

Title	Design and maintain effective ventilation systems for an underground operationcoal mine		
Level	5	Credits	20

Purpose	People credited with this unit standard are able to: explain the principles and practices of ventilation; design ventilation circuits, and select and position ventilation control devices; read and interpret a ventilation plan; explain how the ventilation system is established; measure, maintain, and document ongoing air velocity, air quality, and air quantity in an underground operation coal mine; measure gases and mixtures of gases found in an underground operation coal mine, and interpret results and explain the effects; and explain the primary causes and control mechanisms for fires, spontaneous combustion, and hazardous atmospheres in an underground operation coal mine.
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Classification	Extractive Industries > Underground Extraction
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Available grade	Achieved
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Entry information	
PrerequisitesCritical health and safety prerequisites	Unit 21281, <i>Interpret and test for gases in an underground extraction sitecoal mine</i> , or demonstrate equivalent knowledge and skills.

Guidance Information~~Explanatory notes~~

- Performance of the outcomes of this unit standard must comply with the following:
 - ~~Health and Safety in Employment at Work Act 1992-2015 (HSEHSW);~~
 - ~~Health and Safety at Work (General Risk and Workplace Management) Regulations 2016;~~
 - ~~Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016;~~
 - ~~Health and Safety at Work (Worker Engagement, Participation, and Representation) Regulations 2016;~~
 - ~~Health and Safety in Employment Regulations 1995;~~
 - ~~Health and Safety in Employment (Mining Operations and Quarrying Operations) Regulations 2013;~~
 - approved codes of practice issued pursuant to the ~~HSE-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 Joint assessment must be conducted in the assessment of this unit standard because of the high degree of risk.

To conduct a joint assessment, two assessors, or one assessor and one technical verifier, must have witnessed the learner undertaking the tasks required in the unit standard and have come to the same conclusion in regards to the learner being competent or not yet competent. At least one assessor or verifier must hold the unit standard they are assessing on their NZQA Record of Learning.

- 4 Due to the high degree of risk associated with this unit standard, the assessment process must include a learner interview with one or both assessors.

5 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).

~~6—An underground operation includes extractive or tunnelling operations.~~

6 All evidence for assessment against this unit standard must be in accordance with industry best practice and company procedures.

Outcomes and **performance criteria** **evidence requirements**

Outcome 1

Explain the principles and practices of ventilation in an underground ~~operation~~coal mine.

Evidence requirements

- 1.1 The principles and practices of air movement and gas ~~management~~accumulation in underground mines are explained in terms of effective and ineffective air circulation.

Range includes but is not limited to – air movement, gas ~~accumulation~~occurrence, pressure differential, resistance, effects of temperature, air density, air power, areas, volumes.

Outcome 2

Design ventilation circuits, and select and position visual control devices (VCDs) for an underground ~~operation~~coal mine.

Performance criteria

~~Evidence requirements~~

- 2.1 Design meets requirements of industry best practice and company procedures.
- 2.2 The ~~Combined-G~~gas laws and Atkinson's formula are calculated to demonstrate the design is effective.
- 2.3 VCDs are selected and positioned on the designed plan to gain optimal atmospheric conditions for mine operation.

Range includes but is not limited to – main fans, air intake, return airflow, stoppings, air crossings, regulators, doors, auxiliary fans, seals, VCD's strength rating, design, location.

Outcome 3

Read and interpret a ventilation plan for an underground ~~operation~~coal mine.

Performance criteria

~~Evidence requirements~~

- 3.1 Standard symbols on a ventilation plan are interpreted in accordance with ~~industry best practice and~~ approved mine survey standards.

Range includes but is not limited to – main fan, air intake, return airflow, stoppings, air crossing, regulators, doors, auxiliary fan, air mover.

- 3.2 Mathematical calculations are made and interpreted for a ventilation plan for an underground ~~operation~~coal mine.

Outcome 4

Explain how the ventilation system for an underground ~~operation~~coal mine is established.

Performance criteria

~~Evidence requirements~~

- 4.1 A VCD's construction is described ~~in accordance with industry best practice and company procedures~~.

Range includes but is not limited to – temporary and permanent materials, timber, fabric, concrete, blocks, shotcrete, mesh, steel, brattice cloth, strength rating.

- 4.2 The installation of auxiliary ventilation fans and ducting is explained ~~in accordance with industry best practice and company procedures~~.

4.3 The installation of VCDs is explained ~~in accordance with industry best practice and company procedures.~~

4.4 The methods for testing the effectiveness and efficiency of the ventilation system and VCDs are evaluated against the intent of the ventilation plan and site requirements.

Range includes but is not limited to – pressure differential, air flow quantity and velocity, air leakage, air quality, air power.

Outcome 5

Measure, maintain, and document ongoing air velocity, air quality, and air quantity in an underground ~~operation~~coal mine.

Performance criteria

~~Evidence requirements~~

5.1 Air velocity and quantity is measured in accordance with equipment manufacturers' specifications ~~and company procedures.~~

Range includes – anemometer, pitot tube; may include – smoke tubes, velometer, pitot tube.

5.2 Air quality is measured in accordance with equipment manufacturers' specifications ~~and company procedures.~~

Range includes – humidity measurement, hand-held gas detection, remote gas detection (tube bundle and real time), thermometer (wet and dry bulb), dust monitoring, diesel particulate matter; may include – ~~locked flame safety lamp~~, chemical gas tubes.

5.3 Anomalous readings or readings indicating hazardous situations are reported and recommended actions taken. ~~ies are dealt with immediately in accordance with industry best practice and company procedures.~~

5.4 Actions to minimise hazards are dealt with immediately implemented and reported ~~in accordance with industry best practice and company procedures.~~

5.5 Adjustments required are made to VCDs and equipment to maintain required air flow and air quality are described.

5.6 Documentation is completed ~~in accordance with industry best practice and company procedures.~~

Outcome 6

Measure gases and mixtures of gases found in an underground ~~operation~~coal mine, and interpret results and explain the effects.

Range may include but is not limited to – carbon monoxide, carbon dioxide, methane, hydrogen, oxygen, nitrogen, sulphur dioxide, hydrogen sulphide, damps, oxides of nitrogen, higher hydrocarbons.

Performance criteria

~~Evidence requirements~~

- 6.1 The type and proportions of gases and mixtures of gases are measured in accordance with ~~industry best practice, and~~ instrument specifications ~~and company procedures~~.
- 6.2 The potential hazards of the gas concentrations measured are interpreted in terms of consequences to mine site and mine workers.
- 6.3 Hazards are eliminated and/or minimised ~~in accordance with industry best practice and company procedures~~.
- 6.4 The characteristics and behaviour of gases are explained in terms of known gas laws.
- Range includes but is not limited to – Boyle's law, Charles's law, Combined Gas law, Coward's Triangle, Ellicott's diagram, Jones-Trickett's Ratio, CO make by volume.

Outcome 7

Explain the primary causes and control mechanisms for fires, spontaneous combustion, and hazardous atmospheres in underground ~~operation~~ coal mines.

Performance criteria

~~Evidence requirements~~

- 7.1 Primary causes of underground fires, spontaneous combustion, and hazardous atmospheres are explained in terms of an underground environment.
- 7.2 Sources of ignition are explained in terms of an underground environment.
- Range includes but is not limited to – frictional ignition, electrical, mechanical, spontaneous combustion, prohibited material, flammable substances, ~~flash point~~.
- 7.3 Control mechanisms for underground fires, spontaneous combustion, and hazardous atmospheres are explained ~~in accordance with industry best practice~~.
- Range includes but is not limited to – fire fighting methods, emergency responses, fire fighting equipment, neutralising agents.

Planned review date	31 December 2019 <u>2022</u>
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	29 August 1996	31 December 2017
Revision	2	17 December 1996	31 December 2017
Revision	3	18 December 1998	31 December 2017
Review	4	25 November 2000	31 December 2017
Review	5	24 November 2005	31 December 2017
Rollover and Revision	6	16 July 2010	31 December 2017
Review	7	18 June 2015	N/A <u>31 December 2019</u>
<u>Review</u>	<u>8</u>		<u>N/A</u>

Consent and Moderation Requirements (CMR) reference	0114
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Please note

~~Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.~~

~~Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.~~

~~Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.~~

~~Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.~~

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.~~

~~Please contact the NZ Motor Industry Training Organisation (Incorporated) (MITO) info@mito.org.nz if you wish to suggest changes to the content of this unit standard.~~