

Demonstrate knowledge of welding metallurgy

Level 5

Credits 20

Purpose People credited with this unit standard are able to demonstrate knowledge of: the role of carbon and manganese in weldable steels; the effects of welding on steels; and the weldability of metals.

Subfield Mechanical Engineering

Domain Welding

Status Registered

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Entry information Open.

Accreditation Evaluation of documentation and visit by NZQA and industry.

Standard setting body (SSB) Competenz

Accreditation and Moderation Action Plan (AMAP) reference 0013

This AMAP can be accessed at <http://www.nzqa.govt.nz/site/framework/search.html>.

Special notes

- 1 This unit standard is for people seeking the *International Welding Specialist* qualification from the International Institute of Welding (IIW). Details are available from the Heavy Engineering Research Association, PO Box 76 134, Manukau City.
- 2 Industry standards/codes relevant to this unit standard include (but are not limited to):
 - a AS/NZS 1554.1:2004: *Structural steel welding – Welding of steel structures*.
 - b *The 2004 ASME Boiler and Pressure Vessel Code*.
 - c ISO 15607:2003: *Specification and qualification of welding procedures for metallic materials – General rules*.

Elements and performance criteria

Element 1

Demonstrate knowledge of the role of carbon and manganese in weldable steels.

Performance criteria

- 1.1 The methods of manufacture and designation are identified for weldable steels.
- 1.2 The mechanical properties of iron-carbon alloys are identified and explained in terms of their composition, and time-temperature transformations.
- 1.3 Plain carbon and carbon-manganese steels are assessed for weldability.
- 1.4 Heat treatments of weldments are explained in terms of processes and procedures.
- 1.5 Alloying elements are described in terms of their effects on the properties of steels, and in relation to phase diagrams.

Element 2

Demonstrate knowledge of the effects of welding on steels.

Performance criteria

- 2.1 Heat input and cooling rates are described in terms of their effect on the structures of welded joints.
- 2.2 Examples of cracking phenomena in welded joints are identified.
Range hydrogen induced cracking, hot cracking, lamellar tearing.
- 2.3 Methods for the destructive testing of materials and weld joints are described.
Range tensile, bend, notch impact, hardness, fatigue tests.

Element 3

Demonstrate knowledge of the weldability of metals.

Performance criteria

- 3.1 The welding procedures required for fine-grained steels are described in terms of the $t_8/5$ concept.
- 3.2 The characteristics of thermomechanically treated steels are identified in terms of requiring specific welding procedures.
Range chemical composition, mechanical properties, weldability.

- 3.3 Welded applications are identified for structural and high strength steels.
- Range bridges, cranes, pressure vessels, low temperature applications, vehicles.
- 3.4 Welding problems and precautions are identified for low alloy steels.
- Range low alloy steels include – very low temperature steels, creep resistance steels.
- 3.5 The parameters required for welding stainless steels are described in terms of the required properties of the joint.
- Range parameters – control of heat input, weld metal composition;
properties – corrosion resistance, strength, toughness.
- 3.6 Welding methods that avoid defects are identified for aluminium and aluminium alloys.
- Range methods – arc welding using inert shielding gases, suitable joint preparations, correct filler metal composition;
defects – oxidation, cracking, porosity.

Please note

Providers must be accredited by the Qualifications Authority, or an inter-institutional body with delegated authority for quality assurance, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be accredited by the Qualifications Authority before they can register credits from assessment against unit standards.

Accredited providers and Industry Training Organisations assessing against unit standards must engage with the moderation system that applies to those standards.

Accreditation requirements and an outline of the moderation system that applies to this standard are outlined in the Accreditation and Moderation Action Plan (AMAP). The AMAP also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

Please contact the Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.