

Title	Manage the mine ventilation system at an extractive site		
Level	7	Credits	30

Purpose	<p>This unit standard covers the development and management of the operation and maintenance of a mine ventilation system.</p> <p>People credited with this unit standard are able to: identify, analyse, and evaluate hazards and risks associated with the current mine ventilation system, and ventilation control options and measures; develop and maintain the Ventilation Principal Control Plan in accordance with the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016; implement mine ventilation monitoring, recording, and reporting systems in accordance with the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016; coordinate and control the maintenance of and changes to the mine ventilation system and ventilation control devices; and audit and review the effectiveness of the mine ventilation system and ventilation control devices in accordance with the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016 and the Ventilation Principal Control Plan.</p>
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Classification	Extractive Industries > Extractive Industries Management
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Available grade	Achieved
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Guidance Information

- Performance of the outcomes of this unit standard must comply with the following:
 - Crown Minerals Act 1991;
 - 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 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 (HSNO) Act 1996;
 - Mines Rescue Act 2013;
 - Resource Management Act 1991; and company procedures.

- 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 This unit standard is intended for, but is not limited to, workplace assessment. This unit standard requires calculations to be completed where analysis is specified, and where applicable, computer-based ventilation models may be used for design and analysis purposes.
- 4 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.

- 5 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.

6 Definitions

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).

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.

Ventilation System is one which covers all the mine workings, including waste and sealed areas, and it includes all surface and underground fans and ventilation devices which control or impact on the mine ventilation. For the purposes of this unit standard the ventilation system may include workings relating to spontaneous combustion, ventilation, and outburst management.

Ignition is the rapid chemical reaction of a combustible material with oxygen when exposed to sufficient heat.

Explosion is the sudden release of energy generated from the confinement of the rapid volumetric expansion of an ignition.

Action (alarm or trigger) is a generic term used to describe an event determined at the mine site at which action is initiated or a response made.

Audit is a systematic examination against defined criteria to determine whether activities and related results conform to planned arrangement, and whether these arrangements are implemented effectively and are suitable to achieve the organisation's policy and objectives.

Ventilation control device means a door, regulator, seal, stopping, air crossings or other control device to control or direct ventilation flows in a mine.

Ventilation principal control plans (covering management plans for ventilation, spontaneous combustion, gas, and outburst) establish procedures for maintaining a safe environment, including hazard identification and quantification; risk assessment; authority and responsibility; controls established to manage identified risks (mine

design, monitoring, procedures, trigger levels and response plans); reporting and communication; document control; and, audit and review.

Inertisation is defined as the displacing or reducing of oxygen to a level that will not support combustion. It may be either a natural process using seam gases or a process of introducing inert gases.

Frequency is a measure of the rate of occurrence of an event expressed as the number of occurrences of an event in a given time.

Hazard is a source of potential harm or a situation with a potential to cause loss. Hazards in the workplace may relate to equipment, methods/plans, competencies and/or the work environment.

Likelihood is used as a qualitative description of probability and frequency.

Outcomes and performance criteria

Outcome 1

Identify, analyse, and evaluate hazards and risks associated with the current mine ventilation system.

Performance criteria

- 1.1 The sources, hazards, and risks of gases and fumes are identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 1.2 The likelihood and risks of spontaneous combustion are identified and evaluated in accordance with industry best practice and company procedures.
- 1.3 The hazards and risks of airborne and flammable dust are identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 1.4 The potential for, and the likely impact of, windblast on the ventilation system is identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 1.5 The potential for, and the likely impact of, an outburst is identified, analysed, and evaluated in accordance with industry best practice and company procedures.

Range	includes but is not limited to – coal rank, fusinite, mylonite, seam gas and desorption rate, depth, coal strength, permeability.
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- 1.6 The impacts of fire, ignition, and explosion on the ventilation system are identified, analysed, and evaluated in accordance with industry best practice and company procedures.

Range	ignition sources include but are not limited to – electrical, friction, contraband, spontaneous combustion, naked flame, chemical, explosives, machinery.
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- 1.7 The potential for the impact of ventilation pressure differential is identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- Range ventilation pressure differentials may include those resulting from – changes in barometric pressure, fall of ground, fan changes or failure, ventilation control device changes or failure, outburst, holing into previous workings, re-circulation, ventilation circuit changes, natural ventilation pressure changes, explosions, changes in ambient temperature or humidity, fires, equipment moves.
- 1.8 The effect of changes in air temperature and humidity is identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 1.9 The causes and effects of re-circulation are identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 1.10 The impact associated with disruption to the ventilation system is identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 1.11 The likelihood and impacts of holing into previous workings are identified, analysed, and evaluated in accordance with industry best practice and company procedures.

Outcome 2

Identify, analyse, and evaluate ventilation control options and measures

Performance criteria

- 2.1 The types, applications, and limitations of the ventilation control devices are identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- Range includes but not is limited to – doors, regulators, seals, stoppings, air crossings, bulk heads, goaf seals, pressure chambers.
- 2.2 The impact of mine design on the ventilation system is identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- Range the impact of mine design on the ventilation system may be related to – surface access, mining method or rate, barrier pillars and segregation of roadways, system of mining, bleeder or back returns, number of headings, bleeders, geological features.

- 2.3 The methods, purposes, and limitations of mine atmospheric monitoring systems and processes are identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- Range includes but is not limited to – flammable or explosive gas, toxic gas, spontaneous combustion, diesel particulate matter (DPM), dust, hand-held gas detectors, remote monitoring systems, analysing systems, sampling, airflow, explosion risk zone (ERZ) areas, interlocks, sensors, data loggers, alarm settings.
- 2.4 Inertisation techniques and applications are identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- Range inertisation techniques may include – pressure swing absorption, natural oxidation, evaporative and pumped liquefied inert gas, seam gas, exhaust gas (Thomlinson Boiler or jet engine), water.
- 2.5 The impact of seam gas management on the ventilation system is identified, analysed, and evaluated in accordance with industry best practice and company procedures.
- 2.6 The impact of water management on the ventilation system is identified, analysed, and evaluated in accordance with industry best practice and company procedures.

Outcome 3

Develop and maintain the Ventilation Principal Control Plan in accordance with the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016.

Performance criteria

- 3.1 The objectives and criteria for safe and effective ventilation are identified, analysed, and confirmed in accordance with industry best practice and company procedures.
- 3.2 The principles and requirements of mine ventilation are incorporated into the mine development plan.
- 3.3 The requirements for mine fans are identified, analysed, evaluated, and selected in accordance with industry best practice and company procedures.
- 3.4 Design criteria and specifications for ventilation networks and individual circuits are evaluated and applied in accordance with industry best practice and company procedures.
- Range evaluation of design criteria may require consideration of – reserve optimisation, mining direction, geological structures, ventilation, strata control, mining method, productivity, environmental consideration, seam access.

- 3.5 Ventilation control device options are evaluated against requirements and the best option is selected.
- Range ventilation control devices may include – doors regulators, seals, stoppings, air crossings, bulk heads, goaf seals, pressure chambers.
- 3.6 Design criteria for ventilation and environmental monitoring systems are established and selections made in accordance with industry best practice and company procedures.
- 3.7 Procedures for the installation, establishment, and operation of ventilation management systems are prepared and incorporated into the Ventilation Principal Control Plan.
- 3.8 A system for early warning for each identified hazard, including action requirements for each event, is developed and incorporated into the Ventilation Principal Control Plan.
- 3.9 Maintenance programme and procedures are formulated and incorporated into the Ventilation Principal Control Plan.
- 3.10 Procedures for the audit, review, and updating of the ventilation system are incorporated into the Ventilation Principal Control Plan.
- 3.11 Ventilation training requirements are identified and incorporated into the Ventilation Principal Control Plan.
- Range ventilation training may include – induction, basic miner, deputy and ventilation systems operators.

Outcome 4

Implement mine ventilation monitoring, recording, and reporting systems in accordance with the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016.

Performance criteria

- 4.1 Procedures for monitoring, recording, and reporting on the ventilation system are implemented according to legislative requirements and those of the Ventilation Principal Control Plan.
- 4.2 Procedures for the installation and operation of monitoring systems and equipment are implemented in accordance with the requirements of legislation and the Ventilation Principal Control Plan.
- 4.3 Procedures for the collection and analysis of ventilation data are implemented in accordance with the requirements of legislation and the Ventilation Principal Control Plan.

- 4.4 Monitoring system data is processed, recorded, and reported in accordance with the requirements of legislation and the Ventilation Principal Control Plan.
- 4.5 Measured data is interpreted and compared with legislative requirements and those stipulated by the Ventilation Principal Control Plan. Action requirements are implemented.
- 4.6 The periodic review of alarm settings and alarms raised in the Ventilation Principal Control Plan is implemented.

Outcome 5

Coordinate and control the maintenance of and changes to the mine ventilation system and ventilation control devices.

Performance criteria

- 5.1 The ventilation system maintenance programme is reviewed, confirmed, and communicated to responsible parties in accordance with industry best practice and company procedures.
- 5.2 Maintenance activities, including inspections, repair, and maintenance are coordinated in accordance with the Ventilation Principal Control Plan.
- 5.3 The system of recording and reporting maintenance requirements and activities is implemented in accordance with the Ventilation Principal Control Plan.
- 5.4 Changes to the ventilation system are planned, controlled, and implemented in accordance with the Ventilation Principal Control Plan.
- 5.5 Mine ventilation plans are prepared and maintained in accordance with legislative requirements, industry best practice, and company procedures.

Outcome 6

Audit and review the effectiveness of the mine ventilation system and ventilation control devices in accordance with the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016 and the Ventilation Principal Control Plan.

Performance criteria

- 6.1 The effectiveness of the ventilation system is audited in order to verify that it is in compliance.

Range includes but is not limited to – ventilation control devices, ventilation standards, mine monitoring systems.
- 6.2 Ventilation recording systems are accurately maintained and data processed.
- 6.3 The ventilation system maintenance programme and procedures are implemented and recorded.

6.4 The content of the Ventilation Principal Control Plan is communicated to the workforce in a manner that ensures it is understood.

6.5 The ventilation system is reviewed.

Range includes but is not limited to – emergency plans are consistent with the Ventilation Principal Control Plan and the Mines Rescue Act 2013; ventilation standards continue to meet industry best practice and statutory requirements; the training of mine employees is current, relevant, and conducted in accordance with the requirements of the Ventilation Principal Control Plan.

6.6 Future ventilation requirements are identified, assessed, and incorporated into the ventilation planning procedures as stipulated by the Ventilation Principal Control Plan.

Planned review date	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	23 February 2007	31 December 2017
Review	2	18 June 2015	N/A
Rollover and Revision	3	25 January 2018	N/A

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>.

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.