Title	**Complete heat treatment of engineering metals in a furnace**		
Level	**4**	**Credits**	**10**

Purpose	People credited with this unit standard are able to: demonstrate knowledge of heat treatment equipment and materials; prepare for heat treatment of engineering metals in a furnace; complete heat treatment of engineering metals in a furnace; and test metals and document results after heat treatment.

Classification	Mechanical Engineering > Engineering - Materials

Available grade	Achieved

Entry information	
Recommended skills and knowledge	Unit standards: 2383, *Carry out heat treatment of metal parts under supervision*; and 29551**,** *Demonstrate knowledge of the strength, mechanical properties, and treatment of engineering metals;* or demonstrate equivalent skills or knowledge.

Explanatory notes

1 References Health and Safety at Work Act 2015 and supporting Regulations.

2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors as examples of best practice.
Job specifications – instructions relevant to the safe completion of the specific task, such as technical specifications, assembly instructions, drawings, parts list, standards, codes of practice, test and commissioning procedures, and verbal instructions.

3 Assessment information
Heat treatments may include but are not limited to – homogenising, annealing, normalising, stress relieving, hardening, recrystalisation, tempering.
Metal specimens may be ferrous or non-ferrous metals and their alloys.
Evidence is required for two different metals each undergoing a different type of heat treatment.

Outcomes and evidence requirements

Outcome 1

Demonstrate knowledge of heat treatment equipment and materials.

Evidence requirements

1.1 Furnaces are described in terms of types available for, and their function in, the heat treatment of engineering metals.

Range furnace types may include but are not limited to – oil, gas, electric, gas carburising, aluminium solution heat treatment, vacuum heat treatment, liquid carburising.
Description of a minimum of two furnaces types is required.

1.2 Pyrometers are described in terms of types available for use in heat treatments.

Outcome 2

Prepare for heat treatment of engineering metals in a furnace.

Evidence requirements

2.1 Metals are prepared in accordance with metal type, treatment process, and accepted industry practice.

2.2 Heat treatment process and quenching medium (if applicable) are selected for metal and condition required in accordance with job specifications and accepted industry practice.

2.3 Heat treatment equipment is selected and prepared for operation in accordance with manufacturer's specification and accepted industry practice.

2.4 Hazards involved with process and equipment are identified, and safety precautions are taken in accordance with accepted industry practice.

2.5 Data on heating temperatures is sourced from materials suppliers.

Outcome 3

Complete heat treatment of engineering metals in a furnace.

Evidence requirements

3.1 Heat treatment equipment is started and operated in accordance with manufacturer's specifications and accepted industry practice.

3.2 Heat treatment process is completed in accordance with specimen type and process requirements.

3.3 Heat treatment activity ensures minimisation of distortion through thermal and transformation stresses in accordance with accepted industry practice.

Outcome 4

Test metals and document results after heat treatment.

Evidence requirements

4.1 Inspection and testing of metals following processing is completed to confirm modified structure and metal condition in accordance with accepted industry practice.

Range includes but is not limited to – hardness testing, inspection for fracture or crazing, distortion, microanalysis.
A minimum of two methods of inspection and testing is required.

4.2 Quality control checks are performed and faults are reported in accordance with accepted industry practice.

4.3 Documentation for heat treatment is completed in accordance with accepted industry practice.

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
Revision	7	17 November 2011	31 December 2017
Review	8	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 (CMR). 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.