Title	Demonstrate knowledge of theoretical mechanics for extractive industries		
Level	5	Credits	20

Purpose	People credited with this unit standard are able to explain: the relationship between static force systems and the effects of forces on simple components and structures; methods for determining characteristics of metals; the mechanics applied to components of machinery, and the fundamentals of static fluids, for extractive industries.

Classification	Extractive Industries > Extractive Industries Management

Available grade	Achieved

Guidance Information

None.

Outcomes and performance criteria

Outcome 1

Explain the relationship between static force systems and the effects of forces on simple components and structures.

Range   tensile, compressive and direct shear force, shear stresses.

Performance criteria

1.1   The relationship between the principle of moments and its application is explained in relation to beam reactions (point loaded beams only) and resultant parallel and coplanar force systems.

1.2   The conditions of equilibrium are explained in relation to external forces acting on that condition.

      Range   internal and external forces; free body diagrams.

1.3   The relationship of the centre of gravity to centre of area of simple plane shapes is determined for safe lifting.

      Range   vector and scalar values.

1.4 The relationship of force vectors to coplanar and concurrent force systems is determined.

Range parallel and non-parallel coplanar forces;
resolution and composition, resultant, equilibrium.

1.5 The relationship of and notation of three-force systems to coplanar and concurrent forces is determined.

Range resultant equilibrium;
triangle of forces, force diagram.

Outcome 2

Explain methods for determining characteristics of metals used in extractive industries.

Performance criteria

2.1 The relationship of stress and strain to typical metallic materials is explained.

Range types of stress and strain, Hooke's Law, Young's Modulus of Elasticity, Modulus of Rigidity, Poisson's Ratio, ferrous and non-ferrous, brittle and ductile.

2.2 Material stress testing is explained in relation to metal specimens.

Range tensile, compressive, shear.

2.3 The relationships of bending moments and forces for simple beams with point loads to determine beam reactions are explained.

Range simple cantilever beams, simple bridged beams, wall reactions.

2.4 Tensile and compressive stress due to bending is explained in relation to bending moment for simple beams.

Outcome 3

Explain the mechanics applied to components of machinery used in extractive industries.

Performance criteria

3.1 The relationship of velocity to time diagrams is explained.

Range linear velocity and acceleration, relative velocity, equations of linear motion, motion along an inclined plane.

3.2 The relationship of kinetic and potential energy to work and power is explained.

3.3 Friction is explained in terms of movement of loads.

> Range lubricated and un-lubricated surfaces, coefficient of friction, angle of friction.

3.4 Mechanical advantage is explained in terms of simple mechanisms.

> Range wheels, levers, pulleys, screws, gears, worm and wheel, belts, velocity ratio, efficiency.

3.5 The relationship of engine efficiency to power is explained.

> Range input power, indicated power, brake power.

3.6 The relationship of transmitted power to drive shafts is explained.

> Range torque, simple and compound spur gearing, belt tension.

3.7 Types of drive shaft couplings and mechanisms are explained in terms of their typical applications.

> Range ratchet, connecting, rod and crank, eccentric, cam.

Outcome 4

Explain the fundamentals of static fluids used in extractive industries.

Performance criteria

4.1 Fluids are explained in terms of fundamental mechanics.

> Range Archimedes' Principle, flotation, pressure/depth relationship, static pressure.

4.2 Basic molecular structure differences are explained in terms of solids, liquids, and gases.

4.3 Vessels containing fluid are explained in terms of the impact of pressure applied.

> Range gauge pressure, atmospheric pressure, vacuum.

4.4 The principles of hydraulic energy systems are explained in terms of simple hydraulic machines.

Replacement information	This unit standard replaced unit standard 15671.

Planned review date	31 December 2022

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	23 September 2005	N/A
Rollover	2	16 July 2010	N/A
Rollover and Revision	3	25 January 2018	N/A

Consent and Moderation Requirements (CMR) reference	0114

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

Comments on this unit standard

Please contact MITO New Zealand Incorporated info@mito.org.nz if you wish to suggest changes to the content of this unit standard.