

<b>Title</b>	<b>Demonstrate knowledge of common engineering metals</b>		
<b>Level</b>	<b>3</b>	<b>Credits</b>	<b>4</b>

<b>Purpose</b>	People credited with this unit standard are able to: demonstrate knowledge of the types, properties and characteristics of common engineering metals; describe the selection, use, and processing of common engineering metals; and demonstrate knowledge of the effect that external factors have on common engineering metals.
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<b>Classification</b>	Mechanical Engineering > Engineering - Materials
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<b>Available grade</b>	Achieved
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### Guidance Information

- 1 **Definition**  
*Common engineering metals* – includes but is not limited to – iron, carbon steels, austenitic stainless steels, aluminium, copper, brasses, bronzes, zinc.
- 2 **References**  
 National and international standards setting bodies applicable to this unit standard include but are not limited to – American Iron and Steel Institute (AISI), ASTM International, British Standards Institution (BSI), Standards New Zealand (NZS), International Organisation for Standardisation (ISO), Japanese Industrial Standards (JIS), Standards Australia (AS), Deutsches Institut für Normung e.V. (German Institute for Standardisation (DIN)).
- 3 **Assessment Information**  
 This unit is intended to cover entry level knowledge of common engineering metals, to establish a foundation knowledge base.
- 4 **Recommended skills and knowledge:**  
 Unit 20917, *Demonstrate basic knowledge of engineering materials*; or demonstrate equivalent knowledge and skills.

### Outcomes and performance criteria

#### Outcome 1

Demonstrate knowledge of the types, properties, and characteristics of common engineering metals.

**Performance criteria**

- 1.1 The difference between pure metals and metal alloys is described, with reference to examples.
- Range at least two pure metals and at least two metal alloys.
- 1.2 The difference between ferrous and non-ferrous metals is described with reference to examples.
- Range at least two ferrous metals and at least four non-ferrous metals.
- 1.3 Basic elemental composition of common engineering metals is identified.
- 1.4 Common engineering metals are compared in terms of their physical characteristics.
- Range physical characteristics include but are not limited to – machinability, weldability, hardenability, malleability, ductility, durability, thermal conductivity, electrical conductivity, surface texture / finish, strength, density, hardness, lustre, colour, melting point, wear resistance;  
at least six physical characteristics for each of the common metals are required.
- 1.5 Terms used to describe material properties of common engineering metals are defined.
- Range terms include but are not limited to – tensile stress, shear stress, compressive stress, yield stress, proof stress, strain, % elongation, creep resistance, bending, twisting, impact strength, toughness, fatigue strength, wear resistance, hardness;  
at least four characteristics are required.

**Outcome 2**

Demonstrate knowledge of the selection, use, and processing of common engineering metals.

**Performance criteria**

- 2.1 Factors influencing the selection of common engineering metals are described.
- Range factors include but are not limited to – cost, availability, preparation time, appropriateness for job, ease of working, job specifications, mechanical properties, machine capability;  
description of the mechanical properties, appropriateness for job, and at least two other factors is required.

2.2 Applications of common engineering metals are identified.

Range at least three applications for each common engineering metal are required.

2.3 Methods of processing common engineering metals are identified.

Range includes but is not limited to – casting, rolling, forging, extrusion, drawing, spinning, stamping and forming, punching and blanking, machining processes.

### Outcome 3

Demonstrate knowledge of the effect that external factors have on common engineering metals.

#### Performance criteria

3.1 Changes to the states of heat treated metals are defined.

Range metals composed of 2% carbon, heated from ambient to 1300°C; states include but is not limited to – austenite, martensite, pearlite, cementite, bainite, ferrite, ledeburite.

3.2 Changes to metals caused by normalising, annealing, and hot working are identified.

Range changes – grain structure, strength, hardness, ductility, magnetism, dimensions, colour;  
hot working – rolling, bending, forging, drawing, extrusion, casting.

3.3 Changes to metals caused by cold working are identified.

Range changes – grain structure, strength, ductility, hardness, malleability;  
cold working – bending, rolling, punching, blanking, spinning, stamping, forming.

3.4 Corrosive processes and preventive measures are identified.

Range Corrosive processes include but are not limited to – dry corrosion, wet corrosion, galvanic action;  
Identification of five preventive measures is required.

<b>Replacement information</b>	This unit standard has been replaced by unit standard 29550.
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**This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.**

**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	26 July 2004	31 December 2014
Review	2	17 June 2011	31 December 2016
Revision	3	17 November 2011	31 December 2022
Review	4	8 December 2016	31 December 2022
Rollover	5	16 December 2021	31 December 2022

<b>Consent and Moderation Requirements (CMR) reference</b>	0013
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.