



Australian Government

Assessment Requirements for MARL051 Demonstrate advanced knowledge of marine electrical systems

Release: 1

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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:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements and work practices
- assessing own work outcomes and maintaining knowledge of current codes, standards, regulations and industry practices
- explaining advanced principles of electrical circuits, switchboards, alternators and circuit breakers
- explaining advanced principles of lighting, cathodic protection and high voltage (HV) systems
- identifying and interpreting complex 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, testing and repairing complex marine electrical systems
- imparting knowledge and ideas through verbal, written and visual means
- 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
- AC and DC marine motors
- alternators, including:
 - alternator excitation system design
 - characteristics
 - construction

- synchronised operation
- types
- batteries
- cables, including:
 - calculation of voltage drop
 - classification and identification of cables and wires
 - cross section of cables
 - identifying types of cables
 - rules and purpose of cable shielding
 - sizing of cable for current tolerance and acceptable voltage drop
- cathodic protection system
- circuit breakers
- circuits
- distribution layout systems, including:
 - emergency lights
 - safety lights
- earthing
- electrical safe working practices
- electrical:
 - layout systems
 - measuring and testing instruments
 - shipboard equipment
 - symbols, basic electrical diagrams/circuits
- emergency battery systems
- encapsulation, including:
 - drip proof
 - submersible
 - totally enclosed fan cooled (TEFC)
- fault-finding procedures
- HV electrical motor propulsion systems
- how excitation systems impact on output normal and adverse circumstances, including:
 - loss of excitation
 - short circuit
- isolation procedures
- lighting systems used onboard ships, including:
 - fluorescent
 - halogen
 - incandescent
 - light-emitting diode (LED)
 - mercury

- sodium vapour
- marine motors, including:
 - polyphase
 - reduced starting current motors
 - single
 - speed changing
 - synchronous
 - variable speed
- motor ratings, including:
 - continuous
 - short time
- motor starters for three phase and synchronous motors
- motor starters, including:
 - direct on line (DOL)
 - primary and secondary resistance
 - soft or electronic starters
 - star-delta
 - transformer starter
- operating parameters, including:
 - excitation current
 - insulation grade
 - operating temperature
 - speed
- operational problems, including:
 - loss of insulation resistance
 - open circuit
 - overheating
 - short circuit
 - wrong connections
- phase angle, power factor, and current flow
- power management and uninterruptable power supply (UPS) fitted to vessels
- problems, including:
 - electric shock
 - enclosed space work
 - non-compliance with safe working procedures
 - unfamiliar with marine electrical systems
 - using equipment beyond safe working limits
 - working at heights
- procedures for dealing with hazards and emergencies
- regulations of relevant state/territory maritime and electrical licensing authorities

- resistance, inductance and capacitance
- requirements and components associated with electrical systems for hazardous spaces onboard vessels
- risks and safety procedures associated with working in HV environments
- safe electrical working practices
- safety requirements, including:
 - company requirements
 - manufacturer requirements
 - statutory requirements
- safety, environmental and hazard control precautions and procedures relevant to marine electrical systems
- switchboard layouts, including:
 - DC systems
 - dedicated power supplies
 - dual supply for steering gear
 - feed-back and feed forward arrangements
 - interconnection with low voltage (LV)
- systems and components, including:
 - motors
 - transformers
- switchboards and protection, including:
 - purpose
 - testing and maintenance
 - equipment removal
- WHS/OHS requirements and work practices.

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 personnel and 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>