

<b>Title</b>	<b>Describe, install, and reassess support systems for an underground operation</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>15</b>

<b>Purpose</b>	People credited with this unit standard are able to: describe the forces that act at depth to influence the stability of openings in rock and strata; describe the principles of proactive and reactive support systems; describe ground conditions and support mechanisms for an underground operation; describe opening dimensions for an underground operation; install roof and sides supports in an underground operation; and reassess roof and sides, and ensure documentation is completed.
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<b>Classification</b>	Extractive Industries > Underground Extraction
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<b>Available grade</b>	Achieved
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<b>Prerequisites</b>	Unit 7146, <i>Demonstrate basic knowledge and ability required to work in an underground operation</i> , or demonstrate equivalent knowledge and skills.
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### Guidance Information

- 1 Performance of the outcomes of this unit standard must comply with the following:  
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 (Worker Engagement, Participation, and Representation) Regulations 2016;  
Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016;  
approved codes of practice issued pursuant to the HSW Act.
- 2 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.
- 3 **Definitions**  
*Company procedures* mean the documented methods for performing work activities and include health and safety, operational, environmental, and quality management requirements. They may refer to legislation, regulations, guidelines, standard operating procedures, manuals, codes of practice, or policy statements.  
*Industry best practice* may be documented in management plans, control plans, company procedures, managers' rules, occupational health and safety policy,

industry guidelines, codes of practice, manufacturers' instructions, and safe working and/or job procedures (or equivalent).

- 4 An *underground operation* includes extractive or tunnelling operations.

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## Outcomes and performance criteria

### Outcome 1

Describe the forces that act at depth to influence the stability of openings in rock and strata.

#### Performance criteria

- 1.1 The forces acting on, and the behaviour of, rock at depth are described.
- Range vertical, horizontal, reaction forces, stress, strain, strength, stiffness, failure.
- 1.2 The distribution of forces around underground openings is described in terms of bed separation, abutment loads, distressed zones, and pressure arch theory.

### Outcome 2

Describe the principles of proactive and reactive support systems.

#### Performance criteria

- 2.1 The principles of proactive support systems are described in terms of underground operations.
- Range support types include but are not limited to – roof bolts, cable bolts, friction bolts, megastrand or tensionable cable bolts (TCB), anchors, shotcrete, laminated beam, suspension or trusses, spiling bars, mesh, installation methods.
- 2.2 The principles of reactive support systems are described in terms of underground operations.
- Range support types include but are not limited to – timber, props, hydraulic powered systems, poured concrete, yielding and non-yielding steel sets and arches, installation methods.

### Outcome 3

Describe ground conditions and support mechanisms for an underground operation.

**Performance criteria**

3.1 Ground conditions are described in terms of support requirement indicators.

Range may include but is not limited to – roof condition, ribs or sides condition, floor heave, spalling, guttering, ground failures, weak zones, geological structure and features, water make, bed separation, support loading, extensometer readings.

3.2 Preparation and monitoring of ground prior to installation of support are described in accordance with industry best practice and company procedures.

Range may include but is not limited to – trimming, barring down, scaling, sounding, visual and physical inspection, roof movement indicators (e.g. wedge, extensometer, strain gauge), support behaviour and loading.

**Outcome 4**

Describe opening dimensions for an underground operation.

**Performance criteria**

4.1 Influences of geological conditions are described in terms of required opening dimensions.

Range may include but not is limited to – depth, faults, folding, synclinal and anticlinal structures, seam type and thickness, ore body characteristics, roof and side conditions, geologically weakened zones, voids, permeability, porosity, rock strength.

4.2 Effect of opening dimensions on support system selection and installation are described.

Range may include but is not limited to – roadway size and profile, pillar size, width to height ratio, strength of rock and/or strata, rock characteristics, coal extraction voids, stoping voids.

**Outcome 5**

Install roof and sides supports in an underground operation.

**Performance criteria**

5.1 Equipment and materials are prepared for use in installation process in accordance with industry best practice and company procedures.

- 5.2 Installation of support system is in accordance with industry best practice and company procedures.

Range may include but is not limited to – shotcrete, chemical anchor bolts, cable bolts, megastrand or TCB, strap and mesh, steel sets, steel arches, poured concrete, timber supports, hydraulic supports, roof bolts (friction, expansion shell, resin bonded), grouting, shotcrete.

- 5.3 Potential hazards during installation are identified and methods to deal with them are described in accordance with industry best practice and company procedures.

Range may include but is not limited to – unseen voids, water, gas, changing geological conditions.

## Outcome 6

Reassess roof and sides and ensure documentation is complete.

### Performance criteria

- 6.1 Roof and sides are reassessed and any required action taken in accordance with industry best practice and company procedures.
- 6.2 Documentation is completed in accordance with industry best practice and company procedures.

<b>Replacement information</b>	This unit standard replaced unit standard 7147.
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<b>Planned review date</b>	31 December 2022
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### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	24 November 2005	31 December 2017
Rollover and Revision	2	16 July 2010	31 December 2017
Review	3	18 June 2015	N/A
Rollover and Revision	4	25 January 2018	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>.

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**Comments on this unit standard**

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