

<b>Title</b>	<b>Demonstrate knowledge of the composition of common engineering metals</b>		
<b>Level</b>	<b>3</b>	<b>Credits</b>	<b>5</b>

<b>Purpose</b>	People credited with this unit standard are able to demonstrate knowledge of ferrous and non-ferrous metals and their composition, and of techniques for determining the composition of 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 Definitions

*Common engineering metals* – include but is not limited to – iron, carbon steels, austenitic stainless steels, aluminium, copper, brasses, bronzes, zinc.

*Material properties* – performance factors which may 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.

*Physical characteristics* – factors that distinguish one metal from another such as machinability, weldability, hardenability, malleability, ductility, durability, thermal conductivity, electrical conductivity, surface texture/finish, strength, density, hardness, lustre, colour, melting point, wear resistance.

#### 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)).

### Outcomes and performance criteria

#### Outcome 1

Demonstrate knowledge of ferrous metals and their composition.

**Performance criteria**

- 1.1 Types of ferrous metals are identified in terms of their unique physical characteristics.
- Range steels – plain carbon steel, alloy steel, stainless steel, tool steel, cast steel, specialised steels, structural steels; cast iron – grey cast iron, white cast iron, malleable cast iron, ductile cast iron (or spheroidal graphite (SG) iron).
- 1.2 The hardening effects of carbon content on ferrous metals are described in qualitative terms.
- 1.3 The effect of alloying elements on the material properties of ferrous metals is described in qualitative terms.
- Range description is required for eight elements.
- 1.4 Ferrous metals are selected for common engineering applications, and the selections justified.
- Range selection of three ferrous metals for each of six applications is required.

**Outcome 2**

Demonstrate knowledge of non-ferrous metals and their composition.

**Performance criteria**

- 2.1 Types of non-ferrous metals are identified in terms of their unique physical characteristics.
- Range includes but is not limited to – tin, magnesium, nickel, titanium, beryllium, lead.
- 2.2 The elemental composition and unique physical characteristics between cast and wrought aluminium alloys are compared.
- 2.3 The elemental composition and unique physical characteristics of non-ferrous alloys are identified.
- Range non-ferrous alloys - brasses, bronzes, copper alloys, nickel alloys, magnesium alloys.  
Evidence is required for at least two of each non-ferrous alloy.
- 2.4 Non-ferrous metals are selected for common engineering applications, and the selection justified.
- Range selection of three non-ferrous metals for each of six applications is required.

**Outcome 3**

Demonstrate knowledge of techniques for determining the composition of engineering metals.

**Performance criteria**

3.1 Techniques for determining chemical composition of metals are identified and related to their method and application.

Range colour and number code, magnetic test, mass spectroscopy, wet chemical analysis.

<b>Replacement information</b>	This unit standard was replaced by unit standard 29551.
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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	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 2016
Revision	7	17 November 2011	31 December 2021
Review	8	8 December 2016	31 December 2021
Rollover	9	27 August 2020	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>.