Title	**Repair non-ferrous metal components using welding processes**		
Level	**4**	**Credits**	**10**

Purpose	This unit standard is for people repairing non-ferrous metal components by welding, using gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW) processes. People credited with this unit standard are able to: demonstrate knowledge of repair welding of non-ferrous metal components; prepare for repair welding of non-ferrous metal components; repair weld non-ferrous metal components; and perform quality control on repair weld.

Classification	Mechanical Engineering > Welding

Available grade	Achieved

Guidance Information

1 Legislation and reference
Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to the:
Health and Safety at Work Act 2015.
WorkSafe Good Practice Guide “Health and Safety in Welding.” Available at: https://www.worksafe.govt.nz/assets/dmsassets/WKS-13-Welding-GPG.pdf.
Weld Australia (formerly Welding Technology Institute of Australia (WTIA) Technical Note 7 – Health and Safety in Welding. Available at: Product Details Weld Australia Member Portal.

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Any new, amended or replacement Acts, regulations, standards, codes of practice, guidelines, or authority requirements or conditions affecting this unit standard will take precedence for assessment purposes.

2 Definitions
Accepted industry practice – approved codes of practice and standardised procedures accepted by the engineering industry as examples of best practice.
GMAW – Gas Metal Arc Welding; also referred to as *Metal Inert Gas (MIG) Welding*.
GTAW – Gas Tungsten Arc Welding; also referred to as *Tungsten Inert Gas (TIG) Welding*.
Manufacturer’s instructions – instructions provided by manufacturers of substances, equipment, and machinery. These instructions may include details on safe and correct handling, use and storage of substances and/or details on substance properties. Examples are labels on substance containers, product data sheets, and operator’s manuals.

Non-ferrous metals – weldable aluminium alloys, copper and copper alloys, and magnesium and magnesium alloys.
Welding procedure – a work instruction providing all the necessary technical detail for a specific welding application.
Workplace procedures – organisation policies and procedures that are documented in memo, electronic, or manual format and available in the workplace, and are consistent with manufacturer's requirements. They may include but are not limited to – standard operating procedures, site specific procedures, site safety procedures, equipment operating procedures, quality assurance procedures, product quality specifications, references, approved codes of practice, housekeeping standards, environmental considerations, on-site briefings, supervisor's instructions, and procedures to comply with legislative and local body requirements relevant to the industry sector.

3 Assessment information
Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with legislative requirements and workplace procedures, and meet accepted industry practice. This includes the knowledge, use and maintenance of relevant tools and equipment.

4 Recommended skills and knowledge
It is recommended that people seeking credit for this unit standard first hold credit for:
– Unit 2675, *Weld aluminium in downhand positions using the gas metal arc welding process,* or equivalent skills and knowledge;
– Unit 2677, *Weld aluminium in the down hand positions using the gas tungsten arc welding process*, or equivalent skills and knowledge.

5 This unit standard does not qualify people to determine that welding is the preferred method of repair, particularly for critical components. A suitably qualified person such as a welding engineer or metallurgist should directly supervise the repair of critical components.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of repair welding of non-ferrous metal components.

Performance criteria

1.1 Methods of identifying parent metals are described in accordance with workplace procedures.

Range methods – workshop tests, identification of component manufacturer, material analysis;
workshop tests include but are not limited to – button weld test, tab weld test, resistance to filing test.

1.2 Factors influencing the choice of repair method and process are identified, and their practical implications stated.

Range factors include – types of failure, possible fabrication of new or replacement parts, weld type and location, distortion control.

Outcome 2

Prepare for repair welding of non-ferrous metal components.

Performance criteria

2.1 A welding process is selected and assessed for repair welding.

Range welding processes – GMAW, GTAW.

2.2 Equipment is selected, assembled and set up to suit the repair welding process.

2.3 Equipment is maintained ready for use in accordance with the manufacturer's instructions.

2.4 Parent metal is prepared for welding in accordance with welding procedure.

Range preparation includes – cleaning, edge preparation, surface preparation.

2.5 Consumables are selected in accordance with repair welding procedure.

Outcome 3

Repair weld non-ferrous metal components.

Range 5 repair welds;
including aluminium alloys using GMAW and GTAW, and either copper or magnesium alloys using GTAW.

Performance criteria

3.1 Workplace safety procedures are followed.

Range examples are – use of personal protective equipment, checking of equipment for faults, use of fume extraction equipment, elimination of risk of fire or explosion, chemicals from cleaning methods and from prior service environment of components, protection from arc radiation, protection from electrocution.

3.2 Weld metal is deposited in accordance with welding procedure.

3.3 Welds are cleaned in accordance with accepted industry practice.

Outcome 4

Perform quality control on repair weld.

Performance criteria

4.1 Methods of assessing weld quality are identified and the process explained in accordance with workplace procedures.

Range visual examination, penetrant inspection, workshop tests.

4.2 Defective repair welds are identified by visual examination and workshop tests.

4.3 Repair procedure is documented for future traceability in accordance with workplace procedures.

Planned review date	31 December 2027

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	30 November 1994	31 December 2018
Revision	2	14 April 1997	31 December 2018
Revision	3	5 January 1999	31 December 2018
Review	4	4 April 2001	31 December 2018
Rollover and Revision	5	20 April 2006	31 December 2018
Review	6	22 May 2009	31 December 2022
Review	7	17 August 2017	31 December 2025
Review	8	26 January 2023	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council qualifications@hangaarorau.nz if you wish to suggest changes to the content of this unit standard.