

<b>Title</b>	<b>Demonstrate and apply knowledge of welding aluminium and stainless steel</b>		
<b>Level</b>	<b>3</b>	<b>Credits</b>	<b>3</b>

<b>Purpose</b>	<p>This introductory unit standard leads to material-specific sets of aluminium and stainless steel unit standards.</p> <p>People credited with this unit standard are able to: demonstrate knowledge of aluminium and stainless steel from a welding perspective; the GTAW process for welding aluminium and stainless steel; the GMAW process for welding aluminium; and weld aluminium and stainless steel.</p>
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<b>Classification</b>	Mechanical Engineering > Welding
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<b>Available grade</b>	Achieved
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<b>Prerequisites</b>	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](#).

Industry Standard - AS/NZS 1665:2004, *Welding of aluminium structures*, or equivalent. Available at: [www.standards.govt.nz](http://www.standards.govt.nz),

AS/NZS 1554.6:2012, *Structural steel welding – Part 6: Welding stainless steels for structural purposes*, or equivalent. Available at: [www.standards.govt.nz](http://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.

## 2 Definitions

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

*Aluminium* – aluminium and weldable aluminium alloys.

*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.

*Stainless steel* – typically, the austenitic stainless steel grades AISI 304L and AISI 316L, but may also include other materials such as the duplex stainless steels.

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

## 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 accepted industry practice. This includes the knowledge, use and maintenance of relevant tools and equipment.

## 4 Related unit standards

This unit standard is the first introductory unit standard of a comprehensive set of aluminium and stainless steel welding unit standards. Other available related unit standards can be found by searching the Directory of Assessment Standards (DAS) on the NZQA website <http://www.nzqa.govt.nz> in the *Welding* domain.

## Outcomes and performance criteria

### Outcome 1

Demonstrate knowledge of aluminium and stainless steel from a welding perspective.

### Performance criteria

1.1 Factors affecting the weldability of aluminium are described at an overview level.

Range grades of aluminium; thermal conductivity and oxide film; effects of heat input on mechanical properties of the 5000 and 6000 series alloys.

1.2 Weld faults in aluminium are identified and remedial and preventative actions are described.

Range faults – cracks, lack of fusion, incomplete penetration, porosity, undercut, incorrect weld shape and size.

1.3 Factors affecting the weldability of austenitic stainless steel are described and compared to those of carbon steel.

Range simple definition of stainless steel; maintenance of the protective oxide film for the 304 and 316 grades by control of heat input, back purging, and post-weld cleaning.

- 1.4 Weld faults in austenitic stainless steel are identified and remedial and preventative actions are described.
- Range faults – oxidation, cracks, lack of fusion, incomplete penetration, porosity, undercut, incorrect weld shape and size.
- 1.5 Metal distortion and handling considerations are described for welding aluminium and stainless steel.

## Outcome 2

Demonstrate knowledge of the GTAW process for welding aluminium and stainless steel.

### Performance criteria

- 2.1 Features and functions of the equipment are described for the GTAW process.
- Range power source – characteristic, current type, polarity, rating, duty cycle, methods of welding current control, high frequency, lift-arc; torch set-up – tungsten electrodes, nozzles, gas lens.
- 2.2 The advantages, limitations, and typical applications of GTAW welding are identified in accordance with accepted industry practice.
- 2.3 Selection, handling, and storage requirements of welding consumables are described in accordance with accepted industry practice.
- Range shielding gas, tungsten electrodes, filler rods.
- 2.4 Distortion considerations specific to GTAW welding are identified and described.

## Outcome 3

Demonstrate knowledge of the GMAW process for welding aluminium.

### Performance criteria

- 3.1 Features and functions of the equipment are described.
- Range power source – conventional constant voltage characteristic type, synergic control for pulsed arc welding, arc length (trim) control; welding gun set-up; wire feed systems.
- 3.2 The advantages, limitations, and typical applications of GMAW welding are identified in accordance with accepted industry practice.

3.3 Selection, handling, and storage requirements of welding consumables are described in accordance with accepted industry practice.

Range consumables commonly used to weld the 5000 and 6000 series alloys, and shielding gases.

3.4 Distortion considerations specific to GMAW welding are identified and described.

#### **Outcome 4**

Weld aluminium and stainless steel.

#### **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.

4.2 Aluminium is prepared and welded in accordance with welding procedure.

Range 3 welds:  
GTAW – one lap or tee fillet weld in the horizontal-vertical position and one butt weld in the flat position, in the 2-5mm thickness range;  
GMAW – one lap or tee fillet weld in the horizontal-vertical position in the 2.5-6mm thickness range.

4.3 Austenitic stainless steel is prepared and GTAW welded in accordance with welding procedure.

Range 2 welds;  
one lap or tee fillet weld in the horizontal-vertical position and one back purged butt weld in the flat position, in the 1-2 mm thickness range.

4.4 Component damage is minimised and distortion is controlled during welding and handling in accordance with accepted industry practice.

4.5 Welds are assessed for imperfections and evaluated using acceptance levels in AS/NZS 1665:2004 for aluminium and AS/NZS 1554.6:2014 for stainless steel welds.

Range visual examination examples are – break-over, nick break, and bend testing.

<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	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

<b>Consent and Moderation Requirements (CMR) reference</b>	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](mailto:qualifications@hangaarorau.nz) if you wish to suggest changes to the content of this unit standard.