Title	**Describe the properties and use of engineering materials used in an energy and chemical plant primary process**		
Level	**4**	**Credits**	**3**

Purpose	This unit standard is intended for people working as boiler operators and energy and chemical process operators in an energy and chemical plant. People credited with this unit standard are able to describe: the characteristics of engineering materials used in an energy and chemical plant; the chemical, physical, and mechanical properties of engineering materials used in an energy and chemical plant, and methods for determining properties; and the applications and factors influencing selection of engineering materials used in an energy and chemical plant primary process.

Classification	Energy and Chemical Plant > Operation of Energy and Chemical Plant

Available grade	Achieved

Guidance information

1 Legislation, regulations, and the code of practice relevant to this unit standard include but are not limited to:

- *Approved Code of Practice for the Design, Safe Operation, Maintenance and Servicing of Boilers* (the Code), Published by the Occupational Safety and Health Service Department of Labour, 2004;
- Health and Safety at Work Act 2015;
- Health and Safety at Work (Hazardous Substances) Regulations 2017;
- Hazardous Substances and New Organisms Act 1996

and any subsequent amendments.

2 Definitions

Energy and chemical plant may be in – petrochemical, agri-nutrient, power generation, dairy processing, meat processing, and wood fibre manufacturing, or other plants that operate with a combination of high temperatures, pressures, steam and/or chemicals in gas, liquid or solid form.

Organisational requirements – documented policies and procedures. These may include: equipment manufacturers' procedures; plant procedures; suppliers' instructions; site signage; codes of practice; company health and safety plans; on site briefings; and supervisor's instructions. This includes all regulatory and legislative obligations that apply to the plant and international standards applicable to engineering materials used in the plant.

Plant – the operational unit, equipment and/or workplace at which the person is working.

3 Engineering materials include but are not limited to – metals; steel - mild, high tensile, stainless, high strength low alloy (HSLA), specialty; alloys - copper, aluminium; titanium, cast iron; thermoplastics - polymers, commodity, engineering and high performance; elastomers, thermosets, composites, adhesives; ceramics - electrical, refractory, concrete; individually and in combination.

4 For the purposes of assessment:
- evidence for this unit standard must be supplied from the workplace.
- evidence must be presented in accordance with organisational requirements.

Outcomes and performance criteria

Outcome 1

Describe the characteristics of engineering materials used in an energy and chemical plant.

Performance criteria

1.1 Describe engineering materials in terms of their characteristic properties.

Range properties include but are not limited to – strength, ductility, density, thermal conductivity, electrical conductivity, hardness, environmental performance.

Outcome 2

Describe the chemical, physical, and mechanical properties of engineering materials used in an energy and chemical plant, and methods for determining properties.

Range evidence of at least four engineering materials is required.

Performance criteria

2.1 Describe the chemical, physical and mechanical properties of engineering materials in accordance with international standards.

2.2 Describe methods for determination of the physical properties of engineering materials.

Range physical properties – density, melting temperature, glass transition temperature, modulus, conductivity, colour, magnetic.

2.3 Describe methods for determining the mechanical properties of engineering materials.

Range yield strength, ultimate tensile strength, percentage elongation, proof stress, reduction in area, impact strength, toughness, hardness, heat distortion temperature, creep resistance, fatigue resistance, flexural strength, viscoelasticity.

Outcome 3

Describe the applications and factors influencing selection of engineering materials used in an energy and chemical plant primary process.

Range evidence of at least four engineering materials is required.

Performance criteria

3.1 Describe common applications of engineering materials.

Range evidence of four applications is required.

3.2 Describe factors influencing the selection of engineering materials.

Range includes but is not limited to – cost, availability, preparation time, appropriateness for job, ease of working, job specifications, mechanical properties, capability; and at least one other factor.

Replacement information	This unit standard was replaced by skill standard 40455.

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	27 February 2020	31 December 2027
Review	2	24 April 2025	31 December 2027

Consent and Moderation Requirements (CMR) reference	0079

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.