Title	**Weld steel pressure pipe using the gas tungsten arc and manual metal arc welding processes**		
Level	**4**	**Credits**	**15**

Purpose	This unit standard is for people welding steel pressure pipe to ASME Boiler and Pressure Vessel Code using the gas tungsten arc welding process (GTAW) and the manual metal arc welding process (MMAW). People credited with this unit standard are able to: prepare to weld steel pressure pipe using the GTAW and the MMAW processes; weld steel pressure pipe using the GTAW and the MMAW processes; and inspect and repair GTAW and MMAW steel pressure pipe welds.

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.

Industry Standards - ASME BPVC-IX:2021, *Boiler and Pressure Vessel Code, Section IX, Welding and brazing qualifications*, or equivalent. American Society of Mechanical Engineers, current version. Available from https://www.asme.org/.
Industry Standard - 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.

2 Definitions

Accepted industry practice – approved codes of practice and standardised procedures accepted by the engineering industry as examples of best practice.
GTAW – Gas Tungsten Arc Welding, also referred to as *Tungsten Inert Gas (TIG) Welding*.
Industry standard – ASME BPVC-IX:2021, AS/NZS ISO 9606.1:2017, 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.*
NDE – Non-Destructive Examination, also referred to *Non-Destructive Testing NDT*.
Steel – weldable low-carbon unalloyed (carbon-manganese) steels or low alloyed steels for pressure pipe or pressure vessel applications.
Welding procedure specification (WPS) – written specification providing all the necessary technical detail for a specific welding application meeting the requirements of the appropriate industry standard.
Workplace procedures refer to 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.

4 Recommended skills and knowledge

It is recommended that people seeking credit for this unit standard first hold credit for:
- Unit 2685, *Weld steel structures in all positions using the manual metal arc welding process*, or equivalent skills and knowledge.
- Unit 2696, *Weld steel or stainless steel pressure pipe in all positions using the gas tungsten arc welding process*, or equivalent skills and knowledge.

Outcomes and performance criteria

Outcome 1

Prepare to weld steel pressure pipe using the GTAW and the MMAW processes.

Performance criteria

1.1 Equipment is selected to meet WPS requirements.

Range power source rating and duty cycle, torch, shielding gas supply, welding cables, work clamp.

1.2 Equipment is assembled, set up and maintained ready for use in accordance with manufacturer's instructions.

Range torch, electrode, nozzle, collet, and cap; shielding gas supply; welding cables; work clamp.

1.3 Steel pipe is prepared and assembled in accordance with WPS.

Range preparation and assembly – cleaning, verifying bevel angle, providing root face where required, tack welding to correct alignment.

1.4 Consumables are selected in accordance with WPS.

Outcome 2

Weld steel pressure pipe using the GTAW and the MMAW processes.

Range 1 or 2 welds;
either; the 2G and 5G positions, or the 6G position (ISO 6947 PC, PH, H-L045);
size minimum – 150mm nominal bore, schedule 40.

Performance criteria

2.1 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.

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

2.3 Preheat and inter pass temperatures are measured to ensure compliance with welding procedure.

2.4 Root pass is welded using the GTAW process to industry standard and in accordance with WPS.

2.5 Fill and cap passes are welded using the MMAW process with hydrogen controlled electrodes to industry standard and in accordance with WPS.

2.6 Welds are cleaned in accordance with accepted industry practice.

Outcome 3

Inspect and repair GTAW and MMAW steel pressure pipe welds.

Performance criteria

3.1 Weld imperfections are identified by visual examination or from a NDE report.

Range One visual examination for each weld from Outcome 2 is required.

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

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

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	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	17 August 2017	31 December 2025
Review	8	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.