



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

**Revision Number: 1**

## **TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

### **Modification History**

Not applicable.

### **Unit Descriptor**

**UNIT DESCRIPTOR:**

**This unit involves the skills and knowledge required to operate and carry out basic routine servicing checks within the limits of responsibility and skill level of a Marine Engine Driver Grade 2 on electrical systems up to 50 volts AC and 115 volts DC, starter motors and alternators used on a small vessel, including operation and basic maintenance of DC systems, basic care and basic maintenance of batteries and charging systems and basic operation and basic maintenance of starter motors, alternators and associated equipment.**

Note: All installation, maintenance and repair of AC (50 volts or above) or DC (above 115 volts) must be carried out only by a suitably qualified engineer or licensed tradesman. Relevant State/Territory electrical licensing requirements must be fulfilled by any persons carrying out installation, maintenance and repair of electrical circuits and systems at such voltages on a vessel.

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### **Application of the Unit**

<b>Application of the unit</b>	The unit has applications in the qualification for a Marine Engine Driver Grade 2 (MED 2) as per relevant sections of Part D of the National Standard for Commercial Vessels (NSCV), i.e. Certificate III in Transport&Distribution (Marine Engine Driving - Grade 2).
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## Licensing/Regulatory Information

<b>Licensing/legislative requirements</b>	The unit is consistent with the relevant sections of State and Territory maritime regulations and NSCV/USL Code for a MED 2.
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## Pre-Requisites

Not applicable.

## Employability Skills Information

Not applicable.

## Elements and Performance Criteria Pre-Content

<i>Elements describe the essential outcomes of a unit of competency.</i>	<i>Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.</i>
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
<b>1 Operate low and medium voltage electrical systems</b>	<ul style="list-style-type: none"> <li>a All relevant specifications and operating procedures are obtained</li> <li>b Low and medium voltage electrical systems are operated safely in accordance with licensing requirements and manufacturer's instructions and specifications</li> <li>c The performance of low and medium voltage electrical systems is monitored in accordance with manufacturer's instructions</li> <li>d Poor performance and faults are identified and appropriate action initiated to report or rectify the problem in accordance with standard operating procedures</li> <li>e Records of performance are maintained in accordance with standard operating procedures where required</li> </ul>

ELEMENT	PERFORMANCE CRITERIA
<p><b>2 Carry out basic maintenance on low and medium voltage electrical equipment and systems</b></p>	<ul style="list-style-type: none"> <li>a All relevant circuit diagrams, specifications and schematics are obtained</li> <li>b Basic maintenance procedures are carried out in accordance with licensing restrictions and manufacturer's instructions within the limits of responsibility of a Marine Engine Driver Grade 2</li> <li>c Poor performance and faults are investigated in accordance with manufacturer's instructions and appropriate action initiated to report or rectify problems identified in accordance with standard operating procedures</li> <li>d Faulty equipment and components are identified and reported, and action is initiated as required for isolation, tagging and repair or replacement in accordance with standard operating procedures and regulatory requirements</li> <li>e Faults in electrical systems and equipment are localised and isolated within limits of responsibility using appropriate tools, test equipment, techniques and procedures</li> <li>f Repaired equipment and system is tested and reactivated in accordance with electrical regulations and manufacturer's instructions</li> <li>g Appropriate action is taken within limits of responsibility to prevent damage in accordance with safety regulations and manufacturer's instructions</li> <li>h Reports of maintenance activities are recorded in accordance with standard operating procedures</li> </ul>
<p><b>3 Follow safety and hazard control procedures</b></p>	<ul style="list-style-type: none"> <li>a Safety and hazard minimisation procedures and regulations are followed at all times when operating and maintaining low and medium voltage electrical systems.</li> <li>b Operational and maintenance hazards are identified and action is taken to minimise or eliminate risk to personnel, vessel and the environment</li> </ul>

ELEMENT	PERFORMANCE CRITERIA
	<p>c Action is taken in the event of failure or emergency to isolate and secure the electrical systems and maintain the safety of the vessel and persons involved</p> <p>d Vessel's emergency and contingency plans are followed in the event of a failure or emergency involving low and medium voltage electrical systems</p>

## Required Skills and Knowledge

### REQUIRED KNOWLEDGE

*This describes the knowledge required for this unit.*

- 1 Relevant OH&S legislation and electrical regulations and wiring rules  
Note: All installation, maintenance and repair of AC (50 volts or above) DC (above 115 volts) must be carried out only by a suitably qualified engineer or licensed tradesman. Relevant State/Territory electrical licensing requirements must be fulfilled by any persons carrying out installation, maintenance and repair of electrical circuits and systems at such voltages on a vessel.
- 2 Relevant sections of State and Territory maritime regulations, NSCV and USL Code dealing with the maintenance of small vessels
- 3 Limits of responsibility in terms of company requirements and electrical licensing requirements
- 4 Procedures for the operation and routine maintenance of low and medium voltage electrical systems, on a small vessel falling within the limits of responsibility of a Marine Engine Driver Grade 2, including:
  - a standard operating procedures for low and medium voltage electrical systems used on small vessels
  - b preventative maintenance checks and procedures
  - c the use of appropriate instrumentation when checking performance and identifying faults
  - d procedures and precautions when connecting batteries
  - e procedures for connecting a small vessel to shore power
  - f basic fault-finding techniques

## REQUIRED KNOWLEDGE

- g procedures for localising faults and isolating faulty circuits and equipment
  - h repair and replacement procedures
  - i safety precautions and hazard minimisation strategies when working on electrical systems
- 5 Safety, environmental and hazard control precautions, and procedures relevant to the operation and maintenance of low and medium voltage systems and associated equipment on a small vessel
- 6 Principles of typical low and medium voltage systems used on small vessels, including:
- a basic electro-technology and electrical circuit theory relevant to the operation and maintenance of low and medium voltage electrical systems on a small vessel
  - b basic care and maintenance of shipboard electrical systems generally
  - c configuration of typical AC and DC low voltage electrical systems used on a small vessel
  - d batteries - types, care, maintenance, hazards and safety precautions
  - e use of protection devices, including the selection of correct capacity
  - f types of starter motors and alternators typically used on small vessels
  - g series and parallel operation

## **REQUIRED KNOWLEDGE**

- 7 Problems related to the during the operation and maintenance of low and medium voltage systems, starter motors and alternators on small vessels and appropriate action and solutions
- 8 Servicing records that are kept on a small commercial vessel

## **REQUIRED SKILLS**

*This describes the basic skills required for this unit.*

- 1 Use basic verbal communication skills required when operating and servicing marine low and medium voltage electrical systems
- 2 Read, interpret and apply operating and service manuals and instructions for marine low and medium voltage electrical systems, including all required OH&S procedures and precautions
- 3 Read and interpret material safety data sheets
- 4 Read and interpret equipment and instrument gauge and meter readings and indications
- 5 Complete any required operational and servicing records
- 6 Work safely and collaboratively with others when operating and servicing marine low and medium voltage electrical systems
- 7 Select and use relevant tools and equipment as per instructions
- 8 Recognise faulty low and medium voltage electrical systems and take appropriate action
- 9 Recognise routine problems when operating and servicing marine low and medium voltage electrical systems and take appropriate action
- 10 Adapt to differences in vessels, electrical systems and equipment and operating and servicing procedures
- 11 Operate marine low and medium voltage electrical systems as per standard operating procedures

## **Evidence Guide**

<p><b>Evidence Guide</b>  <b>TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS</b></p>
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*The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.*

<p><b>1 Critical aspects of evidence required to demonstrate competency in this unit</b></p>	<p>Assessment must confirm appropriate knowledge and skills to:</p> <ul style="list-style-type: none"> <li>a Operate and carry out maintenance and checks on low and medium voltage electrical systems and associated equipment in accordance with regulatory restrictions and manufacturer's instructions</li> <li>b Initiate and coordinate maintenance, repair or replacement of faulty or damaged equipment and components in accordance with regulatory restrictions and manufacturer's instructions</li> <li>c Exercise all required safety, environmental and hazard control precautions and procedures during operational and maintenance operations</li> <li>d Communicate effectively with others when carrying out operations and maintenance procedures on board a vessel</li> </ul>
<p><b>2 Evidence required for demonstration of consistent performance</b></p>	<ul style="list-style-type: none"> <li>a Performance is demonstrated consistently over a period of time and in a suitable range of contexts</li> <li>b Consistently applies underpinning knowledge and skills when: <ul style="list-style-type: none"> <li>1 operating and carrying out maintenance on low and medium voltage systems</li> <li>2 identifying and evaluating operational and maintenance problems and determining appropriate courses of action</li> <li>3 applying safety precautions relevant to the operation and maintenance of low and medium voltage systems</li> </ul> </li> <li>c Shows evidence of application of relevant workplace procedures, including: <ul style="list-style-type: none"> <li>1 relevant sections of State and Territory marine and electrical regulations, NSCV and USL Code</li> </ul> </li> </ul>



**Evidence Guide**

**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

- 2 OH&S regulations, pollution control and hazard prevention policies and procedures
- 3 job procedures and work instructions
- 4 manufacturer's guidelines relating to the operation and basic routine maintenance of low and medium voltage electrical systems
- d Action is taken promptly to report and/or rectify issues and problems identified with the operation and basic routine maintenance of low and medium voltage systems
- e Work is completed systematically with required attention to detail
- f Recognises and adapts appropriately to cultural differences in the workplace, including modes of behaviour and interactions among crew and others

**Evidence Guide (continued)**

**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

**Context of  
3 assessment**

- a Assessment of competency must comply with the assessment requirements of the relevant maritime regulations
- b Assessment of this unit must be undertaken within relevant marine authority approved and audited arrangements by a registered training organisation:
  - 1 As a minimum, assessment of knowledge must be conducted through appropriate written/oral examinations, and
  - 2 Appropriate practical assessment must occur:
    - i at the registered training organisation; and/or
    - ii on an appropriate working or training vessel

**Evidence Guide (continued)**  
**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

**4 Specific resources required for assessment**

- Access is required to opportunities to:
- a participate in a range of exercises, case studies and other simulated practical and knowledge assessments that demonstrate the skills and knowledge to operate and carry out basic routine maintenance on low and medium voltage electrical systems within the permissible voltage levels on a small vessel; and/or
  - b operate and carry out basic routine maintenance on low and medium voltage electrical systems within the permissible voltage levels on an operational small commercial or training vessel

**Range Statement**

**Range Statement**  
**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

*The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.*

**VARIABLE**

**SCOPE**

**1. GENERAL CONTEXT**

<b>a. Work must be carried out:</b>	1 in compliance with the relevant sections of State and Territory maritime and electrical regulations, NSCV and USL Code
<b>b. Work is performed:</b>	1 within operational requirements, with responsibility for own outputs in relation to specified quality standards and limited responsibility for others in achieving the specified quality and quantity of outcomes

**Range Statement**

**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

- c. Work involves:** 1 the application of specified procedures for the operation and basic maintenance on low and medium voltage electrical systems on board a small vessel and the application of solutions to a variety of predictable basic maintenance problems

Note: All installation, maintenance and repair of AC (50 volts or above) DC (above 115 volts) must be carried out only by a suitably qualified engineer or licensed tradesman. Relevant State/Territory electrical licensing requirements must be fulfilled by any persons carrying out installation, maintenance and repair of electrical circuits and systems at such voltages on a vessel

**2. WORKSITE ENVIRONMENT**

<p><b>a Electrical systems may include:</b></p>	<p>1 those typically found on a small commercial vessel (for permissible voltage ranges, i.e. up to 50 volts AC and 115 volts DC)</p>
<p><b>b Operation and basic maintenance of on-board low and medium voltage systems may be carried out:</b></p>	<p>1 by day or night in both normal and emergency situations                  2 under any permissible conditions of weather                  3 while underway                  4 while anchored or moored                  5 during maintenance operations                  6 when vessel is slipped</p>
<p><b>c Basic maintenance may include:</b></p>	<p>1 preventative maintenance inspections, checks and procedures                  2 routine inspections of systems and equipment</p>

**Range Statement (continued)**

**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

<b>VARIABLE</b>	<b>SCOPE</b>
<p><b>c Basic maintenance may include: (continued)</b></p>	<p>3 identification of poor performance or faulty operation</p> <p>4 identification of faulty equipment or fittings and arranging for repair or replacement</p> <p>5 basic fault-finding and repair of low and medium voltage systems within limits of responsibility</p>
<p><b>d Equipment to be operated and maintained may include:</b></p>	<p>1 low and medium voltage AC and DC electrical distribution circuits</p> <p>2 single and three phase medium voltage electrical power systems</p> <p>3 protection devices typically used on the low and medium voltage electrical systems small vessels</p> <p>4 equipment for connection to shore power</p> <p>5 batteries and battery circuits</p> <p>6 earth indicating devices</p>
<p><b>e Maintenance tools and equipment may include:</b></p>	<p>1 hand tools, including screwdrivers, pliers, cutters, soldering iron, etc.</p> <p>2 meters, tong testers, wattmeters, Meggers and other relevant instrumentation</p> <p>3 protective clothing and equipment such as:</p> <p style="padding-left: 20px;">i eye and ear protection</p> <p style="padding-left: 20px;">ii head gear and helmet</p>

**Range Statement (continued)**  
**TDMMR2907B OPERATE AND MAINTAIN MARINE LOW AND MEDIUM VOLTAGE ELECTRICAL SYSTEMS**

	iii safety boots
<b>f Documentation and records may include:</b>	<ol style="list-style-type: none"> <li>1 relevant State/Territory electrical licensing requirements and wiring rules</li> <li>2 relevant sections of State and Territory marine regulations, NSCV and USL Code</li> <li>3 maintenance records</li> <li>4 company maintenance procedures</li> <li>5 manufacturer's instructions, specifications and recommended procedures</li> <li>6 relevant Australian standards</li> </ol>
<b>g Applicable legislation, regulations and codes may include:</b>	<ol style="list-style-type: none"> <li>1 State and Territory marine regulations related to the operation of small vessels</li> <li>2 National Standard for Commercial Vessels and USL Code</li> <li>3 relevant Commonwealth, State and Territory OH&amp;S legislation</li> <li>4 relevant State/Territory electrical licensing requirements and wiring rules</li> </ol>

**Unit Sector(s)**

Not applicable.

## Field

Field R Carry Out Operations on Equipment and Systems

### Relationship to other units

<b>Relationship to other units</b>	The unit may be assessed in conjunction with other units that relate to the functions of the occupation(s) concerned.
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