical diagrams/circuits
- electrical hazards, including:
 - 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
- electrical motors
- high voltage (HV)
- marine electrical systems, including:
 - earthing
 - instrumentation
 - power distribution boards
 - switchboards
- monitoring systems
- phase angle, power factor and current flow
- procedures for dealing with hazards and emergencies
- protective devices
- resistance, inductance and capacitance
- switchboards and protection, including:
 - equipment removal
 - purpose
 - testing and maintenance
- work health and safety (WHS)/occupational health and safety (OHS) legislation and policies.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

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.

Practical assessment must occur in a workplace, or realistic simulated workplace, under the normal range of workplace conditions.

Simulations and scenarios may be used where situations cannot be provided in the workplace or may occur only rarely, in particular for situations relating to emergency procedures and adverse weather conditions where assessment would be unsafe, impractical or may lead to environmental damage.

Resources for assessment must include access to:

- applicable documentation, such as legislation, regulations, codes of practice, workplace procedures and operational manuals
- tools, equipment, machinery, materials and relevant personal protective equipment (PPE) currently used in industry.

Links

Companion Volume implementation guide can be found in VetNet -

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