

<b>Title</b>	<b>Demonstrate basic knowledge of common engineering metals</b>		
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>3</b>

<b>Purpose</b>	<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 29551 and 29552.</p> <p>People credited with this unit standard are able to demonstrate basic knowledge of the mechanical properties, strength and composition of common engineering metals, and their selection and use.</p>
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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 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)).

### 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.

### 3 Range

Common engineering metals – austenitic stainless steel, aluminium, carbon steel, copper and bronze.

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## Outcomes and performance criteria

### Outcome 1

Demonstrate basic knowledge of the mechanical properties of common engineering metals.

Range mechanical properties include – machinability, ductility, formability, conductivity, density, hardness, brittleness, weldability, corrosion resistance.

**Performance criteria**

- 1.1 Mechanical properties are defined.
- 1.2 Engineering metals that exhibit a relatively high and low degree of each mechanical property are stated.
- 1.3 The mechanical properties that make an engineering metal suitable for its purpose are stated.
- Range for example stainless steel is used in food preparation and processing areas because it is corrosion resistant and can be easily cleaned.  
Evidence is required of five examples using different engineering metals.
- 1.4 The relationship between mechanical properties is described.
- Range includes but is not limited to – the relationships between hardness, machinability, brittleness and formability.

**Outcome 2**

Demonstrate basic knowledge of the strength of common engineering metals.

Range types of strength – compressive, tensile, shear, yield point.

**Performance criteria**

- 2.1 Strength of engineering metals is defined.
- 2.2 An example is stated of an engineering application where each type of strength is an important factor, and a metal suitable for the application is stated.

**Outcome 3**

Demonstrate basic knowledge of the composition of common engineering metals and their alloying elements.

**Performance criteria**

- 3.1 The difference between pure metals and metal alloys is described with reference to examples.
- 3.2 The difference between ferrous and non-ferrous metals is described with reference to examples.

- 3.3 The effects alloying elements have on the mechanical properties of metals are described and an example stated of a metal in which each element is used.
- Range elements – carbon, chromium, lead, manganese, molybdenum, nickel, silicon, vanadium.
- 3.4 Typical carbon content is listed for types of carbon steel, and the effect it has on mechanical properties is stated.
- Range types of carbon steel – low carbon steel (mild steel), medium carbon, high carbon steel.  
Mechanical properties include hardness, formability, machinability, weldability.
- 3.5 The elemental composition of common engineering alloys is stated and an engineering application for each alloy described.
- Range common engineering alloys – brass, bronze.
- 3.6 The elemental composition of common grades of aluminium alloys is stated and an engineering application for each is described.
- Range a minimum of three different common grades of aluminium alloys.
- 3.7 Chromium and nickel content are stated for grades of austenitic stainless steel and the effect they have on the corrosion resistance of the metal are described.
- Range grades of stainless steel include but are not limited to – 304, 316.

#### Outcome 4

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

#### Performance criteria

- 4.1 Factors influencing the selection of common engineering metals to meet job specifications are explained.
- Range factors include – strength, mechanical properties, cost, availability, preparation time.
- 4.2 A suitable metal and the factors influencing its selection are described for given job specifications.
- Range a minimum of three job specifications are given requiring a different metal for each; a minimum of three factors are described for the selection of each metal.

<b>Replacement information</b>	This unit standard replaced unit standard 20799
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<b>Planned review date</b>	31 December 2021
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**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	8 December 2016	N/A
Revision	2	28 September 2017	N/A

<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>.

**Comments on this unit standard**

Please contact Competenz at [qualifications@competenz.org.nz](mailto:qualifications@competenz.org.nz) if you wish to suggest changes to the content of this unit standard.