

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

Purpose	<p>This unit standard covers repair of steel, stainless steel, and cast iron components by welding, using GMAW, GTAW, MMAW, OAW, 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 quality-assure repair welding of ferrous metal components.</p>
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Classification	Mechanical Engineering > Welding
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Available grade	Achieved
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Guidance Information

- 1 Reference

Health and Safety in Welding. Wellington: Department of Labour, 2006. Available from <http://www.worksafe.govt.nz/>.
- 2 Definitions

Accepted industry practice – approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors 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.

GTAW – Gas Tungsten Arc Welding.

MMAW – Manual Metal Arc Welding.

OAW – Oxyacetylene Welding.

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

Safe working practice – formal worksite or company safety policies, or the practices established by *Health and Safety in Welding* or similar codes.

Welding procedure – written work instruction providing all the necessary technical details for a specific welding application.

Workplace procedures – procedures used by the organisation carrying out the work and applicable to the tasks being carried out. Examples are – standard operating procedures, safety procedures, equipment operating procedures, codes of practice, quality management practices and standards, procedures to comply with legislative and local body requirements.

- 3 Recommended for entry
Unit 2676, *Weld stainless steel sheet to industry standard using the gas tungsten arc welding process*; and Unit 2682, *Weld steel in the downhand positions to a general purpose industry standard using the manual metal arc welding process*.
- 4 Scope of use
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 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 Work area is assessed for hazards associated with repair welding and all necessary precautions taken in accordance with safe working practice.
- Range electric shock, arc and flame radiation, fire, explosion, fumes and gases, heat, confined space, compressed gas, chemicals from cleaning methods and from prior service environment of components.
- 2.2 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.

- 2.3 Equipment is selected and assembled to suit the repair welding process.
- 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.

Performance criteria

- 3.1 Safety procedures are followed and personal protective equipment is worn in accordance with safe working practice.
- 3.2 Electrodes are stored and handled in accordance with manufacturer's specifications.
- 3.3 Weld metal is deposited in accordance with welding procedure.
- Range evidence is required of three welding repairs, using steel, stainless or heat resistant steel, and cast iron; and using a different welding process for each metal.
- 3.4 Welds are cleaned in accordance with accepted industry practice.

Outcome 4

Quality-assure repair welding of ferrous metal components.

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.

Planned review date	31 December 2022
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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	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 Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.