Title	**Demonstrate knowledge of heat treatment for engineering non-ferrous metals**		
Level	**4**	**Credits**	**4**

Purpose	People credited with this unit standard are able to demonstrate knowledge of: the principles of heat treatment of non-ferrous metals; heat treatment processes; and heat treatment applications.

Classification	Mechanical Engineering > Engineering - Materials

Available grade	Achieved

Entry information	
Recommended skills and knowledge	Unit standards 29551, *Demonstrate knowledge of the strength, mechanical properties, and treatment of engineering metals*; and 29552, *Demonstrate knowledge of heat treatment of engineering metals*: or demonstrate equivalent knowledge and skills.

Explanatory notes

1 Definition
Non-ferrous metals – non-ferrous metals in both their elemental and alloyed forms.

2 Assessment information
Examples/evidence given must be within the context of mechanical engineering or manufacturing. Numerous reference texts and training manuals on engineering material science are available and may be used; however no one textbook or source of information is envisaged.

Outcomes and evidence requirements

Outcome 1

Demonstrate knowledge of the principles of heat treatment of non-ferrous metals.

Evidence requirements

1.1 Heat treatment of non-ferrous metals is described in terms of its purpose.

Range evidence is required for a minimum of two non-ferrous metals.

1.2 Non-ferrous metal equilibrium diagrams are interpreted and related to phases and phase changes.

Range equilibrium phase diagrams may include but are not limited to – copper, copper/aluminium, copper/zinc, copper/tin, copper/nickel, aluminium silicon, aluminium/magnesium, nickel-based alloys, titanium alloys;
evidence is required for a minimum of two diagrams.

1.3 Transformations in the alloy's microstructure are identified and related to phase changes.

Range non-ferrous metals selected for evidence requirement 1.2.

Outcome 2

Demonstrate knowledge of heat treatment processes.

Evidence requirements

2.1 Heat treatment processes are described in terms of the effects they have on microstructure and mechanical properties of non-ferrous metals.

Range processes include but are not limited to – annealing, homogenising, stress relieving, solution and precipitation hardening, quenching and tempering.
Mechanical properties may include but are not limited to – hardness, brittleness, machinability, formability.

2.2 Non-ferrous heat treatment processes are selected to achieve specified metal properties.

Range includes but is not limited to – mechanical, machinability, and formability properties.

2.3 Information on specific non-ferrous treatment processes and non-ferrous metal applications are extracted from heat treatment graphs and chart.

Range includes but is not limited to – stress/strain curves, specifications for non-ferrous metals.

Outcome 3

Demonstrate knowledge of heat treatment applications.

Evidence requirements

3.1 Heat treatment processes are related to non-ferrous applications.

Range includes but is not limited to – castings, fabrications, aluminium extrusions, forming processes, rivets, aircraft and mould components, sports goods.

Planned review date	31 December 2021

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	30 June 1995	31 December 2011
Revision	2	14 April 1997	31 December 2011
Revision	3	5 January 1999	31 December 2011
Revision	4	23 May 2001	31 December 2011
Review	5	26 July 2004	31 December 2014
Review	6	17 June 2011	31 December 2017
Review	7	8 December 2016	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Please note
Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMRs). The CMR 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 Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.