

<b>Title</b>	<b>Repair ferrous metal components using welding processes</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>10</b>

<b>Purpose</b>	<p>This unit standard is for people repairing steel, stainless steel, and cast iron components by welding and powder spray processes.</p> <p>People credited with this unit standard are able to: demonstrate knowledge of repair-welding of ferrous metal components; prepare for repair-welding of ferrous metal components; repair-weld ferrous metal components; and perform quality control on repair-weld.</p>
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<b>Classification</b>	Mechanical Engineering > Welding
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<b>Available grade</b>	Achieved
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## 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](#).

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.

*Ferrous metal* – carbon and low alloy steels, stainless and heat resistant steels, austenitic manganese steels, cast iron (grey, ductile, and alloy).

*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.

*MMAW* – Manual Metal Arc Welding, also referred to as *Stick Electrode Welding*.

*OAW* – Oxyacetylene Welding, also referred to as *Gas Welding*.

*Powder spray* – welding method in which a thin layer of metal is fused onto a base metal.

*Welding procedure* – a work instruction providing all the necessary technical details 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 2676, *Weld stainless steel sheet using the gas tungsten arc welding process*, or equivalent skills and knowledge;
- Unit 2682, *Weld steel in the downhand positions to a general purpose industry standard using the manual metal 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.

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## Outcomes and performance criteria

### Outcome 1

Demonstrate knowledge of repair-welding of 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, spark test, magnet 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 ferrous metal components.

**Performance criteria**

- 2.1 A welding process is selected and assessed for repair welding.
- Range welding processes include but are not limited to – MMAW, GMAW, GTAW, OAW, powder spray.
- 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 by filing or grinding.
- 2.5 Consumables are selected in accordance with repair welding procedure.

**Outcome 3**

Repair-weld ferrous metal components.

- Range 3 welding repairs; using steel, stainless or heat resistant steel, and cast iron; and using a different welding process for each metal.

**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 Electrodes are stored and handled in accordance with manufacturer's instructions.

3.3 Weld metal is deposited in accordance with welding procedure.

3.4 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, magnetic particle 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.

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<b>Planned review date</b>	31 December 2027
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**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](mailto:qualifications@hangaarorau.nz) if you wish to suggest changes to the content of this unit standard.