

Title	Weld steel structures in all positions using the manual metal arc welding process		
Level	4	Credits	10

Purpose	<p>This unit standard is for people welding steel structures in all positions using the manual metal arc welding (MMAW) process.</p> <p>People credited with this unit standard are able to: prepare to weld steel in all positions using the MMAW process; weld steel in all positions using the MMAW process; and inspect and repair MMAW steel welds.</p>
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Classification	Mechanical Engineering > Welding
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Available grade	Achieved
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Guidance Information

1 Legislation and references

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](#)

Industry Standard: AS/NZS 1554.1:2014, *Structural steel welding - Part 1: Welding of steel structures*. Available at: www.standards.govt.nz.

Welder qualification Standards - AS/NZS 2980:2018, *Qualification of welders for fusion welding of steels - Additional requirements for Australia and New Zealand*.

Available at: www.standards.govt.nz.

AS/NZS ISO 9606.1:2017 *Qualification testing of welders - Fusion welding - Part 1: Steels*, or equivalent. Available at: www.standards.govt.nz.

ISO 6947:2019, *Welding and allied processes - Welding positions*. Available at: www.standards.govt.nz.

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, pending review of this unit standard.

2 Definitions

Accepted industry practice – approved codes of practice and standardised procedures accepted by the industry as examples of best practice.

Industry standard – Category SP of AS/NZS 1554.1, AS/NZS 2980: or equivalent.

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*.

Steel – weldable low-carbon unalloyed (carbon-manganese) steel, also referred to as *mild steel*.

Welding procedure specifications (WPS) – written specification providing all the necessary technical details for a specific welding application meeting the requirements of the appropriate industry standard.

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 but is not limited to 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 2671, *Weld steel structures in the downhand positions using the manual metal arc welding process*, or equivalent knowledge and skills.

Outcomes and performance criteria

Outcome 1

Prepare to weld steel in all positions using the MMAW process.

Performance criteria

- 1.1 MMAW power source characteristics and controls are selected for positional welding and WPS requirements.
- Range rating, duty cycle, open circuit voltage, current type (alternating or direct current), polarity, arc characteristic (dynamics) control, hot start control.
- 1.2 Equipment is assembled, set up, and maintained ready for use in accordance with manufacturer's instructions.
- Range welding cables, electrode holder, work clamp.

1.3 Steel is prepared and assembled in accordance with WPS.

Range cleaning, providing root face where required, tack welding to correct alignment, preset.

1.4 Electrodes are selected in accordance with WPS.

Outcome 2

Weld steel in all positions using the MMAW process.

Range 5 welds;
hydrogen controlled electrodes;
material thickness – 8 to 16mm;
butt welds – 2G, 3G, and 4G positions (ISO 6947 PC, PF, PE), full penetration;
fillet welds – 3F and 4F positions (ISO 6947 PF, PD).

Performance criteria

2.1 Workplace safety procedures are followed.

Range use of personal protective equipment, checking of equipment for faults, use of fume extraction equipment, elimination of risk of fire or explosion, protection from arc radiation, protection from electrocution.

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

2.3 Measures to minimise welding distortion are applied in accordance with accepted industry practice.

Range examples are – weld sequence, restraint, backstepping.

2.4 Welds are deposited on steel to industry standard and in accordance with WPS.

2.5 Welds are cleaned in accordance with accepted industry practice.

Outcome 3

Inspect and repair MMAW steel welds.

Performance criteria

3.1 Weld imperfections are identified by visual examination and workshop tests.

Range examples of workshop tests are – nick break, fillet break-over, bend, macro examination;
one workshop test is required for each weld from Outcome 2.

3.2 Weld imperfections are evaluated using acceptance levels in industry standard.

3.3 A weld defect is repaired in accordance with WPS and to industry standard.

Range removal of a defect in the root or intermediate pass of the butt weld, and rewelding.
One of the following positions – 2G, 3G, 4G, 3F, 4F (ISO 6947 PC, PF, PE, PF, PD).

Planned review date	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 2022
Revision	2	14 April 1997	31 December 2022
Revision	3	5 January 1999	31 December 2022
Review	4	4 April 2001	31 December 2022
Rollover and Revision	5	20 April 2006	31 December 2022
Review	6	22 May 2009	31 December 2022
Review	7	20 July 2017	31 December 2025
Review	8	26 January 2023	N/A

Consent and Moderation Requirements (CMR) reference	0013
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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.