

Title	Demonstrate knowledge of the strength, mechanical properties, and treatment of engineering metals		
Level	3	Credits	3

Purpose	<p>This unit standard is for use in the training and assessment of mechanical engineering trades and is one of a series of three unit standards for this purpose with 29550 and 29552.</p> <p>People credited with this unit standard are able to demonstrate knowledge of: steelmaking; heat treatment processes; the effects of working metals; corrosive processes and corrosion control measures; and, of techniques for determining the composition, and the traceability and control of engineering metals.</p>
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Classification	Mechanical Engineering > Engineering - Materials
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Available grade	Achieved
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Recommended skills and knowledge	Unit standard 29550, <i>Demonstrate basic knowledge of common engineering metals</i> , or demonstrate equivalent skills or knowledge.
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Explanatory notes

1. 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 steelmaking.

Evidence requirements

- 1.1 The process of steelmaking is outlined.

Range includes but is not limited to - difference between basic oxygen steelmaking and electric arc furnace processes; use of iron sand,

iron ore or and scrap steel; removal of impurities; control of dissolved gasses and inclusions.

Outcome 2

Demonstrate knowledge of heat treatment processes.

Range Heat treatments – annealing, case hardening, hardening, normalizing, tempering.

2.1 Heat treatment processes are explained in terms of the heating temperature, soaking time and cooling time.

2.2 Heat treatment processes are explained in terms of the change in mechanical properties.

2.3 Heat treatment processes are selected to achieve given outcomes.

Range examples of given outcomes – preparing a hardened copper washer for use, hardening a high carbon steel screwdriver blade, preparing a hardened part for milling.
Evidence is required of a minimum of three given outcomes requiring three different heat treatments.

Outcome 3

Demonstrate knowledge of the effects of working metals.

Evidence requirements

3.1 The effects that working metals has on the mechanical properties is described.

Range working metals includes but is not limited to – welding, cutting, machining, bending.
Examples of mechanical properties – ductility, malleability, hardness, brittleness.

3.2 The effects that welding has on metals is explained in terms of distortion caused by thermal expansion.

3.3 Methods to overcome the distortion and build-up of stress during welding are explained.

Range examples of methods – do not over weld, balance welds around neutral axis, use of jigs or stiffeners.
Evidence is required for a minimum of 6 different methods.

Outcome 4

Demonstrate knowledge of corrosive processes and corrosion control measures.

Evidence requirements

4.1 Corrosive processes are identified and described.

Range corrosive processes include but are not limited to – uniform attack, crevice corrosion, pitting, erosion corrosion, galvanic action.

4.2 The effects corrosion has on the safe, reliable and efficient operation of equipment and structures are described.

Range effects include but are not limited to - reduced strength, downtime of equipment, escape of fluids, lost surface properties, reduced value of assets.

4.3 Methods to control corrosion are explained.

Range methods include but are not limited to - applied coatings, anodisation, cathodic protection.
Evidence is required of three different applied coatings and two further corrosion control methods.

Outcome 5

Demonstrate knowledge of techniques for determining the composition, and of the traceability and control of engineering metals.

Evidence requirements

5.1 Techniques for determining the composition of metals are described in terms of their method and application.

Range techniques include - colour and number code, magnetic test, mass spectrometry, wet chemical analysis.

5.2 Methods to ensure the identification of metal composition is maintained on partially used stock lengths of steel section or plate are described.

Range examples of methods – cutting from the unmarked end, remarking unused section.

Replacement information	This unit standard replaced unit standard 4797
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.