

<b>Title</b>	<b>Evaluate mining methods, and analyse and select plant for metalliferous underground extraction</b>		
<b>Level</b>	<b>6</b>	<b>Credits</b>	<b>20</b>

<b>Purpose</b>	<p>People credited with this unit standard are able to: evaluate geological features of metalliferous ore bodies in relation to mining methods; describe support requirements and potential hazards in metalliferous mines; evaluate metalliferous mine development methods; and evaluate metalliferous extraction methods.</p> <p>They are also able to, for underground metalliferous mines, analyse and select: development machinery and materials; underground ore extraction machinery and materials; and underground transportation methods.</p>
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<b>Classification</b>	Extractive Industries > Extractive Industries Management
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<b>Available grade</b>	Achieved
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## Guidance Information

- 1 Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to the:
  - Health and Safety at Work Act 2015 (HSW);
  - Health and Safety at Work (General Risk and Workplace Management) Regulations 2016;
  - Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2022;
  - Health and Safety at Work (Worker Engagement, Participation, and Representation) Regulations 2016;
  - Health and Safety at Work (Hazardous Substances) Regulations 2017 and related Safe Work Instruments (SWIs) published by WorkSafe NZ;
  - Approved codes of practice issued pursuant to the HSW Act;
  - Hazardous Substances and New Organisms Act 1996;
  - WorkSafe NZ's Good Practice Guidelines for the extractives industries, available from <https://worksafe.govt.nz/>.

Any new, amended or replacement Acts, regulations, standards, codes of practice, guidelines, or authority requirements or conditions affecting this unit standard will take precedence for assessment purposes, pending review of this unit standard.

- 2 Definition
 

*Plant* refers to machinery, materials, and transportation methods used in metalliferous underground extraction.

3 This unit standard is intended for, but is not limited to, workplace assessment.

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## Outcomes and performance criteria

### Outcome 1

Evaluate geological features of metalliferous ore bodies in relation to mining methods.

#### Performance criteria

1.1 The effects of geological features are evaluated in relation to a given mining method.

Range includes but is not limited to – geological structure, rock properties, ore body characteristics, host rock, minerals, ground water and hydrogeology.

### Outcome 2

Describe support requirements and potential hazards in metalliferous mines.

#### Performance criteria

2.1 Support requirements are described in terms of the stability of the excavation.

Range includes but is not limited to – rock bolting methods, timber support, steel support, side support, mesh, grout, shotcrete, lining.

2.2 Potential hazards are described in terms of mining safety.

Range includes but is not limited to – gas, dust, rock instability, water inundations.

### Outcome 3

Evaluate metalliferous mine development methods.

#### Performance criteria

3.1 Development methods are evaluated in relation to the physical nature of the ore body.

Range may include but is not limited to – hand mining, drill and blast, mechanical loading, roadheader, single entry, stope development, level development, ore passes, winzes, shafts, escape ways, ventilation raises, ingress and egress.

3.2 The effectiveness of rock or ground support is evaluated in relation to development methods selected.

- 3.3 The procedures adopted for excavating shafts, connections and facilities are evaluated in relation to their intended use and safety.

Range includes but is not limited to – pump chambers, haulage drives, special use chambers.

- 3.4 The resultant hazards from roadway development are evaluated in terms of possible effects on health, safety of personnel and potential damage to plant and equipment.

## Outcome 4

Analyse and select development machinery and materials for underground metalliferous mines.

### Performance criteria

- 4.1 The geological and mining conditions are analysed in terms of the operation of development machinery required.

Range includes but is not limited to – geological features and structure, gradient, rock properties, strength, hardness, joints, density, orebody characteristics, depth, stress distribution, roadway orientation.

- 4.2 The attributes of the machinery and materials are analysed in terms of development methods.

Range includes but is not limited to – explosives, road headers, boom drilling machine, rock bolters, load haul dump machine, mechanical loaders, raise borer, shotcreting units, explosive charging units.

- 4.3 Potential hazards are analysed in relation to the operation of development machinery.

Range hazards includes but is not limited to – ground stability, gas, dust, water, explosives, shaft sinking, chutes, ore passes, wind blast, water management pumping requirements, ventilation devices and systems, rotating equipment, energy sources, mobile equipment, guarding, conveyors, harmful gases.

- 4.4 The characteristics of the plant and materials, site, and hazards are analysed and plant and materials are selected in terms of end product requirements, financial constraints, and safety considerations and requirements.

## Outcome 5

Evaluate metalliferous extraction methods.

**Performance criteria**

- 5.1 Extraction methods are evaluated in relation to the geological features of the ore body.
- Range includes but is not limited to – stope mining, long hole blasting, cut and fill, shrinkage stoping, sub-level caving, block caving.
- 5.2 The resultant hazards of extraction methods are evaluated in terms of possible effects on health, safety of personnel and potential damage to plant and equipment.
- 5.3 Mining methods are evaluated in terms of their impact on the surface.
- Range includes but is not limited to – subsidence, sink holes, vibration, compressive and tensile fracturing.

**Outcome 6**

Analyse and select underground ore extraction machinery and materials.

**Performance criteria**

- 6.1 The geological and mining conditions are analysed in terms of the operation of extraction machinery required.
- Range includes but is not limited to – geological features and structure, gradient, rock properties, strength, hardness, joints, density, orebody characteristics, depth, stress distribution, stoping methods, hydrogeology.
- 6.2 The attributes of the machinery and materials are analysed in terms of the extraction method.
- Range includes but is not limited to – explosives, road headers, boom drilling machine, rock bolters, load haul dump machine, mechanical loaders, raise borer, shotcreting units, explosive charging units.
- 6.3 Potential hazards are analysed in terms of extraction machinery and materials.
- Range includes but is not limited to – ground stability, gas, dust, water, explosives, shaft sinking, chutes, ore passes, wind blast, water management pumping requirements, ventilation devices and systems, rotating equipment, energy sources, mobile equipment, guarding, conveyors, harmful gases.
- 6.4 The characteristics of the plant, site, and hazards are analysed and machinery and materials selected in terms of end product requirements, financial constraints, and safety considerations and requirements.

## Outcome 7

Analyse and select underground transportation methods for metalliferous mines for metalliferous mines.

### Performance criteria

7.1 The attributes of different transportation methods are analysed in terms of the haul distance, quantity, ore characteristics, and nature of the orebody.

Range may include but is not limited to – conveyors, shuttle cars, rail transport, rope haulage, diesel haulage, scraper drives, shaft hoisting, winzes, chutes, ore passes.

7.2 Potential hazards are analysed in terms of transportation in metalliferous mines for metalliferous mines.

Range ground stability, gas, dust, water, stope stability, fires, shafts, winzes, chutes, ore passes, wind blast.

7.3 The attributes of the plant, site, and hazards are analysed and transportation method selected in terms of end product requirements, financial constraints, and safety considerations and requirements.

<b>Replacement information</b>	This unit standard replaced unit standard 15660 and unit standard 15670.
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<b>Planned review date</b>	31 December 2029
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### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	1 March 2018	31 December 2027
Review	2	26 June 2025	N/A

<b>Consent and Moderation Requirements (CMR) reference</b>	0114
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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 Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council [qualifications@hangaarorau.nz](mailto:qualifications@hangaarorau.nz) if you wish to suggest changes to the content of this unit standard.