



Australian Government

MARC046 Employ tools, equipment and materials in a shipboard context

Release: 2

MARC046 Employ tools, equipment and materials in a shipboard context

Modification History

Release 2. This is the second release of this unit of competency in the MAR Maritime Training Package.

- Minor statement changes in unit Application.

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 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.

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.

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Engineer Class 3 Near Coastal as specified in Marine Order 505.
- This unit is one of the requirements to obtain 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).
- Those 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.

Training providers seeking to offer this unit of competency must gain AMSA approval before the unit is offered.

Seafarers seeking certification should check with AMSA.

Pre-requisite Unit

Not applicable.

Competency Field

C – Equipment Operations

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Follow safe work practices

2 Carry out heat treatment

PERFORMANCE CRITERIA

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

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|------------|---|
| 1.1 | Work health and safety (WHS)/occupational health and safety (WHS/OHS) procedures relevant to using tools and equipment are complied with |
| 1.2 | Safety hazards are identified and reported according to safety and vessel procedures |
| 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 |
| 1.4 | Before commencing maintenance activities, isolation precautions are implemented according to safety and vessel procedures |
| 2.1 | Requirements of job are determined from engineering drawings, job sheet or supervisor |
| 2.2 | Heat treatment equipment is selected for required heat treatment according to safety, workplace and manufacturer requirements |
| 2.3 | Equipment is set up and used according to standard operating procedures (SOPs) and manufacturer |

- instructions
- 2.4** Personal protective equipment (PPE) is used according to SOPs
 - 2.5** Emergency procedures are complied with according to approved safety instructions
 - 2.6** Safety signs and symbols are identified and complied with according to approved safety instructions
 - 2.7** Heat treatment process is applied according to job, safety and workplace requirements
 - 2.8** Hazardous conditions are identified, and risk control measures are implemented to maintain a safe work environment
- 3 Use hand tools**
- 3.1** Hand tools are used according to workplace procedures, WHS/OHS requirements and manufacturer instructions
 - 3.2** Faults with hand tools and equipment are identified and reported to appropriate personnel
- 4 Use hand power tools**
- 4.1** Hand power tools are used according to workplace procedures, WHS/OHS requirements and manufacturer instructions
 - 4.2** Faults with hand power tools and equipment are identified and reported to appropriate personnel
- 5 Perform 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 piping systems are identified using relevant engineering drawings and specifications

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| | 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 |

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| | 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 |

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 MARC018 Employ tools, equipment and materials in a

shipboard context.

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 MARC046 Employ tools, equipment and materials in a shipboard context

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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
- communicating procedures associated with using hand and machine tools and equipment verbally and in writing
- identifying methods, procedures and materials needed for operating hand and power tools on vessels
- initiating timely action in response to defects or damage
- reading and interpreting written information related to operating tools and equipment used for maintenance operations onboard vessels, including technical manuals and specifications
- safely using hand and machine tools.

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:

- characteristics, limitations and use of metals and non-metallic materials used in ship construction and repair
- hand and power tools and components, including:
 - maintenance
 - operational characteristics and performance specifications
 - types
- hand tools, including:
 - 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
- vices
- wrenches
- hand power tools, including:
 - drills
 - grinders
 - hand shear and nibbler
 - impact wrenches
 - portable jigsaw
 - sanders
- heat treatment, including:
 - applications, equipment and processes
 - batch and/or piece loading of furnaces
 - emergency procedures
 - hazards and control measures associated with heat treatment, including housekeeping
 - material characteristics
 - material condition during heat treating process
 - material preparation, quenching, and preheating requirements
 - safe loading of furnaces
 - safe work practices and procedures
 - use and application of personal protective equipment (PPE)
- heat treatment process, including:

- annealing
- hardening
- normalising
- tempering
- joints, including:
 - butt
 - corner joints
 - fillet joints
 - lap joints
 - tee joint plate edge preparations
 - throat length with concave and convex reinforcement
- machine tools, including:
 - basic marking out techniques, including datum points/lines
 - benefits of using correctly sharpened cutting tools
 - correct methods of mounting a variety of cutting tools
 - geometry of cutting tools for a range of materials and applications
 - hazards and control measures associated with general machining
 - machine operation
 - methods of work holding
 - reasons for selecting chosen sequence of operations
 - safe work practices and procedures
 - safety issues with regard to correct clamping, guards and shields
 - selection of feeds and speeds to suit a range of materials and operations within the scope of this unit
 - situations indicating need for machine adjustment, lubrication and cleaning
 - techniques, tools and equipment to measure materials and machined components
 - tolerances and limits of size
 - use and application of PPE
- machine tools, including:
 - drills
 - grinder
 - lathes
 - milling machines
- materials used in ship construction and repair, including:
 - limitations of materials
 - metallurgy principles
 - properties of materials
 - types of materials
- national and international regulations, International Maritime Organization (IMO) conventions and codes, including Australian Maritime Safety Authority (AMSA) Marine

Orders applicable to managing plant and equipment maintenance and repair operations on vessels

- own ability and limits to rectify irregularities and faults
- pipe work, including:
 - capping/sealing pipe work and assembly methods
 - defects:
 - ovality
 - thinning
 - identifying location/layout of pipe work and assemblies, and application and characteristics of enclosure/hanging/supporting systems
 - installation techniques
 - leak testing, applications and uses
 - pipe work, ancillary installation and joining procedures
 - purging techniques, applications and precautions
- procedures for completing temporary and permanent repair and/or replacement procedures for plant and equipment onboard 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, including:
 - dangers of working with sealants and adhesives
 - gasket installation procedures
 - operating principles of gaskets and their relationship to other components
 - sealant and adhesives application techniques
 - types, characteristics, uses and limitations of sealants and adhesives
- soldering, including:
 - cleaning solutions and properties, and cleaning procedures
 - heat and damage protection procedures
 - methods of joint preparation
 - procedures for preventing electrostatic discharge damage
 - properties of fluxes and their uses
 - reworking procedures and precautions
 - soldered joint testing and inspection procedures
 - use and application of PPE for manual soldering/desoldering
- soldered joints, including:
 - hard
 - soft
- testing procedures for materials under load, including:
 - compressive load testing procedures
 - shear load testing procedures
 - tensile load testing procedures

- welding, including:
 - characteristics and properties of common metals and welding materials
 - effect of gas and electrical welding operations on metals
 - effect of various treatments on a range of commonly used metals
 - hazards and control measures associated with gas and electrical welding, including housekeeping
 - use and application of PPE
 - welding safety practices and procedures
 - welding processes:
 - gas metal arc welding
 - gas tungsten arc welding
 - oxy-acetylene welding
 - shielded metal arc welding
- work health and safety (WHS)/occupational health and safety (WHS/OHS) legislation, policies and procedures.

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.

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