Title	**Demonstrate knowledge of heat treatment of engineering metals**		
Level	**4**	**Credits**	**3**

Purpose	This unit standard is for use in the training and assessment for mechanical engineering trades and is one of a series of three unit standards for this purpose with 29550 and 29551. People credited with this unit standard are able to demonstrate knowledge of: phase changes and crystalline structure of carbon steel; and heat treatment of metal.

Classification	Mechanical Engineering > Engineering - Materials

Available grade	Achieved

Recommended skills and knowledge	Unit standard 29550, *Demonstrate basic knowledge of common engineering metals*; and unit standard 29551 *Demonstrate knowledge of the strength, mechanical properties, and treatment of engineering metals*; or demonstrate equivalent skills or knowledge.

Explanatory notes

1 Range
Heat treatment processes – annealing, hardening, normalizing, tempering.

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 phase changes and crystalline structure of carbon steel.

Evidence requirements

1.1 The terms hypoeutectoid, eutectoid, and hypereutectoid are explained with reference to the carbon content of steel.

1.2 Phases and microstructures of carbon steels are described with reference to the iron-carbon phase diagram.

Range phases – ferrite, cementite (carbide), austenite.
Microstructures – martensite, pearlite.

1.3 Temperature-time-transformation (TTT) curves are used to explain the critical cooling rate, phases, and crystalline structure for carbon steel.

Outcome 2

Demonstrate knowledge of heat treatment of metal.

Evidence requirements

2.1 The purpose of heating above the transition temperature and soaking during heat treatment is explained in terms of the phases and carbon distribution.

2.2 The effects heat treatment processes have on the phases and microstructure, and mechanical properties of metal are described.

2.3 The effect of using different quenching media is explained in terms of the relative time taken to cool metal.

Range quenching media includes but is not limited to – air, water, brine, oil.

2.4 Heat treatments, phase changes and microstructure are stated to achieve desired outcomes for given scenarios.

Range example of a scenario - preparing a high carbon steel for use as a lathe tool;
evidence is required of three scenarios.

Replacement information	This unit standard replaced unit standard 4800

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