Title	**Demonstrate knowledge of welding principles and quality control and safe welding practice under supervision**		
Level	**2**	**Credits**	**4**

Purpose	This unit standard is for the training of mechanical engineering and covers welding principles, quality assurance and safe welding practice under supervision at an introductory level. People credited with this unit standard are able to: demonstrate knowledge of welding principles; demonstrate knowledge of welding quality control; demonstrate safe welding practice under supervision to meet job specifications; and demonstrate knowledge of welding principles and quality assurance.

Classification	Mechanical Engineering > Welding

Available grade	Achieved

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.
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*.
Job specifications – instructions relevant to the safe completion of the specific task, such as technical specifications, assembly instructions, drawings, parts lists, standards, codes of practice, test and commissioning procedures, and verbal instructions.
MMAW – Manual Metal Arc Welding, also referred to as *Stick Electrode Welding*.

Under supervision – working under the direction of a suitably qualified tradesperson or manager who oversees the learner and is responsible for ensuring that the quality of work meets the required standard.
Welding procedure – a work instruction providing all the necessary technical details for a specific welding application.
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 Recommended skills
Unit 21911, *Demonstrate knowledge of safety on engineering worksites*; Unit 21912, *Apply safe working practices on an engineering worksite;* or demonstrate equivalent knowledge and skills.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of welding principles.

Performance criteria

1.1 The terms soldering, brazing, and welding are described, and typical applications stated.

1.2 Welding terminology is explained with reference to typical applications.

Range butt weld, fillet weld, weld size (leg length and throat thickness), fusion, penetration, weld profile (concave, convex).

1.3 Material preparation for types of welds is described.

Range types of welds include but are not limited to – closed square butt, open square butt, single V, outside corner, tee joint, lap weld.

1.4 The principles of different types of welding and cutting processes are outlined with reference to typical applications.

Range processes – resistance welding, oxyacetylene, MMAW, GMAW, GTAW.

Outcome 2

Demonstrate knowledge of welding quality control.

Performance criteria

2.1 The principles of, and reasons for, basic welding quality control and inspection are outlined.

Range principles – welding procedures, welder qualification, welding inspection.

2.2 Factors affecting weld quality are described.

Range factors include but are not limited to – welding procedure, material finish and quality, welder skill.

2.3 Defective welds are identified by visual inspection in accordance with workplace procedures or accepted industry practice.

Range defects include but are not limited to – concavity, undercut, undersized, porosity, non-metallic inclusions, cracks.

Outcome 3

Demonstrate safe welding practice under supervision to meet job specifications.

Range one of each; processes – MMAW, GMAW, GTAW;
material – mild steel sheet and/or plate;
minimum of two different material thicknesses from thickness range 1.5 – 10.0 mm;
weld positions include but are not limited to – 1G, 2F (ISO 6947 PA, PB).

Performance criteria

3.1 Hazards for the welding task to be undertaken are identified and controls put in place to eliminate or minimise them in accordance with workplace safety procedures.

Range examples of hazards must include but not limited to – confined space, presence of flammable and/or explosive materials or containers, defective equipment, hot metal, hard and/or hot particles, electric shock.

3.2 Workplace safety procedures are followed.

3.3 Welding plant and materials are checked and prepared for welding in accordance with workplace procedures and/or accepted industry practice.

Range examples of checks – connections of hose, regulator, torch, cables, gas cylinder; condition of cable insulation; welding torches and/or guns; parent material and filler metals.

3.4 Metals are prepared and joined in accordance with workplace procedures and/or accepted industry practice.

3.5 Weld is visually inspected for defects and weld quality confirmed with supervisor.

Replacement information	This unit standard replaced unit standard 2670.

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	22 September 2005	31 December 2021
Rollover and Revision	2	17 September 2010	31 December 2021
Review	3	8 December 2016	31 December 2025
Review	4	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.