



Resources Safety & Health
Queensland

Recognised Standard 04

Underground non-explosion-protected vehicles

Version 3.0

Resources Safety and Health Queensland

Coal Mining Safety and Health Act 1999

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MMQ North Region - Townsville PO Box 1572 MC Townsville Q 4810 P (07) 4447 9248 tsvmines@rshq.qld.gov.au	MMQ North West Region – Mt Isa PO Box 334 Mount Isa Q 4825 P (07) 4747 2158 isa.mines@rshq.qld.gov.au	MMQ – South Region - Brisbane PO Box 15216 City East Q 4002 P (07) 3330 4272 sthmines@rshq.qld.gov.au
Coal South Region – Rockhampton PO Box 3679 Red Hill Q 4701 P (07) 4936 0184 rockymines@rshq.qld.gov.au	Coal North Region – Mackay PO Box 1801 Mackay Q 4740 P (07) 4999 8512 mines.mackay@rshq.qld.gov.au	

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Recognised standards

This document is issued in accordance with **PART 5—RECOGNISED STANDARDS** and **Section 37(3)** of the *Coal Mining Safety and Health Act 1999*.

PART 5 - RECOGNISED STANDARDS

71 Purpose of recognised standards

A standard may be made for safety and health (a “recognised standard”) stating ways to achieve an acceptable level of risk to persons arising out of coal mining operations.

72 Recognised standards

- (1) The Minister may make recognised standards.
- (2) The Minister must notify the making of a recognised standard by gazette notice.
- (3) The CEO must publish on a Queensland government website each recognised standard and any document applied, adopted or incorporated by the standard.
- (4) In this section—
Queensland government website means a website with a URL that contains ‘qld.gov.au’, other than the website of a local government

73 Use of recognised standards in proceedings

A recognised standard is admissible in evidence in a proceeding if—

- (a) the proceeding relates to a contravention of a safety and health obligation imposed on a person under part 3; and
- (b) it is claimed that the person contravened the obligation by failing to achieve an acceptable level of risk; and
- (c) the recognised standard is about achieving an acceptable level of risk.

PART 3 - SAFETY AND HEALTH OBLIGATIONS

37 How obligation can be discharged if regulation or recognised standard made

- (3) ... if a recognised standard states a way or ways of achieving an acceptable level of risk, a person discharges the person’s safety and health obligation in relation to the risk only by—
 - (a) adopting and following a stated way; or
 - (b) adopting and following another way that achieves a level of risk that is equal to or better than the acceptable level.

Where a part of a recognised standard or other normative document referred to therein conflicts with the *Coal Mining Safety and Health Act 1999* or the *Coal Mining Safety and Health Regulation 2017*, the Act or Regulation takes precedence.

This recognised standard is issued under the authority of the Minister for Resources.

[Gazetted 5 August 2022]

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1 Purpose

The purpose of this standard is to establish the minimum standards for the construction and management controls for a non-explosion-protected vehicle in an underground coal mine.

2 Scope

This standard applies to vehicles that are non-explosion-protected in the underground operations of a coal mine. This standard does not apply to vehicles for use on the surface of an underground coal mine.

3 Application framework

Underground non-explosion-protected vehicles must comply with the requirements of the Coal Mining Safety and Health Act and Regulations and should comply with the requirements of this recognised standard.

4 Definitions

NERZ: Negligible explosive risk zone of an underground coal mine.

Note! Other areas of the mine are designated ERZ1 and ERZ0, and are areas where methane is present or is likely to be present in concentration in excess of 0.5% and 2% respectively.

Non-explosion protected vehicle: A vehicle with a power source that does not meet the explosion protected requirements to allow its use in explosion risk zones as per the requirements of CMSHR 2017.

5 Technical guidance

5.1 General

Vehicles that are restricted to the NERZ of an underground coal mine do not have to conform to explosion protection requirements. However, there are other risks introduced by this class of vehicle and this standard identifies management strategies and construction requirements that will effectively control these risks. The identified controls are the minimum requirements and must be supported by a risk assessment conducted by the mine, prior to introduction of this class of vehicle. The risk management process may require the use of additional control measures refer to AS/NZS 4871.6:2013 and AS/NZS 3584.1:2008. The risk management process should also include a review of site controls when standards are updated. A gap analysis should be undertaken and plans implemented to address gaps identified.

5.2 Management controls

Each mine or end user is to undertake a risk assessment, using a risk assessment process recognised by the mining industry, which will address the unique risks of operating this class of vehicle. The risk assessment and any related considerations shall specifically address the following:

- 1) The likelihood of an unexpected change in the Explosion Risk Zone classification.
- 2) Restrictions on the use of this class of machine in emergency situations, including emergency evacuation or loss of ventilation. Battery electric vehicles, that don't meet the required hazardous area protection techniques, shall be taken to the surface immediately in the event of a loss of main ventilation.
- 3) The use of signage and safety interlocking systems to prevent the vehicles operating in a hazardous zone other than a NERZ.
- 4) A system to make the vehicle operator aware of ventilation stoppages or other environmental changes that may pose a risk to the operation of the vehicle.
- 5) Maximum vehicle speeds.
- 6) Means to easily remove/tow the vehicle from the mine.
- 7) Risks of vehicle fire refer AS/NZS 5062:2016. Note: Vehicle construction may now include non-metallic parts which may present a fire risk.

5.3 Operational controls

Each mine is to implement management systems that address the output of the risk assessments and have documented systems that:

- 1) Ensures operators and users are trained in the operation and maintenance of this class of vehicle.
- 2) Ensures any vehicle modifications are supported by a risk assessment that has included a review of any previous risk assessment
- 3) Ensures the maintenance system includes;
 - a) Testing of the vehicle to ensure that exhaust gas emission concentrations are below acceptable limits and surfaces, requiring temperature control, do not exceed 150°C.
 - b) Examinations to ensure electrical systems are maintained to their design standards.
 - c) Tests to ensure the location control system remains functional.
 - d) Routine testing of the installed methanometer and its related engine shutdown system.
 - e) Periodic tests of the vehicle speed management system.
 - f) Systems to control computer software including;
 - i. Version in use and upgrades.
 - ii. Security and modification.
 - g) Routine removal of accumulated coal dust from surfaces requiring temperature control.
- 4) If permitted, a documented process is required to allow the replacement of batteries while the vehicle is underground.
- 5) Provides a permanent record of events where the vehicle was automatically stopped whilst attempting to enter an ERZC1 or ERZC0.

5.4 Vehicle construction controls

- 1) Each diesel engine system classified as a heavy duty application shall comply with the requirements of AS/NZS 3584.1:2008.
- 2) Each vehicle type must be subjected to extensive testing under load to confirm suitability of vehicle design and identify any parts of the vehicle where temperatures in excess of 150°C may occur.
- 3) A temperature monitoring and control system must be fitted to ensure the surface temperatures, and exhaust gases at their point of exit do not exceed 150°C.

- 4) For vehicles utilizing lithium battery technology a system must be in place to ensure that thermal runaway cannot occur or cause an unacceptable level of risk.
- 5) Any temperature monitor fitted to the vehicle shall have an automated alarm and shutdown monitoring system, independent of the operator and shall operate before any surface temperature of 150°C is exceeded.
- 6) A location control system to prevent the vehicle entering an explosion risk zone other than a NERZ. The system components may be installed in the mine or mounted on the vehicle, however the system must include automatic shutdown of the vehicle. The system must be designed in a manner to fail to safety. Note: Vehicles such as man transports and LHDs have a greater potential to enter an ERZ zone inadvertently. It is recommended that an automated machine tracking system is used to monitor, and remotely alarm where applicable, the location of these vehicles.
- 7) Automatic fire suppression system to be installed based on a detailed ignition source hazard assessment and AS 5062 requirements.
- 8) Appropriately sized handheld fire extinguisher mounted on the vehicle.
- 9) Braking system design, performance and testing to validate performance shall be undertaken or overseen by a competent professional engineer. The braking system design, performance and testing shall be validated by an independent competent professional engineer. For further guidance on braking systems requirements reference may be made to the NSW Resources Regulator braking design order.
- 9) Oil immersed fail-safe brakes that limit the surface temperature to less than 150°C.
- 10) Braking systems shall be monitored and must have a fail-safe action that automatically stops the vehicle in a controlled manner.
- 11) Individual braking systems shall be able to be tested independently of each other. For example park, service and retard brakes shall be independently tested.
- 12) Vehicle horn(s) rated at 95 dBA minimum.
- 13) Audible vehicle reversing alarm and an externally visible and/or audible forward motion indicator for battery electric vehicles.
- 14) Where operating speed may present a hazard, facilities shall be provided for speed limitation. The means of limitation may be electrical or mechanical.
- 15) Shutdown in an emergency refer AS/NZS 4871.6:2013 cl 2.3.11 and AS/NZS 3584.1:2008 cl 2.16.
- 16) Window glass (where fitted) shall be laminated glass or polycarbonate material.
- 17) A system to prevent engine start while the vehicle is in gear.
- 18) Electrical circuits and protection systems to conform to the appropriate parts of AS 4242:1994 and AS/NZS 4871.6:2013. Electrical equipment shall be certified as having explosion protection, or have a degree of protection of, or equivalent to, at least IP55 under AS 1939. This does not apply to electrical cables.
- 19) All electrical parts of a machine shall be adequately protected against damage that might reasonably be expected to result from mechanical impact, vibration, and exposure to weather, water, excessive dampness, corrosive substances, accumulation of dust or debris, steam, oil, grease, fuel, high temperature, or other adverse conditions to which the machine may be exposed to or identified from a risk management process.
- 20) Alternators shall comply with the requirements of AS/NZS 4871.6:2013 cl 2.3.4.
- 21) Battery isolation to be fitted and comply with AS/NZS4871.6:2013 cl 2.6.2
- 22) Battery to be adequately mechanically protected, to limit access and provide termination short circuit protection.
- 23) Permanently mounted vehicle headlights and reversing lights.

- 24) The luminaire wattage must ensure that the surface glass temperature cannot exceed 150°C. A label to be attached, in proximity to each luminaire, stating the maximum wattage.
- 25) All decommissioned parts and components of an electrical installation on a machine shall be completely disconnected from the source of supply. Disconnected wiring that remains in association with wiring that is in use shall be terminated and insulated at both ends in a satisfactory manner.
- 26) If fitted an external power source connection shall include an isolator and means to prevent inadvertent reverse polarity.
- 27) The system for temperature control, vehicle mounted location control and speed control must be fail-safe.
- 28) Aluminium alloys shall meet the requirements of CSMHR 2017 sections 254 and 255. All compliant external aluminium components should have surface protection applied.
- 29) Air-conditioning systems fitted to vehicles shall have all pressure hoses demarcated with covers and hose ends easily distinguishable from normal hydraulic hose ends. Air-conditioning gas shall be non-flammable and meet OEM specifications
- 30) Positive means to verify residual pressure on hydraulic circuits should be installed for maintenance purposes when the vehicle is in a de-energised or static state.
- 31) Automatic methane monitoring shall be provided on non-explosion-protected vehicles.
- 32) Any circuits that remain powered after a methane monitor triggered shutdown shall be hazardous area protected.

6 Reference standards

The following documents are referred to in this standard:

- AS/NZS 3584.1:2008 Diesel engine systems for underground coal mines – Fire protected – Heavy duty
- AS 4242 – 1994 Earth moving machinery and ancillary equipment for use in mines - Electrical wiring systems at extra-low voltage
- AS/NZS 4871.5:2010 Electrical equipment for mines and quarries – battery powered electrical mobile machines
- AS/NZS 4871.6:2013 Electrical equipment for mines and quarries – Diesel powered machinery and ancillary equipment.
- AS 5062:2016 Fire Protection for mobile and transportable equipment
- AS/NZS 60079 series Equipment for explosive atmospheres
- NSW Resources Regulator: WORK HEALTH AND SAFETY (MINES AND PETROLEUM SITES) REGULATION 2014 Registration of Braking Systems on Plant Used in Underground Coal Mine Transport Design Order 2018
- [Coal Mining Safety and Health Act 1999](#)
- [Coal Mining Safety and Health Regulation 2017](#)