



**Australian Government**

# **MARC5001A Employ tools, equipment and materials in a shipboard context**

**Release 1**

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## **Modification History**

Release 1

This is the first release of this unit.

This unit replaces and is equivalent to TDMMB3707B Fabricate simple shipboard components.

## **Unit Descriptor**

This unit involves the skills and knowledge required to employ tools, equipment and materials to perform maintenance activities on a vessel. It includes the use of hand, power and machine tools, welding equipment, heat treatment processes, soldering operations, adhesives and bonding materials in performing routine and non-routine maintenance activities.

## **Application of the Unit**

This unit applies to the work of a Marine Engineer Class 3.

## **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

- |                                     |   |
|-------------------------------------|---|
| <b>1 Follow safe work practices</b> | <p>1.1 Work health and safety (WHS)/occupational health and safety (OHS) procedures relevant to using tools and equipment in a shipboard context are complied with</p> <p>1.2 Safety hazards are identified and reported according to safety and vessel procedures</p> <p>1.3 Prior to use, tools and equipment needed to carry out maintenance activities are checked for correct operation and safety according to safety and vessel procedures</p> <p>1.4 Before commencing maintenance activities, isolation precautions are implemented according to safety and vessel procedures</p>  |
| <b>2 Carry out heat treatment</b>   | <p>2.1 Requirements of job are determined from engineering drawings, job sheet or supervisor</p> <p>2.2 Heat treatment equipment is selected for required heat treatment according to safety, workplace and manufacturer requirements</p> <p>2.3 Equipment is set up and used according to standard operating procedures and manufacturer instructions</p> <p>2.4 Personal protective equipment (PPE) is used according to standard operating procedures</p> <p>2.5 Emergency procedures are complied with according to approved safety instructions</p> <p>2.6 Safety signs and symbols are identified and complied with according to approved safety instructions</p> <p>2.7 <b><i>Heat treatment process</i></b> is applied according to job, safety and workplace requirements</p> <p>2.8 Hazardous conditions are identified and risk control measures are implemented to maintain a safe work environment</p> |
| <b>3 Use hand tools</b>             | <p>3.1 Hand tools are used according to workplace procedures, WHS/OHS requirements and manufacturer instructions.</p> <p>3.2 Faults with hand tools and equipment are identified and reported to appropriate personnel</p>  |
| <b>4 Use hand power tools</b>       | <p>4.1 Hand power tools are used according to workplace procedures, WHS/OHS requirements and manufacturer instructions.</p> <p>4.2 Faults with hand power tools and equipment are identified and</p>  |

- reported to appropriate personnel
- 5 Perform onboard pipe work**
- 5.1 Job requirements are determined from engineering drawings, job sheet or supervisor
  - 5.2 Sequence of operations is determined according to workplace, WHS/OHS and job requirements
  - 5.3 Pipe work is fabricated and joined according to relevant standards, and job, safety and workplace requirements
  - 5.4 Pipe work is inspected for *defects* according to workplace procedures
  - 5.5 Pipe work is installed in specified location without damage or distortion to pipe work, surrounding environment or other services
  - 5.6 Type of filters and strainers in shipboard piping systems are located and determined using relevant engineering drawings and specifications
  - 5.7 Pipe work is tested for compliance with job specification and workplace requirements
- 6 Use machine tools**
- 6.1 Job requirements are determined from engineering drawings, job sheet or supervisor
  - 6.2 Sequence of operations is determined according to workplace, WHS/OHS and job requirements
  - 6.3 *Machine tools* are selected according to workplace procedures, WHS/OHS requirements and manufacturer instructions
  - 6.4 Machining operations are performed according to workplace, WHS/OHS and job requirements
  - 6.5 Components are measured in line with workplace, WHS/OHS and job requirements
  - 6.6 Machine is adjusted and maintained according to workplace, safety, manufacturer and job requirements
- 7 Perform welding and thermal cutting operations**
- 7.1 Job requirements are determined from engineering drawings, job sheet or supervisor
  - 7.2 Materials are prepared for welding using correct tools, equipment, materials and procedures
  - 7.3 Materials are welded using appropriate *welding process* according to relevant standards and job, safety and workplace requirements

- 7.4 **Joints** are welded according to relevant standards and job, safety and workplace requirements
- 7.5 Oxygen fuel gas cutting torch is used to cut straight lines and curves in mild steel plate up to 10 mm thick according to relevant standards and job, safety and workplace requirements
- 7.6 Weld is inspected according to relevant standards, and job and workplace requirements
- 8 Perform soldering operations**
- 8.1 Job requirements are determined from engineering drawings, job sheet or supervisor
- 8.2 Materials are prepared for soldering using correct tools, equipment, materials and procedures
- 8.3 Materials are soldered according to relevant standards and job, safety and workplace requirements
- 8.4 **Soldered joints** are performed according to relevant standards and job, safety and workplace requirements
- 8.5 Soldered joints are inspected according to relevant standards and job, and workplace requirements
- 8.6 Materials are desoldered using correct procedure and minimising damage to materials/components
- 9 Select and use sealants, adhesives, bonding agents, gaskets and packings**
- 9.1 Job requirements are determined from engineering drawings, job sheet or supervisor
- 9.2 Gaskets and packings are selected and used according to job requirements and manufacturer/component supplier instructions
- 9.3 Sealants and adhesives are selected and used according to job requirements and manufacturer/component supplier instructions
- 9.4 Plastic bonding is performed according to job requirements and manufacturer/component supplier instructions
- 9.5 Sealants, adhesives, bonding agents, gaskets and packings are stored according to workplace and manufacturer/component supplier instructions

## Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

### Required Skills:

- Assess own work outcomes and maintain knowledge of current codes, standards, regulations and industry practices
- Communicate procedures associated with using hand and machine tools and equipment verbally and in writing
- Identify methods, procedures and materials needed for operating hand and power tools on vessels
- Read and interpret written information related to operating tools and equipment used for maintenance operations on board vessels, including technical manuals and specifications
- Safely use hand and machine tools

### Required Knowledge:

- Characteristics, limitations and use of metals and non-metallic materials used in ship construction and repair
- Hand and power tools and component:
  - types
  - operational characteristics and performance specifications
  - maintenance
- Heat treatment:
  - material characteristics
  - applications, equipment and processes
  - emergency procedures
  - material preparation, quenching, preheating requirements
  - material condition during heat treating process
  - batch and/or piece loading of furnaces
  - safe loading of furnaces
  - hazards and control measures associated with heat treatment, including housekeeping
  - use and application of PPE
  - safe work practices and procedures
- Machine tools:
  - reasons for selecting chosen sequence of operations
  - methods of work holding
  - basic marking out techniques including datum points/lines
  - geometry of cutting tools for a range of materials and applications
  - benefits of using correctly sharpened cutting tools
  - machine operation

- selection of feeds and speeds to suit a range of materials and operations within the scope of this unit
- correct methods of mounting a variety of cutting tools
- safety issues with regard to correct clamping, guards and shields
- tolerances and limits of size
- situations indicating need for machine adjustment, lubrication and cleaning
- techniques, tools and equipment to measure materials and machined components
- use and application of PPE
- safe work practices and procedures
- hazards and control measures associated with general machining
- Materials used in ship construction and repair:
  - metallurgy principles
  - types of materials
  - limitations of materials
  - properties of materials
- National and international regulations, IMO Conventions and Codes, including AMSA Marine Orders applicable to managing shipboard plant and equipment maintenance and repair operations on vessels
- Pipe work:
  - installation techniques
  - purging techniques, applications and precautions
  - capping/sealing pipe work and assembly methods
  - identifying location/layout of pipe work and assemblies, and application and characteristics of enclosure/hanging/supporting systems
  - pipe work, ancillary installation and joining procedures
  - leak testing applications and uses
- Procedures for completing temporary and permanent repair and/or replacement procedures for plant and equipment on board vessels at sea, alongside and in dry dock
- Properties and parameters of engineering materials
- Safety data sheets (SDS)/Material safety data sheets (MSDS)
- Sealants, gaskets, bonding agents, adhesives and packing:
  - dangers of working with sealants and adhesives
  - operating principles of gaskets and their relationship to other components
  - types, characteristics, uses and limitations of sealants and adhesives
  - gasket installation procedures
  - sealant and adhesives application techniques
- Soldering:
  - cleaning solutions and properties, and cleaning procedures
  - use and application of PPE for manual soldering/desoldering
  - methods of joint preparation

- properties of fluxes and their uses
- heat and damage protection procedures
- procedures for preventing electrostatic discharge damage
- soldered joint testing and inspection procedures
- reworking procedures and precautions
- Testing procedures for materials under load:
  - compressive load testing procedures
  - shear load testing procedures
  - tensile load testing procedures
- Welding:
  - characteristics and properties of common metals and welding materials
  - effect of gas and electrical welding operations on metals
  - hazards and control measures associated with gas and electrical welding, including housekeeping
  - welding safety practices and procedures
  - effect of various treatments on a range of commonly used metals
  - use and application of PPE
- WHS/OHS legislation, policies and procedures



## 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:

- being aware of own ability and limits to rectify irregularities and faults
- ensuring currency of relevant WHS/OHS skills and knowledge
- initiating timely action in response to defects or damage.

### 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 employing tools, equipment and materials in a shipboard context 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 employing tools, equipment and materials in a shipboard context
- 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.

Heat treatment process may include:

- Annealing
- Hardening
- Normalising
- Tempering

Hand tools may include:

- Anvil
- Benders
- Brushes
- Chisels
- Chucks
- Cutters
- Drills
- Drivers
- Files
- Gear pullers
- Hacksaws
- Hammers
- Nippers
- Pliers
- Punchers
- Reamers
- Scissors
- Scrapers
- Spanners
- Swage block
- Taps and dies
- Vises
- Wrenches

Hand power tools may include:

- Drills
- Grinders
- Hand shear and nibbler
- Impact wrenches
- Portable jigsaw
- Sanders

Pipe work defects may include:

- Ovality
- Thinning

Machine tools may include:

- Drills
- Grinder

- Welding process may include:
- Lathes
  - Milling machines
  - Gas metal arc welding
  - Gas tungsten arc welding
  - Oxy-acetylene welding
  - Shielded metal arc welding
- Joints may include:
- Butt
  - Filet joints:
    - corner joints
    - lap joints
    - tee joint plate edge preparations
    - throat length with concave and convex reinforcement
- Soldered joints may include:
- Hard
  - Soft

## **Unit Sector(s)**

Not applicable.

## **Competency Field**

Equipment Operations