Title	**Demonstrate basic knowledge of the mechanical properties and selection of engineering materials**		
Level	**2**	**Credits**	**3**

Purpose	This unit standard is for people employed in mechanical engineering requiring a basic knowledge of engineering materials and their application People credited with this unit standard are able to demonstrate basic knowledge of: the mechanical properties and strength of materials; manufacturing and production methods of engineering plastics; the use of rubber in mechanical engineering applications; the use of powdered material in manufacturing and mechanical engineering processes; the use and fabrication methods of composite materials; and the selection and use of common engineering materials.

Classification	Mechanical Engineering > Engineering - Materials

Available grade	Achieved

Guidance Information

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.

2 Range
Common engineering materials - metals and polymers.

3 Definition
Polymer refers to plastic and synthetic rubber.

Outcomes and performance criteria

Outcome 1

Demonstrate basic knowledge of the mechanical properties and strength of materials.

Range mechanical properties - machinability, ductility, formability, brittleness, conductivity, density, hardness.
Types of strength – compression, tensile, shear, yield point.

Performance criteria

1.1 Mechanical properties are defined.

1.2 The mechanical properties of common engineering materials are stated.

Range evidence is required of a minimum of one type of plastic, one type of rubber, and three different metals.

1.3 Types of strength are defined.

1.4 An example is described of an engineering application where each type of strength is an important factor, and an engineering material suitable for the application is stated.

Outcome 2

Demonstrate basic knowledge of the manufacturing and production methods of engineering plastics.

Performance criteria

2.1 The difference between thermoset polymers and thermoplastic polymers is described.

2.2 An example of a product manufactured from common industry plastics is stated and the mechanical properties that make it suitable for the product described.

Range examples of common industry plastics – acetal, acrylic, nylon, polyethylene (PE), polycarbonate, polypropylene, Polytetrafluoroethylene (PTFE), polyvinyl chloride (PVC). Evidence is required of eight different industry plastics.

2.3 Methods of moulding and fabricating plastic materials are described and an example of an item produced using each method is stated.

Range plastic moulding methods – injection moulding, extrusion moulding, rotational moulding.
Fabrication methods – welding, joining, forming.

Outcome 3

Demonstrate basic knowledge of the use of rubber in mechanical engineering applications.

Performance criteria

3.1 Common uses for rubber in mechanical engineering applications are described and the properties that make it suitable for the application are stated.

Range evidence is required of a minimum of three common applications.

Outcome 4

Demonstrate knowledge of the use of powdered material in manufacturing and mechanical engineering processes.

Performance criteria

4.1 The use of powdered material in manufacturing or mechanical engineering processes is described.

Range processes – sintering, additive manufacturing (3D printing).

4.2 The benefits of using sintered tungsten carbide for cutting tools are described.

Outcome 5

Demonstrate basic knowledge of the use and fabrication methods of composite materials.

Performance criteria

5.1 The term composite material is defined with reference to the overall structure of the finished material.

5.2 The relative merits of using composites over other materials are stated.

5.3 An example is stated of a product produced from common composite materials.

Range common composite materials include – concrete, glass reinforced plastic, carbon fibre composite, laminated wood.

Outcome 6

Demonstrate basic knowledge of the selection and use of common engineering materials.

Performance criteria

6.1 Factors influencing the selection of common engineering materials to meet job specifications are explained.

Range factors include – strength, mechanical properties, cost, availability, preparation time.

6.2 A suitable material and the factors influencing its selection are described for given job specifications.

Range a minimum of three job specifications are given requiring three different materials; a minimum of three factors are described for each.

Replacement information	This unit standard replaced unit standard 20917

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
Revision	2	28 September 2017	N/A

Consent and Moderation Requirements (CMR) reference	0013

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 if you wish to suggest changes to the content of this unit standard.