



**Australian Government**

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

# **MEM05027A Perform aluminothermic welding**

**Release: 1**

## MEM05027A Perform aluminothermic welding

### Modification History

Release 1 New unit

### Unit Descriptor

This unit of competency covers the skills and knowledge required to weld using the aluminothermic welding process. It includes planning and preparing the welding method, preparing materials and the site for aluminothermic welding, carrying out the welding process in accordance with safe working/regulatory requirements and workplace procedures, checking weld conformance, and completing all required documentation.

### Application of the Unit

This unit applies in a maintenance or site environment where the weld quality is not required to meet an Australian Standard. The aluminothermic welding process (commonly referred to as the CADWELD process) is pre-engineered and can be used to make welded connections of copper to copper or copper to steel or other metals. It is also used for header cable taps, conductor splices and terminations, and ground rod connections, or for attaching cathodic protection leads to pipes (steel or cast iron), tanks and structures in which no outside source of heat or power is required. A common use is to join copper cables (wire) for use in direct burial (grounding/earthing) applications.

Work may be undertaken in the field/on site (as distinct from a production/manufacturing facility) and may be undertaken in a trench. In those situations, it may be appropriate to also access *MSAPMOPS363A Organise on site work* for work on site and *MSAPMPER205C Enter confined space* for work in a trench. Work will often be undertaken under a permit to work system in which case it may also be appropriate to access *MSAPMPER200C Work in accordance with an issued permit* and possibly other related permit units.

Where the aluminothermic welding process is required for rail track welding, *TLIW3015A Weld rail using aluminothermic welding process* should be selected from the TL110 Transport and Logistics Training Package.

**Band: A**

**Unit Weight: 2**

### 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 performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

## Elements and Performance Criteria

- |                                 |     |                                                                                                                        |
|---------------------------------|-----|------------------------------------------------------------------------------------------------------------------------|
| 1 Prepare and plan for welding  | 1.1 | Weld requirements are identified from job instructions                                                                 |
|                                 | 1.2 | Permits and other required authorities are obtained                                                                    |
|                                 | 1.3 | Site and job hazards are identified and appropriate hazard controls implemented                                        |
|                                 | 1.4 | Pre-site preparations are completed                                                                                    |
|                                 | 1.5 | The locations of welds are identified and assessed in accordance with standard operating procedures and specifications |
|                                 | 1.6 | Surfaces are cleaned and prepared ready for welding                                                                    |
|                                 | 1.7 | Site is cleared of obstructions and combustible material to minimise risk of accidents and fire                        |
| 2 Prepare equipment for welding | 2.1 | Welding equipment is set up correctly                                                                                  |
|                                 | 2.2 | Consumables are selected to suit application                                                                           |

|   |                                |     |                                                                                                        |
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| 3 | Perform aluminothermic welding | 3.1 | Safe welding practices are applied                                                                     |
|   |                                | 3.2 | Moulds are fitted and shimmed, sleeved or sealed, as required                                          |
|   |                                | 3.3 | Materials are pre-heated to standard                                                                   |
|   |                                | 3.4 | Materials are welded using aluminothermic method in accordance with approved procedures                |
|   |                                | 3.5 | Welds are cleaned to standard operating procedures                                                     |
|   |                                | 3.6 | Mould is cleaned and inspected to standard operating procedures                                        |
| 4 | Check weld conformance         | 4.1 | Weld conformance is assessed in accordance with standard operating procedures and specifications       |
| 5 | Complete documentation         | 5.1 | Required reports, documentation and/or records are completed in accordance with workplace requirements |

## Required Skills and Knowledge

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

### Required skills

Required skills include:

- communicating effectively with others
- reading and interpreting technical data, drawings, procedures, instructions and manuals
- working collaboratively with others when welding materials using the aluminothermic process
- planning and monitoring own work, including predicting consequences and identifying improvements
- selection and use of required personal protective equipment
- implementing fire control procedures
- selecting appropriate welding tools and equipment
- applying precautions and required action to minimise, control or eliminate hazards that may exist during work activities without injury to self or others, or damage to equipment
- reporting and/or rectifying any identified problems, faults or malfunctions that may occur in

- accordance with regulatory requirements and workplace procedures
- applying defect acceptance criteria and identifying actions to be taken after rejections of welds
- checking compliance between work and job specifications
- completing reports, records and documentation

## Required knowledge

Required knowledge includes:

- relevant safety, occupational health and safety (OHS) and environmental procedures and regulations
- principles of the aluminothermic welding process chemical reaction
- common types of welding imperfections and defects and their causes (e.g. cracks, porosities, mould off centre, stresses in materials, pre-heating offset, sand inclusions and moisture)
- workplace procedures for the welding of materials using the aluminothermic technique
- problems that may occur during the welding of materials using the aluminothermic technique and action that can be taken to report or resolve the problems
- hazards that may exist during the welding of materials using the aluminothermic technique and ways of controlling the risks involved
- contents of relevant technical manuals and instructions
- characteristics of plant and equipment, hardware and components used in welding activities
- impact on work activities of regulatory requirements
- impact of other work activities on welding integrity
- workplace documentation requirements
- site inspection techniques

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

|                                                                                                     |                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview of assessment</b>                                                                       | A person who demonstrates competency in this unit must be able to carry out and apply the principles of the aluminothermic welding process and associated equipment, applications and procedures, outlining the main phases and operations, including safety aspects. |
| <b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b> | Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency                                                |

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | <p>in new and different situations and contexts.</p> <p>Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways, including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.</p>                                                                                                                                                                                                                                                                                                                                         |
| <b>Context of and specific resources for assessment</b> | <p>This unit may be assessed on the job, off the job, or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.</p> <p>The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.</p> |
| <b>Method of assessment</b>                             | <p>This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with carrying out aluminothermic welding or other units requiring the exercise of the skills and knowledge covered by this unit</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Guidance information for assessment</b>              | <p>Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## 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. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

|                         |                                                      |
|-------------------------|------------------------------------------------------|
| <b>Work environment</b> | Work environment may include, but is not limited to: |
|-------------------------|------------------------------------------------------|

|                                      |                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                      | <ul style="list-style-type: none"> <li>• restricted spaces</li> <li>• exposed conditions</li> <li>• controlled or open environments</li> </ul>                                                                                                                                                                                                                                           |
| <b>Pre-site preparations</b>         | <p>Pre-site preparations may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• checking all required equipment and materials</li> <li>• identifying required personal protective equipment</li> <li>• loading all requirements for the job</li> </ul>                                                                                                        |
| <b>Materials to be joined</b>        | <p>Materials to be joined may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• common steel</li> <li>• copper-clad steel</li> <li>• Columbium</li> <li>• Niobium</li> <li>• brass</li> <li>• wrought iron</li> <li>• stainless steel</li> <li>• cast iron</li> <li>• galvanised and bethanised steel</li> <li>• bronze</li> <li>• silicon bronze</li> </ul> |
| <b>Assessment of weld locations</b>  | <p>Assessment of weld locations may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• proximity to existing welds or repairs</li> <li>• substrate integrity issues</li> <li>• preparation of pre-qualification samples</li> </ul>                                                                                                                            |
| <b>Weld consumables</b>              | <p>Weld consumables may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• aluminothermic powder</li> <li>• starting powder</li> <li>• metallic disc</li> </ul>                                                                                                                                                                                               |
| <b>Equipment</b>                     | <p>Equipment may include, but is not limited to:</p> <ul style="list-style-type: none"> <li>• mould</li> <li>• lute (sealant)</li> <li>• ignition source</li> <li>• handle clamps</li> <li>• wire brush</li> <li>• mould scraper</li> <li>• gas pre-heating/cutting equipment</li> </ul>                                                                                                 |
| <b>Personal protective equipment</b> | <p>Personal protective equipment may include, but is not</p>                                                                                                                                                                                                                                                                                                                             |

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                 |
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|                             | <p>limited to:</p> <ul style="list-style-type: none"><li>• high visibility clothing</li><li>• fire retardant overalls or long sleeved shirts and long pants</li><li>• hearing protection</li><li>• gauntlet type gloves</li><li>• welding goggles</li><li>• safety glasses</li><li>• safety headwear</li><li>• safety footwear</li><li>• portable radios/mobile phones</li><li>• other safety devices</li></ul> |
| <b>Procedures and codes</b> | <p>Procedures and codes may include, but are not limited to:</p> <ul style="list-style-type: none"><li>• relevant state/territory OHS legislation together with any nationally approved compliance codes and/or guidelines</li><li>• relevant state/territory environmental protection requirements</li><li>• legislation</li><li>• relevant fire regulations</li></ul>                                         |

## Unit Sector(s)

Fabrication

## Custom Content Section

Not applicable.