Title	**Join ferrous and non-ferrous metal components by torch brazing**		
Level	**3**	**Credits**	**6**

Purpose	This unit standard is for people who are required to join ferrous and non-ferrous metal components for engineering maintenance and fabrication operations. People credited with this unit standard are able to: demonstrate knowledge of torch brazing principles; prepare to torch braze metal components; join metals by torch brazing; assess and repair brazed joints; and complete brazing activities.

Classification	Mechanical Engineering > Welding

Available grade	Achieved

Guidance Information

1 Legislation and references
Legislation, regulations and/or industry standards relevant to this unit standard includes 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: NZS 4781:1973, *Code of practice for safety in welding and cutting*. Available at: www.standards.govt.nz,
AS/NZS 2865:2001, *Safe working in a confined space.* 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.

2 Definitions
Accepted industry practice – approved codes of practice and standardised procedures accepted by the engineering industry as examples of best practice.
Ferrous metals – carbon and low alloy steels, stainless and heat resistant steels, austenitic manganese steels, cast iron (grey, ductile, and alloy).
Industry standard – NZS 4781:1973, and AS/NZS 2865:2001, or equivalent.

Job requirements – variable specifications and/or standards required for brazed joints depending on the materials being brazed, joint strength requirements, fluid sealing requirements, the environment or worksite where brazing is being carried out.
Non-ferrous metals – weldable aluminium alloys, copper and copper alloys, and magnesium and magnesium alloys,
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.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of torch brazing principles.

Performance criteria

1.1 The principles of brazing are described in accordance with accepted industry practice.

Range fusion of the brazing alloy to metal, temperature requirements, heat requirements, brazing alloys, use of flux, capillary action, surface clearance limitations, joint strength.

1.2 Types of equipment and materials are described in terms of their use in different joint types.

Range equipment and materials – gas types, gas equipment, torches and tips, brazing alloys, fluxes.
joint types – ferrous to ferrous metals, non-ferrous to non-ferrous metals, ferrous to non-ferrous metals.

1.3 Hazards and associated risks with brazing are identified and control measures for their management are described in accordance with workplace safety procedures.

Outcome 2

Prepare to torch braze metal components.

Performance criteria

2.1 Brazing equipment is selected to meet job requirements.

Range may include but is not limited to – gas, cylinders, regulators, flashback arrestors, hoses, torch, tip, fume extraction equipment, PPE.

2.2 Brazing equipment is assembled, checked and made ready for use in accordance with workplace procedures.

2.3 Any equipment defects are identified and corrective actions taken in accordance with accepted industry practice and workplace procedures.

2.4 Metal components are prepared and assembled for brazing in accordance with accepted industry practice.

Range shaped, cleaned, deburred, clearances established.

2.5 Brazing alloy is selected to meet job requirements.

Outcome 3

Join metals by torch brazing.

Range 1 of each joint type is required;
ferrous to ferrous, non-ferrous to non-ferrous, and ferrous to non-ferrous.

Performance criteria

3.1 Workplace safety procedures are followed.

Range examples are – use of personal protective equipment, checking of equipment for faults, elimination of risk of fire or explosion.

3.2 Flame size and type are adjusted to meet job requirements.

3.3 Joints are made in accordance with accepted industry practice.

Range application of heat, uniform temperature of components, application of flux, application of filler.

3.4 Completed joints are cleaned of oxides and flux residue in accordance with accepted industry practice.

Outcome 4

Assess and repair brazed joints.

Performance criteria

4.1 Joint integrity is assessed against job requirements.

Range assessment and test procedures may include but are not limited to – visual inspection, non-destructive testing, leak tests, bend tests, peel tests.

4.2 Joint quality is within the permissible levels allowed by job.

Range melted base metal, lack of filler metal at joint edges, unfused filler metal, cracks, undercutting, pinholes.

4.3 Brazing faults are identified and rectified in accordance with job requirements.

Range evidence of two different types of faults.

Outcome 5

Complete brazing activities.

Performance criteria

5.1 Tools, equipment, and materials are accounted for and returned to storage in accordance with workplace procedures.

5.2 Waste materials and left over parts are disposed of or processed in accordance with workplace procedures.

Planned review date	31 December 2027

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	16 February 2017	31 December 2025
Review	2	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 if you wish to suggest changes to the content of this unit standard.