

Title	Demonstrate knowledge of welding and weld low carbon steel		
Level	3	Credits	5

Purpose	<p>This unit standard provides a welding introduction that leads to a range of more specialised welding unit standards.</p> <p>People credited with this unit standard are able to: demonstrate knowledge of the effects of welding and weldability of ferrous metals; demonstrate knowledge of the MMAW process for welding low carbon steel; demonstrate knowledge of the GMAW and FCAW processes for welding low carbon steel; and weld low carbon steel.</p>
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Classification	Mechanical Engineering > Welding
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Available grade	Achieved
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Prerequisites	Unit 33135, <i>Demonstrate knowledge of safety and health while welding and thermal cutting</i> , or demonstrate equivalent knowledge and skills.
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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](#).

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.

FCAW – flux-cored arc welding (gas shielded).

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*.

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

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*.

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 but is not limited to the knowledge, use and maintenance of relevant tools and equipment.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the effects of welding and weldability of ferrous metals.

Performance criteria

- 1.1 The effects of welding on mechanical properties are explained for ferrous metals in relation to material composition, section thickness, welding heat input, and cooling rates.
- 1.2 Weldability is compared across ferrous metals.
- Range ferrous metals – low carbon steel, structural steel, high strength steel, grey cast iron.
- 1.3 Methods of applying preheat and controlling the cooling rate are described for steel.
- 1.4 Weld faults in steel are identified in accordance with accepted industry practice, and remedial and preventative actions described.
- Range faults – cracks, lack of fusion, incomplete penetration, porosity, undercut, incorrect weld shape and size.

1.5 General distortion considerations are described for welding ferrous metals.

Outcome 2

Demonstrate knowledge of the MMAW process for welding low carbon steel.

Performance criteria

2.1 The characteristics of the welding power source are described in terms of their effect on MMAW welding.

Range characteristics – constant current, current type (alternating/direct), rating, duty cycle, open circuit voltage, arc voltage, welding current, arc starting aids.

2.2 The advantages and limitations of the MMAW process are explained compared to other welding processes.

Range other welding processes – GMAW, FCAW, GTAW.

2.3 Requirements for selection, handling, and storage of welding consumables are described for rutile electrodes and basic electrodes in accordance with accepted industry practice.

2.4 Process specific distortion considerations are described for MMAW.

Outcome 3

Demonstrate knowledge of the GMAW and FCAW processes for welding low carbon steel.

Performance criteria

3.1 The characteristics of the welding equipment are described in terms of effect on GMAW and FCAW welding.

Range characteristics – constant voltage, current type (alternating/direct), rating, duty cycle, voltage, synergic control, wire feed speed, welding current, burn back control, welding gun set-up.

3.2 The advantages and limitations of GMAW and FCAW welding are compared to MMAW and GTAW.

3.3 Requirements for the selection, handling, and storage of GMAW and FCAW welding consumables are described in accordance with accepted industry practice.

Range consumables – solid wire electrodes, gas-shielded rutile FCAW electrodes; shielding gases.

3.4 Process specific distortion considerations are described for GMAW and FCAW.

Outcome 4

Weld low carbon steel.

Range six welds;
steel plate or sections in the 3-10 mm thickness range;
one lap or tee fillet weld in the horizontal-vertical position;
one butt weld in the flat position for each of the MMAW, GMAW, and FCAW processes.

Performance criteria

4.1 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, protection from arc radiation, protection from electrocution.

4.2 Equipment is checked, set up, and used appropriately in accordance with manufacturer's instructions.

4.3 Metals are prepared and welded in accordance with instructions.

4.4 Welds are examined visually and imperfections are identified in accordance with workplace procedures.

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	20 June 2006	31 December 2022
Rollover and Revision	2	17 September 2010	31 December 2022
Review	3	20 July 2017	31 December 2025
Review	4	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.