

Principal Mining Hazard Management Plans

GUIDANCE MATERIAL

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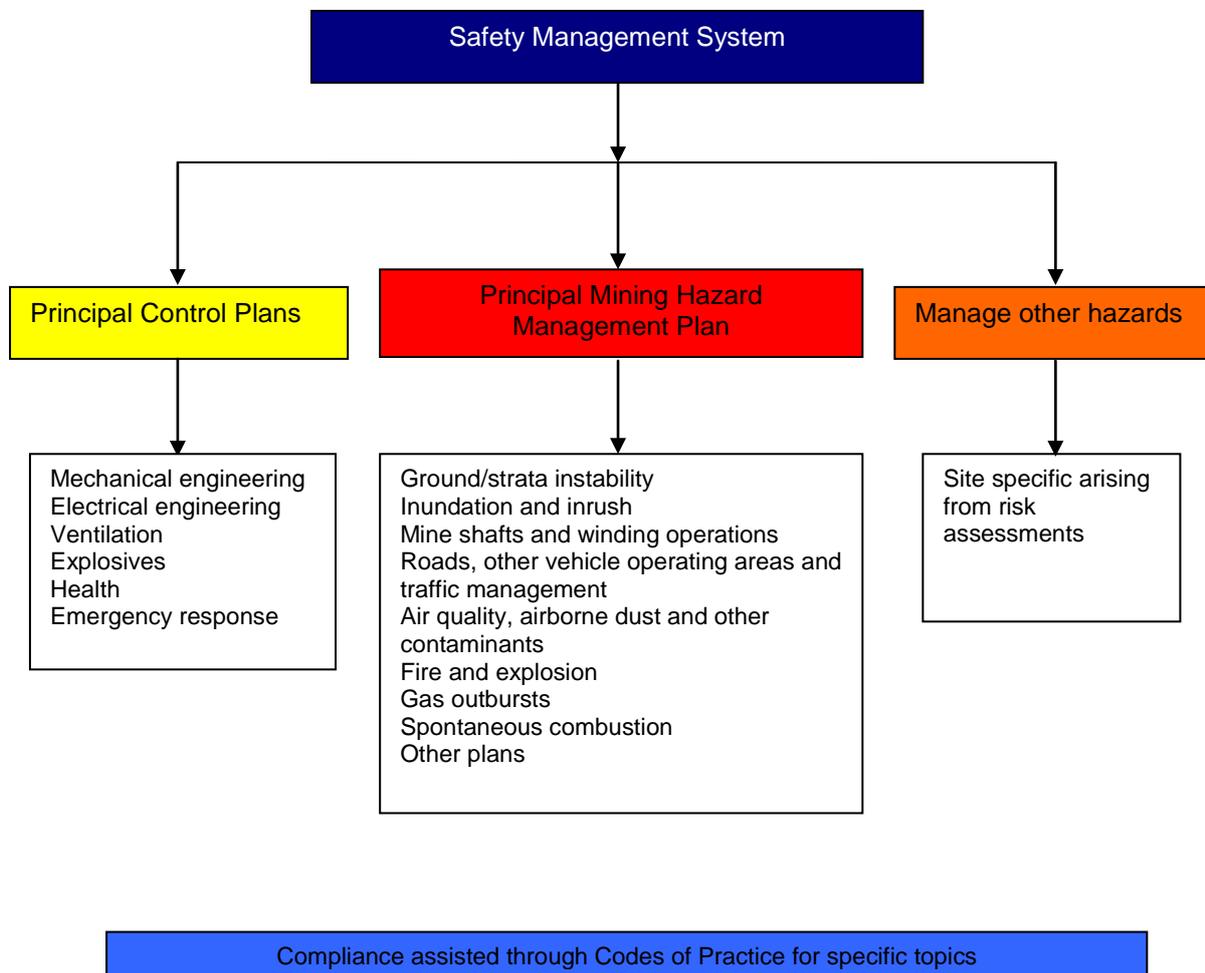
Note

This Guidance Material has been declared by the Chief Inspector of Mines in accordance with Section 33 of the *Mines Work Health and Safety (Supplementary Requirements) Act 2012* to assist mines in the development of Principal Mining Hazard Management Plans for principal mining hazards identified at the workplace.

For any further information about this Guidance Material or Principal Mining Hazard Management Plans please contact the Helpline on **1300 366 322** or if outside Tasmania (03) 6233 7657

A. SAFETY MANAGEMENT SYSTEM

Note: The development, implementation, maintenance and documentation of a safety management system (SMS) in relation to mining operations is the cornerstone duty to achieving the objectives of the Mine Safety Regulations.



The SMS must include as a minimum the following Principal Mining Hazard Management Plans:

- (1) *Ground/Strata Instability*
- (2) *Inundation and Inrush*
- (3) *Mine Shafts and Winding Operations*
- (4) *Roads, other vehicle operating areas and traffic management*
- (5) *Air quality, airborne dust and other airborne contaminants*
- (6) *Fire and Explosion*
- (7) *Gas outbursts*
- (8) *Spontaneous Combustion*

B. Risk Management

B.1 Obligation to conduct risk assessments

The mine operator must ensure that risk management processes and procedures including risk assessments are implemented at the mine.

Note: This is an essential element of a mine operator's compliance with its general health and safety duties under the Act, including the consultation requirements under the Act.

B.2 Risk management forms part of SMS

The risk management processes and procedures must be included in the Safety Management System.

B.3 Risk Management process

The process of risk management must involve:

- (1) the identification of all reasonably foreseeable hazards;
- (2) assessing the risks arising from each hazard, developing a method of assessment that adequately addresses the hazards identified (this may include a risk analysis systematically using available information to determine the likelihood of a specific event and the consequences of such an event occurring and a risk evaluation which involves comparing the level of risk against pre-determined standards to determine the level of priorities to be allocated to each risk);
- (3) the elimination of the hazards identified so far as is reasonably practicable and where it is not reasonably practicable to eliminate the hazard, minimise and control the risk so far as is reasonably practicable using the Hierarchy of Controls; and
- (4) continual monitoring of the effectiveness of the controls implemented including processes for identifying, reviewing and responding to uncontrolled events.

B.4 Triggers for risk assessments

The mine operator must ensure that risk assessments are carried out:

- (1) at the design stage of the mine;
- (2) prior to the commencement of the mining operations;
- (3) at adequate intervals or stages during mining operations having regard to the nature of the mining operations and the risks associated with such mining operations;
- (4) when there is evidence that an existing risk assessment is no longer valid; and

(5) when there is a material change in the mine's practices, processes or procedures.

B.5 Training in risk management

The Mine Operator must, so far as is reasonably practicable, ensure that all workers at the mine are trained and assessed to be competent in basic risk management techniques (unless a higher level is required) prior to commencing work at the mine and for each period not exceeding 5 years thereafter.

B.6 Public safety

Risk management processes must consider the health and safety effects arising from the mine on persons who are outside the mine who are not working at the mine.

B.7 Record of risk management

The risk management process must be documented and records kept of that process.

B.8 Procedures

Where the outcome of a risk assessment process determines that a risk is to be controlled through the use of administrative means, a procedure must be prepared and documented in relation to the method of control of that risk.

Note: The procedure in this provision must be developed in consultation with workers at the mine.

C. Principal Mining Hazard Management Plans

Note: There are hazards associated with mining operations that, although they have a low likelihood of occurrence, have the potential for multiple or repeat fatalities including cumulative effects. This category of hazards is known as a Principal Mining Hazard. The use of management plans to address principal mining hazards of mines was a key recommendation of the Moura No 2 Warden's Inquiry.¹

C.1 Requirement to identify principal mining hazards

- (1) Mine operators must be required to identify principal mining hazards associated with their mining operations.
 - a) In relation to each principal mining hazard, the mine operator must develop a Principal Mining Hazard Management Plan (PMHMP) documenting how the risks to the health and safety of a person arising from the principal mining hazard will be eliminated or minimised so far as is reasonably practicable. PHMPs form part of the SMS and thus work at the mine and mining operations cannot commence until these plans are in place.
 - b) Mine operators must implement and maintain principal mining hazard management plans.
 - c) The development, implementation and maintenance of each principal mining hazard management plan must include the assessment and control of both the individual and cumulative effects of hazards.
 - d) Nothing prevents a Mine Operator from integrating one or more Principal Mining Hazard Management Plans or a Principal Mining Hazard Management Plan with a Principal Control Plan, should a Principal Control Plan be developed.

Note: The principal mining hazard management plan requirement is an essential element of a mine operator's compliance with its primary duties of care under the Act.

- (1) The mine operator must provide the relevant Principal Mining Hazard Management Plans to workers prior to them undertaking any work to which the hazard management plan relates.
- (2) The mine operator must provide the Principal Mining Hazard Management Plans to workers in plain, simple and understandable language.

¹ Report on Accident at Moura No. 2 Underground Mine on Sunday 7 August 1994 – Warden's Inquiry conducted pursuant to section 74 of *The Coal Mining Act 1925*, conducted before Mr F W Windridge, Warden and Coroner (Wardens Court of Queensland).

C.2 Principal Mining Hazard Management Plan is a plan which must:

- (1) provide for the management of all aspects of risk control in relation to the relevant principal mining hazard; and
- (2) be set out and expressed in a way that is readily accessible and comprehensible to persons who use it.
- (3) Without limiting (1) and (2), a principal mining hazard management plan must:
 - a. state the nature of the principal mining hazard to which it relates; and
 - b. describe how a risk assessment will be conducted in relation to the principal mining hazard;
 - c. specify the results of the risk assessment; and
 - d. specify all control measures to be implemented to control risks to health and safety associated with the principal mining hazard;

C.3 The following are prescribed Principal Mining Hazard Management Plans:

- (1) *Ground/Strata Instability*
- (2) *Inundation and Inrush*
- (3) *Mine Shafts and Winding Operations*
- (4) *Roads, other vehicle operating areas and traffic management*
- (5) *Air quality, airborne dust and other airborne contaminants*
- (6) *Fire and Explosion*
- (7) *Gas outbursts*
- (8) *Spontaneous Combustion*

1. Ground/strata instability Principal Mining Hazard Management Plan

- 1.1 Ground/strata instability is one of the principal mining hazards associated with mining operations.² This is an issue for both metalliferous mines as well as coal mines. Mine operators must therefore be expressly directed to develop and implement measures to eliminate or minimise, so far as is reasonably practicable, the risks arising from this hazard for the purposes of meeting their primary duty under the Act. Those measures must be documented and retained in the form of a principal mining hazard management plan.
- 1.2 To ensure a comprehensive risk assessment is conducted at the design, operation and abandonment stages, mine operators must be required to consider the local geological structure and geotechnical conditions, seismic activity, subsidence at or outside the Mine, airblast and windblast potential and the adequacy of installed ground or strata support when developing the principal mining hazard management plan for ground/strata control.
- 1.3 The principal mining hazard management plan for ground/strata control must provide for measures to prevent or minimise local and area failures in ground or strata integrity during the Mine's design, operation and abandonment, having regard to all relevant matters, including:
- (1) local geological structure and rock properties and their influence on rock stability and in situ rock stress; and
 - (2) the local hydrogeological environment, including surface and ground water; and
 - (3) geotechnical characteristics of the rocks and soil, including the effects of time, oxidation and water on rock support and stability; and
 - (4) the size and geometry of the mine's openings; and
 - (5) stope and pillar dimensions in an underground mine; and
 - (6) the presence of previously excavated or abandoned workings; and
 - (7) water inflow, drainage patterns, groundwater regimes and mine dewatering procedures and their influence on rock stability over time; and
 - (8) the collection, analysis and interpretation of relevant geotechnical data, including the monitoring of openings and excavations where appropriate; and
 - (9) design, control and monitoring of production and development blasts; and

² See for example the 25 April 2006 Beaconsfield mine collapse. See the *Coronial Findings into the death of Larry Paul Knight at Beaconsfield gold mine*, prepared by Rod Chandler, Coroner, dated Thursday 26 February 2009 at Launceston in the State of Tasmania [2009 TASCDC 25].

- (10) proposed blasting activities, including airblast from blasting or other sources; and
 - (11) the use of appropriate equipment and procedures for scaling; and
 - (12) the proper design, installation and quality control of rock support and reinforcement; and
 - (13) the timing of ground and strata support, to take account of geotechnical conditions and behaviour; and
 - (14) ensuring appropriate equipment and procedures to provide for the monitoring, recording and interpretation and analysis of data pertaining to seismic activity and behaviour of the mine; and
 - (15) the design, layout, operation, construction and maintenance of any dump or stockpile or emplacement area at the mine; and
 - (16) the location and loadings from existing or proposed mine infrastructure such as waste dumps, tailing storage haul roads and mine facilities; and
 - (17) proposed and existing mining operations, including the nature and number of excavations, the number and size of permanent or temporary voids or openings, backfilling of mine areas and stopes, abutments, periodic weighting and windblast; and
 - (18) appropriate filling and the material used for the filling of mined out areas; and
 - (19) slope stability.
 - (20) Any natural or induced seismicity
- 1.4 In relation to mines, the principal mining hazard management plan for ground/strata control must also provide for the preparation of plans showing support arrangements for working places and there must be a requirement for those plans to be displayed in locations which are readily accessible to workers.
- 1.5 A person must not enter an area of unsupported ground/strata.

Ground/strata support

- 1.6 Where a person is installing ground/strata support, the mine operator must ensure that sufficient temporary support is installed in order to minimise the risk to a person installing the strata support.
- 1.7 An underground mine must have a written procedure for installing strata support.

Note: Where applicable, ensuring the stability of mine workings must include ensuring that ground / strata support has been installed. Such a requirement is necessary because in some circumstances, without strata support there is a significant risk of roof / wall collapse.

1.8 The Mine Operator must, so far as is reasonably practicable:

- (1) eliminate the exposure of workers to risks arising from ground/strata instability; or
- (2) If it is not reasonably practicable to eliminate, minimise the exposure of workers to risks arising from ground/strata instability.

1.9 Where a risk assessment has determined that strata support is required for a working place in order to minimise risks associated with the uncontrolled movement of the roof, ribs or floor of the working place, the mine operator must ensure that:

- (1) suitable strata support methods are designed and implemented for the working place;
- (2) no person enters the working place unless the strata support has been installed or the person is supervising, or engaged in, its installation;
- (3) that the Safety Management System provides for monitoring the effectiveness and integrity of strata support in each place used by a person for normal work or travel; and
- (4) that the Safety Management System provides for maintaining the integrity of the strata support, including, for example, by replacing defective supports.

1.10 It is critical that the principal mining hazard management plan for ground/strata stability provide for consideration of the need to install more strata support or support installation at such frequency as is required. That is, strata support is not only an issue which ought to be considered at the commencement or at the abandonment of mining operations but a consideration which is required throughout the life of the mine, taking into account the experience and expertise of workers at the mine.

1.11 The principal mining hazard management plan for ground/strata control must contain a statement that nothing in the management plan is to be read as preventing the installation of more strata support or support installation at more frequent intervals than is required by the principal mining hazard management plan itself.

1.12 Support plans under the principal mining hazard management plan for ground/strata control must prescribe the following:

- (1) the type of support;
- (2) the dimensions of the support;

- (3) the locations where there are varying types of support in use;
- (4) the distance between supports;
- (5) the maximum distance development can be advanced before support is installed; and
- (6) the means of development support required to be installed in a manner such that they may be readily understood by those required to install the support.

Stability calculations

- 1.13 The principal mining hazard management plan for ground/strata control must also provide for the calculations made in deciding pillar strength and stability and strata support requirements.
- 1.14 The calculations to be provided for include:
- (1) maximum opening widths; and
 - (2) the minimum dimensions of pillars to determine the probability of instability to be assigned to any pillar, consistent with the pillar's role.
- 1.15 Calculating the probability of stability will provide the mine operator with an indication as to whether the strata support is sufficient to ensure health and safety at the mine.
- 1.16 Records of the calculations must be retained.

Dumps and stockpiles

- 1.17 The Mine Operator must ensure that the principal mining hazard management plan for ground/strata control ensures that the risks associated with open cut dumps and stockpiles are eliminated or if it is not reasonably practicable to eliminate them, minimised so far as is reasonably practicable.

Note: The inclusion of this provision in the mine safety legislation is in order to ensure the risks associated with open cut dumps are considered by mine operators as this is an area which is often overlooked.

Emplacement areas

- 1.18 The mine operator must ensure that the principal mining hazard management plan for ground/strata control ensures that the risks associated with emplacement areas are eliminated or if it is not reasonably practicable to eliminate them, minimised so far as is reasonably practicable,

Emplacement Area means a wall or other structure that retains or confines reject material whether or not that wall is itself composed of reject material. An Emplacement Area includes, but is not limited to the following areas where reject material is proposed to be deposited:

- 1) open void / in pit void;
- 2) an elevated above ground containment structure;
- 3) free-standing structure or structures;
- 4) upstream holding structures; and
- 5) any pile, heap, hole, excavation or place in which or on which waste reject material is piled, heaped, dumped, accumulated, deposited or placed,

but does not include an accumulation or deposit of reject material situated underground.

Reject material means a by-product produced from the beneficiation process, whether it is in a solid or fluid state. Reject material also means any carbonaceous material, whether it is mixed with or attached to stone or not, that is left after the treatment of coal in a coal preparation plant or that is not dealt with as coal by the mine operator.

Note: Provision must also be made for the construction and use of Emplacement Areas.

Seismic Activity

1.19 The principal mining hazard management plan for ground/strata control must provide for the monitoring of natural or induced seismic activity and its impact on mining operations.

Note: Issues relating to seismic activity were the subject of consideration in the Beaconsfield Gold Mine Coronial Inquest into the death of a worker. In particular, inactivity by the mine operator after seismic activity was noted at that inquest. The investigation by Special Investigator Mellick into the Beaconsfield rock fall recommended that “commensurate with the level of risk, the mine operator must use appropriate equipment to monitor, record and interpret and respond to data pertaining to seismic activity and the behaviour of the mine”.

1.20 The Mine Operator must record and analyse data pertaining to seismic activity and its impact on mining operations.

1.21 The principal mining hazard management plan for ground / strata control must also provide for stope scheduling, sequencing and timing of filling processes.

1.22 The principal mining hazard management plan should provide for the resulting designs and their assumptions to be continuously modelled, tested and updated.

Note: The Report to the Coroner in the Beaconsfield incident recommended that mines install geotechnically engineered ground support systems that are designed to contain events well in excess of magnitudes that have already been recorded or expected by appropriate modelling and that such support designs consider matters including: the intended life of the excavation; mining induced stress changes and potential cycles of loading and unloading; potential impacts of voids and void management; and tolerance for stability problems and rehabilitation.

Records

- 1.23 Records must be kept of ground/strata failures such as rock fall that have the potential to cause serious injury to persons.
- 1.24 The Mine Operator must, so far as is reasonably practicable, investigate the causes of ground/strata failures including rock falls at the mine. Such an investigation must also include a risk assessment. Records must be kept of the investigation for the life of the mine.

Note: The recording of information regarding strata failures is a necessary requirement in order for mine operators to avail themselves of all essential information when reviewing hazard management plans and assessing the effectiveness of controls in the case of ground strata stability.

2. Inundation and inrush Principal Mining Hazard Management Plan

- 2.1 Inundation and inrush are principal mining hazards in mining operations.³
- 2.2 To ensure a mine operator has adequate systems in place to eliminate or minimise the risk of sudden and unplanned entry of water, rock, gas or other materials or substances into underground workings, mine operators must develop and implement a principal mining hazard management plan for inundation and inrush.
- 2.3 The development of such a principal mining hazard management plan must include consideration of the proposed activities to be undertaken and:
- (1) each potential source of inrush (for example, current, disused, abandoned or neighbouring mine workings (in the same seam or another seam or across strata), surface water bodies, backfill operations, underground cavities, highly permeable aquifers, bore holes, faults or other geological weaknesses); and
 - (2) potential sources of inundation including extreme weather, overflow or failure of levies and dam structures, failure or blocking of flow channels (either regular or overflow/emergency); and
 - (3) the nature and magnitude of all potential sources of inrush and maximum flow rates; and
 - (4) the location of other workings and the strength of the ground between workings; and
 - (5) the location, design and construction of dams, lagoons, tailings dams, emplacement areas and any other bodies of water or material that could become uncontained and enter the mine, including water or material entering the mine from cyclonic weather conditions and other major rain events; and
 - (6) the foreseeable worst case position for each potential source of inrush having regard to such things as the accuracy of plans of the mine including with respect to the location of other workings, variation in rock properties, geological weaknesses, future mining operations, geological changes or similar unknowns; and
 - (7) the potential for an accumulation of water, rock, gas or other materials or substances that could liquefy or flow into other workings or locations.
- 2.4 The mine operator must ensure that its principal mining hazard management plan for inundation and inrush provides for measures to effectively control, mitigate and monitor all critical factors that may affect the likelihood of an inrush or inundation hazard. It must ensure

³ See for example the Report on the Gretley Coal Mine Public Inquiry, August 1998, *Report of a formal investigation under Section 98 of the Coal Mines Regulation Act 1982* by his Honour Acting Judge J.H. Staunton.

workers are at all times aware of the location of the faces being advanced and effectively monitor work in close proximity to other adjacent workings, including old workings.

- 2.5 The principal mining hazard management plan for inundation and inrush must also identify, establish and maintain inrush control zones between the mine workings and each identified potential source of inrush and ensure that any inrush control zone identified in the principal mining hazard management plan is of sufficient distance to safely separate the mine workings from the relevant potential source of inrush or, in the case of a potential source of inrush that is not an accessible place in the same mine, is sufficient to provide adequate separation of solid rock between the mine workings and the assessed worst case position of the potential source of inrush and any particular systems of working developed for mining operations and working in inrush control zones.
- 2.6 The principal mining hazard management plan for inundation and inrush must ensure exploratory bore holes or another appropriate method is used to check the location of old workings in the vicinity of the area in which the work is to be carried out, prior to the commencement of work in a new area of the mine.
- 2.7 The principal mining hazard management plan for inundation and inrush must include a means of sealing or otherwise controlling a bore hole to prevent inrush. Inrush through bore holes is a unique source that is not generally covered by normal mining processes and as such is to be dealt with in the mine safety legislation.
- 2.8 If underground workings are proposed to be connected to other workings the principal mining hazard management plan must ensure the other workings are inspected or otherwise explored for any hazard that may pose a risk to the health or safety of any worker, prior to attempting to connect the workings.
- 2.9 The principal mining hazard management plan must provide for all reasonably practicable measures to control the above hazards. Also, the principal mining hazard management plan must be maintained, reviewed and updated and checked regularly to ensure that it implements the best available knowledge of risk of inrush at the mine. The mine operator must also be required to ensure that the principal mining hazard management plan is reviewed and up-to-date before the mine is extended into any new area.
- 2.10 The Mine Operator must consider the mine survey plans in the preparation and maintenance of the principal mining hazard management plan for inundation and inrush including consideration of original historical survey plans which have been obtained from relevant persons.

Note: This provision is necessary in light of the Gretley Incident in order that mine operators can verify the accuracy of the copy of the plans that they hold against the originals which are held by relevant persons. In particular, the Gretley Judicial Inquiry recommended that:

“In assessing the risk of inrush, the consideration of the originals of any relevant plans and any relevant files or other material held by, or accessible by, the relevant government agency.”

- 2.11 The Mine Operator must record the assumptions made in developing the principal mining hazard management plan for inundation and in-rush.

Note: By recording the assumptions, a mine operator is in a position to review them at appropriate junctures in order to ensure that they are still current and correct. Such recording of assumptions in the development of inrush management plans was also a recommendation of the Gretley Judicial Inquiry.

- 2.12 Where the mine operator forms the opinion that it is not reasonably practicable for the risk of inrush to be practicably removed, or rendered harmless, it is to be a requirement that mining is prohibited.

- 2.13 The reasoning of the mine operator must be recorded.

Note: This requirement is necessary in order to explain the risk assessment process of the mine manager. It also promotes accountability, facilitates review and informs possible scrutiny by workers and inspectors alike. This was also an express recommendation of the Gretley Judicial Inquiry:

“If the mine manager is of the opinion that it is not practicable to remove or render harmless a potential source of in-rush – the manager shall document the reasons for being of that opinion and ensure the retention of that document at the mine.”

- 2.14 The principal mining hazard management plan for inundation and inrush must also include an objective written summary of the nature and magnitude of the identified risks of inrush.

Note: This is required in order that there is accessible information for workers and other persons who require information in relation to the risk of inrush. This was also an express recommendation of the Gretley Judicial Inquiry.

- 2.15 The principal mining hazard management plan for inundation and inrush must also document any special systems of working developed for mining operations and working in inrush control zones, along with the assumptions underpinning the development of the special systems of work.

Note: Such requirements were also express recommendations of the Gretley Judicial Inquiry and facilitate the review of systems of work in inrush control zones.

- 2.16 The principal mining hazard management plan for inundation and inrush must also include a requirement that prior to reducing the separation below 50 metres of solid rock (rock includes coal) between mine workings and a potential source of inrush emanating from an inaccessible place into the mine that exploratory drilling or other risk mitigation measures are put in place to address the risk of inundation or inrush.

Note: This separation requirement is necessary to provide protection to workers in the event that they are required to work in an inaccessible part of the mine. In this regard, the Gretley Judicial Inquiry recommended that:

“In the case of a potential source of in-rush that is not an accessible place in the same mine – is sufficient to provide a separation of 50 metres of solid rock between the mine workings and the assessed worst case position of the potential source of inrush.”

3. Mine shafts and winding operations Principal Mining Hazard Management Plan

- 3.1 Mine operators must develop a principal mining hazard management plan for the purposes of eliminating and minimising risks arising from the design, construction, manufacture, installation, commissioning, maintenance, testing, repair, use, decommissioning and disposal of vertical and underlay or slope haulage mine shafts and winding operations.

Note: Definition of "shaft" is:

Shaft includes vertical and underlay or slope haulage.

- 3.2 The principal mining hazard management plan for mine shafts and winding operations must include consideration of the:
- (1) stability and integrity of the shaft;
 - (2) potential for fires in underground operations, the shaft or winder areas;
 - (3) potential for any unintended or uncontrolled movement of the conveyances within the shaft;
 - (4) potential for a detached conveyance to fall down the shaft;
 - (5) potential for fall of persons, equipment, materials or support structure into or within, the shaft;
 - (6) potential for failure of, or damage to, safety-related equipment and controls, including:
 - a. ropes bearing the weight of the shaft conveyance;
 - b. controls and limiting devices to prevent overwind, overrun, overspeed and other selected limits;
 - c. measures to detect, prevent or cause the winder to stop in the event of slack rope, drum slip or tail rope malfunctions;
 - d. braking system including emergency brakes and preventing free-fall of a conveyance;
 - e. warning systems for any emergency in the shaft; and
 - f. communication systems;
 - (7) potential for injury to people in a conveyance from material being carried in the conveyance or falling from a conveyance;
 - (8) need to enable people to escape from a stalled conveyance; and

- (9) competency of the operator of the winder.

Life cycle control measures

- 3.3 The principal mining hazard management plan for mine shafts and winding operations must provide life cycle control measures for ensuring that every winding system remains in a safe condition. The control measures must have appropriate integrity commensurate with the risk to health and safety.
- 3.4 The principal mining hazard management plan must include measures for eliminating or minimising the risk of shaft fires and the unintended movement or fall of persons, plant, equipment, substances, materials and any other objects.
- 3.5 The principal mining hazard management plan must provide measures and life cycle control measures for ensuring that every winding system for a vertical and underlay or slope haulage shaft at the Mine remains in a safe condition and includes (but not be limited to) the following:
- (1) ropes or other means that will enable the shaft conveyance to bear the weight that can reasonably be expected to be borne by the shaft conveyance;
 - (2) controls and limiting devices that prevent any shaft conveyance from being overwound or overrun or from travelling at an uncontrolled or unsafe speed;
 - (3) measures to prevent, detect and cause the winder to stop in the event of slack rope, drum slip or tail rope malfunctions;
 - (4) effective braking systems, including emergency braking;
 - (5) means for preventing slack rope, drum slip or tail rope malfunction;
 - (6) means for detecting and causing the winder to stop in the event of slack rope, drum slip or tail rope malfunctions;
 - (7) means for persons to escape from a stalled conveyance;
 - (8) effective means of communication to and from the winder room shaft conveyances carrying persons and the entrance to every shaft that is in use;
 - (9) provision for regular testing and inspection of the winding system and its components;
 - (10) measures to prevent a detached conveyance from falling back down the shaft; and
 - (11) means to prevent uncontrolled contact between conveyances, other equipment installed in the shaft and shaft sides.
- 3.6 Where automatic winding systems are in use, the control measures must also include:

- (1) monitor the winder from outside the winder house; and
- (2) warning systems to alert persons at the mine of any emergency in the shafts.

3.7 In relation to dual purpose shafts used for winding materials and persons, control measures must also include:

- (1) adequate protection for persons being carried in a shaft conveyance from any material in the shaft and conveyance that may cause injury;
- (2) a means to prohibit persons from being carried in a cage while material is being carried in a skip or the shaft conveyance; and
- (3) means to prevent material or plant carried in a shaft conveyance from protruding from the shaft conveyance and being or becoming unsecured.

3.8 Principal hazard management plans which apply to automatic winding systems must include measures to prevent spillage into the shaft during loading of plant or material onto or into a shaft conveyance.

Design registration and design verification

Note: Provision may yet be made in the mine safety legislation for design registration of powered winding systems.

Winders, slope haulages and hoists

3.9 The Mine Operator of an underground mine must ensure that:

- (1) a winder or slope haulage used for carrying persons at the mine has at least 2 braking systems;
- (2) braking systems must be capable, at all times, of:
 - (a) bringing the winder, or haulage, to rest safely; and
 - (b) preventing drum movement, under balanced load conditions, when the maximum torque is applied in either direction.
- (3) the brakes are designed and installed to fail to safety;
- (4) the winder must have:
 - (a) an automatic device to prevent the winder overwinding;
 - (b) a device to prevent the descending conveyance from being landed at the lowest entrance to the shaft at a speed exceeding 3.5m/s;

- (c) a device to indicate the position of each conveyance in the shaft;
 - (d) for a manually controlled winder the speed of which is capable of exceeding 4m/s, a rope speed indicator located on the winder where it can be read by the operator.
- (5) the slope haulage must also have the following:
- (a) an automatic device to prevent over-travel;
 - (b) a device to indicate the position of each rope hauled train of vehicles in the roadway;
 - (c) for a manually controlled slope haulage the speed of which is capable of exceeding 2m/s, a rope speed indicator located on the slope haulage where it can be read by the operator.

Controls and safety devices for conveyances

3.10 The Mine Operator of an underground mine must ensure that:

- (1) the headframe, or tower, of a shaft used for winding at the mine contains:
 - (a) apparatus that is designed and installed so a conveyance or counterweight will stop safely if the conveyance is overwound;
 - (b) safety devices that are designed and installed so a conveyance or counterweight that has been brought to rest, or detached from the winding rope, is prevented from falling down the shaft; and
 - (c) a way of egress to enable persons to safely leave an overwound conveyance.
- (2) the shaft contains guides for each conveyance in the shaft if there is a possibility of uncontrolled contact between the conveyances, a conveyance and equipment installed in the shaft or a conveyance and the shaft side;
- (3) each winder has:
 - (a) if the conveyance has doors, a device preventing the conveyance moving when the doors are not closed correctly; and
 - (b) suspension equipment capable of withstanding stall conditions, or a hook, capable of detaching the ascending conveyance from the rope, if the conveyance overwinds;

- (4) each winder and slope haulage that is not under direct supervision at the mine has suitable automatically operated fire extinguishers for extinguishing fire in the plant's engine room;
- (5) each friction winding system at the mine has a device that causes each of the following to happen before the conveyance, counterweight or rope attachment reaches a permanent obstruction to its passage in the shaft:
 - (a) the power to be cut off from the winder; and
 - (b) the brakes to be automatically applied to bring the winding drum or sheave to rest;
- (6) each winder has a way of automatically synchronising the conveyance's position indicator and automatic safety devices with the conveyance's position; and
- (7) any synchronising adjustment is done only while the brakes are applied and the winder is stationary;
- (8) the speed of a friction winder used at the mine does not exceed the following:
 - (a) for raising or lowering persons - 16m/s;
 - (b) for raising or lowering material - 18m/s;
- (9) the brakes on a friction winder used at the mine:
 - (a) when applied automatically, are not likely to cause the winding rope to slip on the driving sheave;
 - (b) apply automatically when the power to the winder fails; and
 - (c) for a manually controlled winder - are also capable of being applied manually by the winder operator;
- (10) the brakes apply automatically and prevent the winder's operation if the brake linings become worn to an extent that affects the brakes' safe operation;
- (11) the supplier of a winder, slope haulage or hoist for use at the mine is given sufficient details of the operating requirements of the plant to allow the supplier and installer to select and install appropriate plant; and
- (12) plant utilising winders, slope haulage or hoists is tested before being put into operation to verify it meets the operating requirements and a record is kept of the details given to the supplier and installer and the test results.

- 3.11 If any plant is intended to be used in excess of the operating requirements, the Mine Operator must ensure a design check by a competent person is carried out and any necessary modification is completed before the plant is used in excess of the operating requirements.
- 3.12 The Mine Operator for a mine at which manually operated winder, slope haulage or hoist equipment is used, must ensure the mine has an appropriate number of mine workers who have the competencies to operate the equipment.
- 3.13 A person must not operate a manually operated winder, slope haulage or hoist equipment at the mine unless the person has the competencies for operating the equipment and is appointed to operate the equipment.
- 3.14 If an underground mine uses signals for communicating with a plant operator, the mine's Safety Management System must provide:
- (1) a signals code as set out at the end of this section:
 - (a) which is easily accessible by each mine worker at the mine;
 - (b) which is posted in the plant operator's view and at each other place where it is appropriate for persons to contact the plant operator by using the code;
 - (2) each person who may need to use the code with training in the code and ready access to the code.

Rope for winders and slope haulage

- 3.15 The Mine Operator of an underground mine must ensure, so far as is reasonably practicable, that:
- (1) a rope is not used for winder or slope haulage at the mine unless the mine has the rope manufacturer's certificate stating the following about the rope:
 - (a) its date of manufacture;
 - (b) its tensile strength, diameter, length and mass;
 - (c) the class of steel used in its construction.
 - (2) a rope is not used for winding or slope haulage at the mine unless the rope's tensile strength has been tested by a nationally accredited testing station;
 - (3) for a rope other than a friction winder rope:

- (a) a sample of at least 2m is cut off the end of the rope during recapping and sent to a nationally accredited testing station for testing its tensile strength; and
 - (b) a certificate stating the tensile strength is obtained from the testing station;
- (4) if the certificate states the tensile strength is less than 90% of the rope's tensile strength when new, the Mine Operator must ensure that the rope is not used for winding or slope haulage at the mine;
- (5) only rope recommended by the manufacturer for winding and slope haulage is used at the mine;
- (6) endless slope haulage system must only use a spliced rope;
- (7) only rope dressing recommended by the manufacturer of the rope is used;
- (8) each rope used at the mine has at least the following safety factor:
- (a) for a slope haulage rope - 8;
 - (b) for a winder rope, other than a friction winder rope:
 - (i) used for winding persons in a shaft in which persons, materials or minerals may be wound - the safety factor worked out under the following formula:
$$7.5 - 0.001L$$
where L is the depth of the wind measured in metres; or
 - (ii) used for winding materials or minerals in a shaft in which persons, materials or minerals may be wound - the safety factor worked out under the following formula:
$$5.5 - 0.0003L$$
where L is the depth of the wind measured in metres; or
 - (iii) used for winding machinery at less than 2m/s in a shaft in which persons, materials or minerals may be wound - 5; or
 - (iv) used for winding materials or minerals in a shaft in which only materials or minerals may be wound - 4.5; or

- (v) for a friction winder rope used in a shaft in which persons, materials or minerals may be wound by a single rope - the safety factor worked out under the following formula:

$$7.5 - 0.001L$$

where L is the depth of the wind measured in metres;

- (vi) for a stage rope used in shaft sinking – 6;
- (9) each winder rope on a multi-rope winder is attached at the conveyance or counterweight by a device that loads the ropes as uniformly as practicable;
- (10) if the rope attachments are connected directly to the conveyance or counterweight, devices are provided to adjust rope length and indicate rope tension;
- (11) provide for regular monitoring and non-destructive testing of winder or slope haulage ropes and establishing discard criteria for the ropes;
- (12) unsuitable rope is discarded.

Code of Signals

The following signals comprise the Code of Signals –

Knocks or Rings	What is Signified
1	Stop — Signal to be returned by driver when the conveyance is or has been brought to rest.
2	Lower
3	Raise
4	Hoist to surface.
5	Danger signal — The conveyance should be moved until release signal 8 has been given.
6	Materials or equipment to be conveyed (cautionary signal). Signal to be returned by driver before a command signal is given when the driver should move the conveyance slowly.
7	Firing warning.
8	Release conveyance from “Danger” signal. Signal to be returned by driver before a command signal is given.
12	Accident signal — to be followed after a pause by the signal for the level where the conveyance is required.
1 pause 2 pause 3	Change to wind from a different level (throw in or out of gear). Signal should not be given while the conveyance is in motion.

The shaft conveyance should be raised or lowered, as required, in accordance with the following signals –

Winding Signals - Change of Level
1 pause 1 To No. 1 level.
1 pause 2 To No. 2 level.
1 pause 3 To No. 3 level.
1 pause 4 To No. 4 level.
1 pause 5 To No. 5 level.
2 pause 1 To No. 6 level.
2 pause 2 To No. 7 level.
2 pause 3 To No. 8 level.
2 pause 4 To No. 9 level.
2 pause 5 To No. 10 level.
3 pause 1 To No. 11 level.
3 pause 2 To No. 12 level.
3 pause 3 To No. 13 level.
3 pause 4 To No. 14 level.
3 pause 5 To No. 15 level.
4 pause 1 To No. 16 level.
4 pause 2 To No. 17 level.
4 pause 3 To No. 18 level.
4 pause 4 To No. 19 level.
4 pause 5 To No. 20 level.
5 pause 1 To No. 21 level.
5 pause 2 To No. 22 level.
5 pause 3 To No. 23 level.
5 pause 4 To No. 24 level.
5 pause 5 To No. 25 level.
6 pause 1 To No. 26 level.
6 pause 2 To No. 27 level.
6 pause 3 To No. 28 level.
6 pause 4 To No. 29 level.
6 pause 5 To No. 30 level.
7 pause 1 To No. 31 level.
7 pause 2 To No. 32 level.

7 pause 3 To No. 33 level.
7 pause 4 To No. 34 level.
7 pause 5 To No. 35 level.
8 pause 1 To No. 36 level.
8 pause 2 To No. 37 level.
8 pause 3 To No. 38 level.
8 pause 4 To No. 39 level.
8 pause 5 To No. 40 level.

Unless preceded by the cautionary signal (6 knocks or rings), indicating that materials or equipment are to be conveyed, all signals from level to level, surface to level and level to surface, should be regarded as meaning that persons are being raised or lowered, and the engine driver should drive accordingly.

The pause between signals in the Code should be the space of time required to give 2 knocks or rings.

4. Roads, other vehicle operating areas and traffic management Principal Mining Hazard Management Plan

Note: Mines include a complex mix of roads and other vehicle and mobile plant corridors both above ground and underground. The interaction of road, vehicles, mobile plant and people at mines is therefore a principal mining hazard in mining operations which must be addressed.⁴

4.1 The Mine Operator must develop a principal mining hazard management plan for eliminating the risks associated with the interaction between vehicles and between vehicles and pedestrians in mines and if it is not reasonably practicable to eliminate those risks to minimise them so far as is reasonably practicable.

4.2 The principal mining hazard management plan for roads and other vehicle operating areas at the mine must:

- (1) prescribe measures for ensuring the design, layout, operation, construction and maintenance of each road and other vehicle operating area at the mine enables the safe operation of all mobile plant authorised to travel on the road or in the area;
- (2) set out how the mine operator intends to:
 - (a) effectively control the risks associated with land adjacent to the road or vehicle operating area at the mine; and
 - (b) effectively control the risks associated with multiple vehicle interactions, interactions between different types of vehicles (such as heavy and light vehicles, volume of traffic and speed of traffic) and vehicle and person interactions at the mine (including the park up areas, driver access and movement of earth moving machinery); and
 - (c) effectively control the risks associated with interaction between mobile plant and public traffic; and
 - (d) effectively control the risks associated with interaction between mobile plant and fixed structures, including overhead and underground power lines, tunnel walls and roofs; and
 - (e) effectively control the risks associated with remote control vehicles in mines; and
 - (f) account for the characteristics of the equipment to be used and the conditions, including environmental conditions such as time of day, visibility, temperature

⁴ Consider for example the Pilbara BHP Billiton fatality which occurred when a mining dump haul truck rolled over the deceased's vehicle on 4 September 2008.

and the effects of weather, on the road or in the particular area of the mine;
and

- (g) ensure that the following matters are given adequate consideration in the design, layout, operation, construction and maintenance of each road:
 - (i) the grade and width of the road at the mine; and
 - (ii) the drainage system for the road at the mine; and
 - (iii) the particular characteristics of the mobile plant or machinery to be used at the mine, including stopping distances, manoeuvrability, operating speeds, driver position and remote control plant; and
 - (iv) the line of the sight for the mobile plant to be used and operated on the road at the mine.

Design and construction of mine roads

4.3 The principal mining hazard management plan at the mine in relation to roads must provide a specification for the design and construction of mine roads in order to enable the safe movement of vehicles about the mine.

4.4 The specification developed must provide for the following in relation to roads:

- (1) barriers;
- (2) curvature;
- (3) grade;
- (4) camber;
- (5) guide posts;
- (6) pavement shape;
- (7) safety berms, windrows and bunds;
- (8) signs;
- (9) surface material;
- (10) width;
- (11) banks and steep drops adjacent to plant operating areas;

- (12) the characteristics of the mine vehicles;
- (13) the types of materials used for road construction;
- (14) the specific mining operations;
- (15) the methods for working at the mine;
- (16) requirements for appropriate intersection design;
- (17) requirement for visibility of road edges at night including adequate lighting; and
- (18) the interface between vehicles and pedestrians.

4.5 The specification which is developed must provide for appropriate control measures relating to the prevention of persons and vehicles from falling over road edges.

4.6 In relation to primary haul roads regularly used for 2-way traffic on surface, the specification must be required to provide for a road width at least 3.5 times the width of the largest vehicle that is regularly using the road.

Note: definitions of “primary haul road” and “width” are :

Primary haul road means a road intended to be used, during the life of the mine, by heavy vehicles to move overburden, coal or reject from the mine and a road that is capable of carrying mixed traffic at operational speed.

Width, in relation to a road, is defined as the width of the road’s usable running pavement clear of guide posts, grader rills and safety berms.

4.7 The mine operator must ensure that the principal mining hazard management plan for roads includes a procedure for maintaining and watering mine roads, including managing the risks associated with excessive watering of roads.

Traffic management

Note: Traffic management is a critical area for road safety, both surface and underground, and is critical for the safety of vehicles operating on such roads.

4.8 The principal mining hazard management plan for roads and other vehicle operating areas must also be required to set out how the mine operator intends to effectively control the risks associated with automated or remote control vehicles in mines. In particular, consideration should be given to the following:

- (1) remote control systems should be designed to mitigate hazardous motions;

- (2) automatic defaulting of remote control systems to an acceptable safe state within a specific time period;
- (3) additional barriers (where assessed as required);
- (4) isolation of power to remote controlled vehicles;
- (5) records of maintenance and testing of remote controlled vehicles;
- (6) safe operating distances for line of sight operations; and
- (7) competency and training of operators of remote controlled vehicles.

4.9 The inspection program at the mine must include roadway inspections.

4.10 The inspection program for the purpose of roadway and vehicle inspection must include inspections that consider dust, visibility, no-go zones, the installation of strata support where applicable, monitoring of strata measuring devices, the interaction of light and heavy vehicles, the interaction between vehicles, plant and persons, bunding and edge protection systems and must include construction as well as use.

Transport of people and items

4.11 The principal mining hazard management plan for roads and other vehicle operating areas and traffic management must provide for transporting people and items and materials both underground at the mine and on the surface of the mine.

4.12 The transport management plan must provide for the operation and movement of load shifting equipment.

4.13 The principal mining hazard management plan must specifically provide for consideration of no go zones.

Note: No go zones were specifically identified as a matter of consideration for mine operators in the context of the Blee Inquest in Queensland underground coal mines. Specific requirements for the transport of people and items at mines are required due to the prevalence of such activities in incidents which have caused serious injuries and fatalities.

4.14 The aspect of the principal mining hazard management plan relating to traffic management must include a procedure for discharging loads from fixed and mobile plant. The procedure must include provision for the following in relation to dump trucks:

- (1) the design, construction and maintenance of safety berms, windrows and bunds on roads used by the trucks;
- (2) identifying and controlling risks of the trucks over turning;

- (3) safe dump areas and routes; and
- (4) methods of working.

4.15 The aspect of the principal mining hazard management plan relating to traffic management at an underground mine, must be required to manage risks associated with the transport of people, items and materials, in particular from transport equipment that is operated in the underground parts of the mining operations and locomotives that are operated on the surface part of a mining operation where the surface rail system operates jointly with the underground system, and in particular must make provision for the following matters:

- (1) provision of sufficient means of transport to ensure that risks to persons at mining operations, during access and egress from their place of work, is controlled;
- (2) conditions for the safe operation of the transport equipment;
- (3) transport equipment being used only within its design parameters;
- (4) minimum dimensions and the conditions of roadways on which the transport equipment is to operate;
- (5) the maximum loads that may be carried or towed by the transport equipment, whether by reference to weight, dimensions or other criteria;
- (6) the safe carriage of persons, including the segregation of people from loads, the provision of seating and the wearing of seatbelts or the use of other operator restraint devices unless a risk assessment determines otherwise;
- (7) the safety of persons working, or travelling, in or near roadways used by the transport equipment;
- (8) the safe parking, refuelling (including safe storage of fuel for vehicles) and recharging of the transport equipment;
- (9) periodic inspection and testing of the braking systems of vehicles;
- (10) the suitability and health and safety impact of vehicles on mining operations;
- (11) the appointment of persons who are to operate transport equipment;
- (12) steps to be taken prior to the transport equipment being operated;
- (13) steps to be taken on discovery of a defect in the transport equipment.

5. Air quality, airborne dust and other airborne contaminants Principal Mining Hazard Management Plan

- 5.1 A principal mining hazard management plan must be developed and implemented for air quality, airborne dust and other airborne contaminants at the mine, taking into consideration:
- (1) the types of dust and other contaminants (chemical and biological) likely to be in the air from both natural and introduced sources that may result in a risk to health and safety on exposure, including naturally occurring asbestos;
 - (2) the levels of oxygen, dust and other contaminants in the natural or supplied air in the mine;
 - (3) the temperature and humidity of the air at the mine;
 - (4) the length of exposure of workers at the mine to atmospheric contaminants or airborne dust, including taking account of extended shifts and reduced recovery period.
- 5.2 The principal mining hazard management plan must include measures for ensuring that the hazards associated with poor air quality, airborne dust and other airborne contaminants are eliminated or minimised, so far as is reasonably practicable, by providing measures for:
- (1) ensuring that atmospheric contaminants in workplaces at the mine are maintained at levels below the exposure standard for the atmospheric contaminant and are as low as is reasonably practicable; and
 - (2) monitoring and assessing atmospheric contaminants at the mine; and
 - (3) the regular monitoring of atmosphere to eliminate or minimise the risks associated with unsafe concentrations of oxygen, methane and other gases in the air in mines; and
 - (4) ensuring that monitoring and assessment of the exposure of workers at the mine to an atmospheric contaminant hazard or airborne dust is carried out in a way which complies with all applicable standards; and
 - (5) the use of appropriate suppression, ventilation or exhaust extraction systems to effectively reduce, dilute or extract atmospheric contaminants; and
 - (6) ensuring that ventilating air provided for the mine is of sufficient volume, velocity and quality to remove atmospheric contaminants from mining operations and maintain a healthy atmosphere at the mine during working hours; and
 - (a) ensuring that the supply of air for any ventilating equipment used underground in the mine is from the purest source available; and

- (b) monitoring and eliminating, minimising and controlling so far as is reasonably practicable, hazards associated with the formation or emission of toxic, asphyxiant and explosive gases in the mine; and
- (c) keeping a plan of the ventilation system at the mine that shows the direction, course and volume of air currents and the position of all air doors, stoppings, fans, regulators and ventilating devices in the mine; and
- (d) the suppression of dust from mining operations including the use of dust collection and dust suppression appliances where appropriate.

6. Fire and explosion Principal Mining Hazard Management Plan

- 6.1 The principal mining hazard management plan for fire and explosion must include measures for ensuring that the hazards associated with fire and explosion are eliminated or minimised, so far as is reasonably practicable. This requires:
- (1) consideration of the potential sources of fire in the mine and of the use presence and storage of certain gases and materials including combustible ore, sulphide dust, coal dust or flammable gas;
 - (2) consideration of potential sources of flammable, combustible and explosive materials, both natural and introduced, including gas, dust, fuels, solvents and timber;
 - (3) potential sources of ignition, fire or explosion, including equipment, electricity, static electricity, spontaneous combustion, lightening, hot work and other work practices;
 - (4) potential for propagation of fire or explosion to other parts of the mine;
 - (5) provision for hot work procedures; and
 - (6) details of the type and location of the systems for prevention, early detection and suppression of fire (including remote monitoring systems) and of the equipment for fire fighting in the mine.

Underground Coal Mines

- 6.2 Principal hazard management plans that apply to coal mines must include provisions for management of dust explosion which provides measures to eliminate or minimise so far as reasonably practicable the risk of coal dust explosion.
- 6.3 These provisions must include the means by which the mine operator will:
- (1) suppress coal dust explosions and limit their propagation to other parts of the coal mine;
 - (2) minimise the production and accumulation of roadway dust;
 - (3) limit coal dust generation, including its generation by mining machines, coal crushers and coal conveyors and at conveyor transfer points;
 - (4) suppress, collect and remove airborne coal dust; limit coal dust accumulation on roadway and other surfaces in the coal mine roadways; remove excessive coal dust accumulations on roadway and other surfaces in the coal mine roadways; and determine the stonedust or other explosion inhibitor application rate necessary to minimise the risk of a coal dust explosion.

- 6.4 The principal mining hazard management plan for fire and explosion must specify control measures to ensure that the monitoring of roadway dust, including the application of an explosion inhibitor, is carried out sufficiently in order to suppress and prevent coal dust explosions.
- 6.5 The principal mining hazard management plan relating to dust explosion management must include procedures for:
- (1) regularly inspecting, sampling and analysing roadway dust layers, including laboratory analysis for incombustible material content; and
 - (2) applying stone dust or another explosion inhibitor for suppressing coal dust explosion;
- 6.6 In order to comply with the procedure referred to above:
- (1) the dust sampling and analysis mentioned above to be carried out at least at the following intervals:
 - (a) For a strip or spot sample of dust mentioned in subparagraph (1) or (2) of section 6.8 below – weekly;
 - (b) For a strip sample of dust mentioned in subparagraphs (1), (2), (3) or (4) of section 6.8 below – monthly; and
 - (c) For a strip sample of dust mentioned in subparagraph (5) of section 6.8 below – every third month.
 - (2) Sampling is to require:
 - (a) samples must be taken where practicable, from the complete perimeter of the roadway and the structures in it, and where possible, over a length of roadway of at least 45 metres, by a method of strip sampling by which the dust is collected from a succession of transverse strips as nearly as possible of equal width and equally spaced, not more than 5 metres apart and of an aggregate area of not less than 1 per cent of the total area sampled; and
 - (b) if it appears that dust on the floor of a roadway contains a different incombustible content from dust on the roof and sides of the roadway, the dust on the floor must be sampled and tested separately from the dust on the roof and sides; and
 - (c) each sample must be collected as near as practicable from a maximum depth of 5 millimetres.

- (3) If a location is re-sampled, the individual strips from which the increments for a strip sample are taken must not coincide with those from which a previous sample has been taken.
- 6.7 The mine operator must ensure the analysis of each sample mentioned above is to be carried out in a registered laboratory.
- 6.8 For the purpose of the requirements in sections 6.3 and 6.6 immediately above, the mine operator of an underground mine must ensure that the content of incombustible material in roadway dust at the mine is kept at or above the following concentration levels:
 - (1) For dust in a panel roadway within 200 metres outbye the last completed line of cut throughs in the panel – 85%;
 - (2) For dust in a 200 metre section of panel roadway within 400 metres of a long wall face – 85%;
 - (3) For dust in a panel roadway within 200 metres from the main roadway, if the above subparagraphs (1) and (2) do not apply to the 200 metre section of the roadway – 80%;
 - (4) For dust in a return roadway not mentioned in subparagraphs (1) to (3) above – 80%;
 - (5) For dust in a return roadway more than 200 metres outbye the last completed cut through in the panel – 70%
 - (6) For dust in an intake roadway not mentioned in subparagraphs (1) to (4) above – 70%.
- 6.9 The Mine Operator at a coal mine must ensure:
 - (1) each 30 metres length of a roadway that is being driven at the mine is stone dusted, or treated with another proven coal dust explosion inhibitor immediately after the length is driven; and
 - (2) each part of the roadway is stone dusted, or treated with another proven coal dust explosion inhibitor within 24 hours after the part is driven.
- 6.10 The requirements in section 6.9 above do not apply to dust in a roadway where there is a sufficient natural make of water associated with the mining operation to prevent a coal dust explosion
- 6.11 The requirements with respect to the content of incombustible material in roadway dust and in particular the concentration levels outlined above, shall be considered as not applying to dust in a part of the mine mentioned in those areas subject to concentration limits if:

- (1) An explosion inhibitor, including, for example, a chemical, is used as a coal dust suppressant in combination with stone dust in a particular part of the mine; and
- (2) A physical test, other than a laboratory test, of the combination carried out by a nationally accredited testing laboratory has shown the combination to effectively suppress a coal dust explosion. Such an explosion inhibitor is a proven coal dust explosion inhibitor.

6.12 If an analysis of a dust sample from an underground mine shows that the dust does not comply with the incombustible material content for the dust as set out above, the Mine Operator at a coal mine must ensure the following:

- (1) the area from which the sample was taken is retreated with stone dust or another explosion inhibitor within the following period after the Mine Operator receives the analysis result:
 - (a) for dust mentioned in subparagraphs (1) (2) and (3) of the concentration limits in section 6.8 above – 12 hours; or
 - (b) for dust mentioned in subparagraphs (4) or (5) of the concentration levels outlined in section 6.8 above – 7 days; and
- (2) a record is kept of the date and time when the area was retreated.

6.13 The mine operator at a coal mine must ensure the Deputy for the area is given notice of the analysis result.

6.14 The mine operator at a coal mine must ensure a record is kept of the following for each roadway dust sample taken at the mine:

- (1) the date it was taken;
- (2) the location from which it was taken;
- (3) its incombustible material content; and
- (4) the method used for analysing the sample.

Explosion Risk Zones (ERZ) at underground coal mines

6.15 Mine Operators for underground coal mines are required to adopt ERZs. ERZs are required to be prescribed as they provide the highest level of safety.

6.16 The Mine Operator must ensure a risk assessment is carried out to identify the location and type of each ERZ at the mine.

Note: Definitions of ERZ, ERZ0, ERZ1 and NERZ are as below:

ERZ means *Explosion Risk Zone*.

ERZ0 means:

- (1) *An underground coal mine, or any part of it, where the general body concentration of methane is known to be, or is identified by a risk assessment as likely to be, greater than 2%.*
- (2) *To remove any doubt, it must be declared that, if the general body concentration of methane in a part of the mine that is an ERZ1 or NERZ becomes greater than 2%, the part becomes an ERZ0.;*

ERZ1 means:

- (1) *an underground coal mine, or any part of it, where the general body concentration of methane is known to range, or is shown by a risk assessment as likely to range, from 0.5% to 2%;*
- (6) *each of the following places is an ERZ1:*
 - (a) *a workplace where coal or other material is being mined, other than by brushing in an outbye location;*
 - (b) *a place where the ventilation does not meet the requirements for ventilation set out in the mine safety legislation;*
 - (c) *a place where connections, or repairs, to a methane drainage pipeline are being carried out;*
 - (d) *a place where holes are being drilled underground in the coal seam or adjacent strata for exploration or seam gas drainage;*
 - (e) *a place, in a panel, other than a longwall panel that is being extracted, inbye the panel's last completed cut-through;*
 - (f) *a goaf area;*
 - (g) *each place on the return air side of a place mentioned in paragraphs (a) to (f) of this drafting instruction above, unless the place is an ERZ0; and*
 - (h) *the part of a single entry drive with exhaust ventilation inbye the last fixed ventilation ducting in the drive.*
- (7) *The requirement in drafting instruction (2)(a) above does not apply to:*
 - (a) *a place where work is undertaken that is a shaft or roadway driven from the surface in material other than coal; or*
 - (b) *between seams that are predominantly driven in material other than coal.*

NERZ means negligible explosion risk zone, including:

- (1) *An underground mine, or any part of it, where the general body concentration of methane is known to be, or is identified by a risk assessment as likely to be, less than 0.5%;*
- (2) *Without limiting the requirement in drafting instruction above, a part of the mine submerged by water is a NERZ;*
- (3) *A NERZ may be divided into sub-zones to enable discrimination to be applied to tripping of the electricity supply to electrical circuits caused when gas detectors detect a general body concentration of methane of 0.5%. Each such sub-zone mentioned in this drafting instruction is a NERZ;*
- (4) *Nothing in this drafting instruction is to be interpreted as preventing the Mine Operator from classifying a NERZ at the mine as an ERZ0 or ERZ1. If the Mine Operator makes a classification under this drafting instruction, the NERZ is taken, while the classification is in force, to be an ERZ of the type stated in the classification.*

Places where methane detectors must be located

6.17 The mine operator must ensure a place mentioned in this guidance material below has automatic methane detectors located as specified.

Intake airways

6.18 At least one automatic methane detector must be located in each intake airway at the interface between:

- (1) a NERZ and an ERZ1; and
- (2) two NERZs.

6.19 A detector located at an interface between a NERZ and an ERZ1 must:

- (1) when the general body concentration of methane detected at the interface exceeds 0.25% - automatically activate a visible alarm; and
- (2) when the general body concentration of methane detected at the interface exceeds 0.5% - automatically trip the electricity supply to non-intrinsically safe plant in:
 - (a) the ERZ1 and NERZ; or
 - (b) if the NERZ has been subdivided – the ERZ1 and the subdivided part of the NERZ adjacent to the ERZ1.

- 6.20 A detector located at the interface between a NERZ and an ERZ1 must be a self-contained unit or part of the gas monitoring system for the mine.
- 6.21 A detector located at an interface between two NERZs must:
- (1) automatically activate a visible alarm when the general body concentration of methane detected at the interface exceeds 0.25%; and
 - (2) if the NERZ has been subdivided – automatically trip the electricity supply to non-intrinsically safe plant in the adjacent subdivided part when the general body concentration of methane detected at the interface exceeds 0.5%.
- 6.22 The alarm mentioned in sections 6.19(1) and 6.21(1) must be visible at the interface.

Main return airway and return airway in a ventilation split

- 6.23 At least one automatic methane detector must be located in:
- (1) each main return airway; and
 - (2) each return airway in a ventilation split.
- 6.24 The detector must automatically activate a visible alarm when the general body concentration of methane detected in the return air exceeds the percentage stated in the mine's principal control plan for ventilation as the percentage that must not be exceeded before the detector activates the alarm.

Longwall face

- 6.25 At least one automatic methane detector must be located at the following places:
- (1) the intersection between the longwall face and an intake airway;
 - (2) the intersection between the longwall face and the return airway.
- 6.26 A detector located between the longwall face and an intake airway must automatically trip the electricity supply to longwall equipment in the longwall face and intake airway when the general body concentration of methane detected at the intersection exceeds 2%.
- 6.27 A detector located between the intersection between the longwall face and the return airway must automatically trip the electricity supply to longwall equipment in the longwall face and return airway when the general body concentration of methane detected at the intersection exceeds 2%.

Action to be taken if methane is detected or methane detector is non-operational

Explosion protected electrically powered loader

- 6.28 If a general body concentration of methane exceeding 1.25% is detected around an explosion protected electrically powered loader that is not fitted with an automatic methane detector, the loader operator must switch off the electricity supply to the loader's trailing cable.

Explosion protected vehicle powered by a battery, or internal combustion engine

- 6.29 This section applies to an explosion protected vehicle powered by a battery, or internal combustion engine and fitted with an automatic methane detector.
- 6.30 If a general body concentration of methane of at least 1% is detected around the vehicle, the vehicle operator must immediately withdraw the vehicle to a place where the general body concentration of methane is less than 1%.
- 6.31 If a general body concentration of methane of at least 1.25% is detected around a vehicle constructed before 1 July 2001 that is not fitted with a methane detector, the vehicle operator must immediately switch off the electrical motors or internal combustion engine.

Other explosion protected electrical plant

- 6.32 This section applies to explosion protected electrical plant supplied with electricity by a trailing cable, other than plant:
- (1) mentioned in the two previous subsections above; or
 - (2) fitted with an automatic methane detector; or
 - (3) having explosion protection category Ex ia.
- 6.33 If a general body concentration of methane of at least 1.25% is detected around the plant, the person detecting the methane must immediately switch off the electricity supply to the equipment's trailing cable.

Non-explosion protected vehicle powered by a battery or an internal combustion engine

- 6.34 If the automatic methane detector fitted to a non-explosion protected vehicle powered by a battery or an internal combustion engine fails in service, the vehicle operator must immediately park the vehicle.

Ventilation split or main return airway

6.35 A mine operator of an underground mine must have a procedure for taking action when methane, at a general body concentration stated in the procedure, is detected at a ventilation split or main return airway.

Action to be taken if methane detector activates or is non-operational

6.36 An underground mine operator must have a procedure for taking action when any of the following happens:

- (1) an automatic methane detector fitted to a coal cutter, continuous miner, tunnel boring and road heading machine, a longwall shearer, mobile bolting machine, electrically powered loader, load-haul dump vehicle or other explosion protected plant powered by battery or internal combustion engine trips the electricity supply to the machine, vehicle or plant or stops its internal combustion engine;
- (2) a methane detector mentioned in paragraph (1), other than a methane detector fitted to a longwall shearer, fails in service;
- (3) a methane detector located at the interface between a NERZ and an ERZ1, or between adjoining NERZs, fails in service or is being tested or relocated.

6.37 The procedure may provide that, if an event mentioned in section 6.36(1) or (2) happens to a machine or vehicle (other than a longwall shearer) in an ERZ1, the methane detector may be temporarily overridden to allow the machine or vehicle to be moved, but only if:

- (1) the general body concentration of methane around the machine or vehicle is less than 1.25%; and
- (2) a portable methane detector is used to continuously monitor the concentration. ‘

6.38 The procedure may also provide that if an event mentioned in section 6.36(2) happens to a longwall shearer, the methane detector may be temporarily overridden to allow the machine to be operated to allow movement to a secure place along the face or at the gate ends, but only if:

- (1) the general body concentration of methane around the machine is less than 1.25%; and
- (2) a portable methane detector is used to continuously monitor the concentration.

6.39 The procedure may also provide that:

- (1) if an event mentioned in section 6.36(2) happens to a relevant machine or vehicle being used in a NERZ, the operator may continue to use the machine or vehicle only if:
 - (a) the general body concentration of methane around the machine or vehicle is less than 0.5%; and
 - (b) the place where the machine or vehicle is located is continuously monitored by a person using a portable methane detector; or
- (2) if an event mentioned in section 6.36(3) happens, the methane detector:
 - (a) must be replaced or repaired as soon as practicable; and
 - (b) may be overridden temporarily to allow operations to continue in the zones until the detector is replaced or repaired, but only if the conditions mentioned immediately below are complied with.

6.40 For subsection section 6.39(2)(b), the conditions are:

- (1) a person uses a portable methane detector to continuously monitor for methane:
 - (a) if the event involves a methane detector—at the location of the methane detector; or
 - (b) if the event involves more than one methane detector at an interface—by moving between the methane detectors at the interface that have failed or are being tested or relocated; and
- (2) the electricity supply to the affected zones can be readily tripped when the general body concentration of methane at the location of a methane detector being monitored as required under paragraph (1) exceeds 0.5%.

6.41 In this section:

- (1) **relevant machine** means a machine supplied with electricity by a trailing cable.
- (2) **relevant vehicle** means an explosion protected vehicle powered by a battery or internal combustion engine.

Record of tripping of electricity supply

6.42 The mine operator must ensure a record is kept of the date and time of the event if an electricity supply is tripped by an automatic methane detector:

- (1) located at the interface between a NERZ and an ERZ1, or between adjoining NERZs;
or
- (2) fitted to a non-explosion protected vehicle.

General back-up for gas monitoring system

- 6.43 The principal mining hazard management plan fire and explosion must provide for the use of portable gas detectors to manage risk in the event of a failure or the non-operation of the gas monitoring system.
- 6.44 The mine operator must have a procedure for using the portable gas detectors in the event of the failure or non-operation.
- 6.45 If the system fails or becomes non-operational, the mine operator must ensure coal mining operations are not carried out in the part of the mine affected by the failure or non-operation unless the part is continually monitored, using portable gas detectors, to achieve an acceptable level of risk.

Withdrawal of persons in case of danger caused by failure or non-operation of gas monitoring system

- 6.46 The mine operator must ensure all persons are withdrawn to a place of safety when a coal mine is dangerous. A part of an underground mine is taken to be dangerous if the part is affected by the failure or non-operation of the gas monitoring system and the mine does not have:
- (1) a procedure for using portable gas detectors; or
 - (2) sufficient portable gas detectors to continually monitor the part to the extent necessary to achieve an acceptable level of risk.

Auxiliary, or booster, fan

- 6.47 An auxiliary or booster fan must be protected by at least one methane detector to detect the general body concentration of methane at the fan.
- 6.48 For an **auxiliary** fan, the detector must be an automatic methane detector that trips the electricity supply to the fan when the concentration exceeds 2%.
- 6.49 For a **booster** fan, the detector must, when the concentration exceeds 1.25%, automatically activate an audible and visible alarm located in a place that allows the necessary action to be taken promptly.
- 6.50 If the detector protecting an **auxiliary** fan fails or is otherwise non-operational, the underground mine manager must ensure that, while the fan is operating, a person:

- (1) continuously monitors the general body concentration of methane at the fan by using a portable methane detector that gives an audible and visible alarm when the concentration exceeds 1.25%; and
- (2) disconnects the electricity supply to the fan when the concentration exceeds 1.25%.

6.51 This section does not apply to an auxiliary or booster fan for a drift or shaft being driven from the surface in material other than coal.

Signposting ERZ boundaries in underground coal mines

6.52 The Mine Operator must provide for the signposting of ERZ boundaries in underground coal mines. Such signposting requirements should be required in circumstances where a person or machine can physically pass through a boundary between a NERZ and an ERZ1 or between an ERZ1 and an ERZ0. Where either of those circumstances is possible, the Mine Operator must ensure the actual location of the boundary is signposted in each intake airway and machine access leading into:

- (1) for a boundary between a NERZ and an ERZ1, the ERZ1; or
- (2) for a boundary between an ERZ1 and an ERZ0, the ERZ0.

6.53 A signpost need not change if:

- (1) a temporary change in conditions results in a temporary change in the boundary location; and

NOTE: An example of temporary change in conditions for section 6.52 (1) or (2) above is a major goaf fall causing a sudden temporary flush of methane to change an ERZ1 to an ERZ0 or a NERZ to an ERZ1.

- (2) the Mine Operator ensures that appropriate precautions are taken to ensure control of persons and machines entering an ERZ affected by the change.

6.54 Where an underground mine's ERZ boundaries are signposted in accordance with the requirements of section 6.53 above, the Mine Operator must ensure that a plan showing the boundaries is displayed at the surface of the mine.

6.55 The Mine Operator of a coal mine must ensure the plan is updated at the end of each shift to reflect any changes in the boundary locations required to be signposted under section 6.53 above.

Record of roadway dust sampling

6.56 The Mine Operator of a coal mine must ensure that the results of the analysis of incombustible material content is marked on a plan of the mine.

Note: The above control measures are proven ways of ensuring the risk of coal dust explosion is minimised. Identifying these key requirements will ensure that the management plan relating to dust explosion is effective and complete.

- 6.57 The operator of an underground coal mine must ensure:
- (1) an explosion barrier is installed and maintained in the part of any roadway (other than part of a single entry roadway) containing a conveyor belt within a face zone;
 - (2) an explosion barrier is installed and maintained in the part of any return roadway (other than part of a single entry roadway or a part of a roadway referred to in (a)) within a face zone; and
 - (3) adequate explosion suppression measures are installed and maintained in single entry roadways.
- 6.58 An explosion barrier is taken to have been installed in a part of a roadway if the most inbye part of the barrier is in the part of the roadway.
- 6.59 When installing explosion barriers, the Mine Operator must:
- (1) determine through a risk assessment whether to install a:
 - (a) fixed distributed; or
 - (b) advancing distributed; or
 - (c) fixed concentrated; or
 - (d) advancing concentrated explosion barrier.
- 6.60 Where a distributed barrier is used:
- (1) it must:
 - (a) be kept as near as possible to the face and not further outbye than 100 metres from the face and not further outbye than 30 metres from the conveyor belt feeder or boot-end in a conveyor roadway, and not further outbye than 30 metres from a trickle duster, auxiliary fan (where used) or the last line of cut-throughs (where no auxiliary ventilation fan is used).
 - (b) be loaded with stonedust or water, to not less than 200 kg per square metre of roadway cross-sectional area.

- (2) the spacing between consecutive rows must be such that the mass of water or stonedust in the volume of roadway occupied by the barrier, is not less than 1 kg per cubic metre.

6.61 Where an advancing distributed bag barrier is used:

- (1) the barrier must consist of four sub-barriers, installed over a maximum distance of 120m of continuous roadway; and
- (2) three complete sub-barriers must be in position at all times and the following distances maintained:
 - (a) the first sub-barrier closest to the last through road must not be installed closer than 60m and not further than 120m from the last through road;
 - (b) the fourth sub-barrier furthest from the last through road must be installed not more than 120 m from the first sub barrier;
 - (c) the two intermediate sub-barriers must be equidistant between the first and fourth sub-barriers;
 - (d) the maximum distance between sub-barriers must not exceed 30m.

6.62 Where an advancing concentrated bag barrier is used:

- (1) the barrier must be in two barriers each 20 to 40 m long which leap frog to maintain a distance between the last through road and the first row of bags greater than 70 m but less than 120m; and
- (2) the second barrier must start no further than 120m from the end of the first barrier. The stone dust required is calculated on the basis of $M_a=100\text{kg/m}^2$ of roadway cross sectional area.

6.63 Where a fixed distributed bag barrier is used:

- (1) a continuous array of barrier bags must be place in a roadway over its entire length;
- (2) the dust density must be $M_v=1\text{kg/m}^3$; and
- (3) the distance between the start of the continuous distributed bag barrier and the last through road must not exceed 120m.

6.64 Where a concentrated explosion barrier is used:

- (1) it must be kept within 200 metres of the face but not closer than 60 metres to the face;

- (2) be loaded with stonedust or water, to not less than 200 kg per square metre of roadway cross-sectional area;
- (3) the spacing between consecutive rows shall be such that the mass of water or stonedust in the volume of roadway occupied by the barrier, is not less than 1 kg per cubic metre.

6.65 The Mine Operator must determine through a risk assessment the need for any additional barriers.

6.66 The Mine Operator must ensure the **design** of the explosion barrier is effective to eliminate so far as reasonably practicable a coal dust explosion from travelling:

- (1) where a bag explosion barrier is installed the design of the explosion barrier must have the following characteristics:
 - (a) each bag must contain 6kg of dry stone dust;
 - (b) the horizontal distance between hooks of the bags in a row must not be less than 0.4m and not greater than 1.0m;
 - (c) the distance between the bags and side of the pillar must not be greater than 0.5m;
 - (d) for roadways up to 3.5m high each row must have a single level of bags suspended with the hooks not more than 0.5 from the roof;
 - (e) for roadways between 3.5m and 4.5m high the bags must be distributed evenly between two layers suspended with the hooks at 0.5m and 1.0m below the roof level;
 - (f) for roadways between 4.5m and 6.0m high the bags must be distributed evenly between two layers suspended with the hooks at 0.5m, 1.0m and 1.5m below the roof level;
 - (g) the distance measured along the roadway between rows of bags must be not less than 1.5m and not more than 3.0m;
 - (h) the total mass of stone dust used in the barrier is based upon the values of either M_a or M_v where M_a is 100kg/m² of roadway cross sectional area and M_v is 1kg/m³ of roadway volume between the extremities of the barrier. The total mass of stone dust must be the greater amount based on the values of M_a and M_v ;

- (i) the total proportion of broken bags must not exceed 10% of bags in any sub-barrier; and
 - (j) only bag and hook arrangements complying with South African Patent No.95/10595 and South African Registered Design No F95/1238 may be used.
- (2) Where any other type of explosion barrier is installed the design of the explosion barrier must have the following characteristics:
- (a) is rectangular, and is made of timber or sheet metal with a height of at least 150mm. Two timbers or metal purlins form the front and back of the frame, and are fixed by cross-pieces so that the frame measures no more than 200mm from front edge to back edge;
 - (b) the frame rests on rigid supports fixed on each side of the roadway, but the frame is not fixed to the supports; and
 - (c) dust boards or trays must rest on the frame aligned in the direction of the roadway, and are free to move or purlins placed on their edge can 'roll' and displace the trays.

6.67 The Mine Operator must ensure that:

- (1) troughs used in water barriers are made and tested to a German standard (DIN 21576) dated 1969 or British Coal Specification 733: 1991;
- (2) water troughs are of 80L capacity or 40L capacity;
- (3) an explosion barrier is not be installed in a cavity in the roof; and
- (4) any explosion barrier in a roadway with a conveyor is installed with a major part of the barrier no lower than the top of the conveyor belt.

6.68 The Mine Operator must make enquiries with any supplier or manufacturer of any explosion barrier to ensure it is fit for purpose, having regard to:

- (1) proven design criteria;
- (2) results of empirical testing; and
- (3) relevant guidance or technical specifications made available by the regulator or other authoritative source.

7. Gas outbursts Principal Mining Hazard Management Plan

- 7.1 The Mine Operator must develop, implement and maintain a documented Principal Mining Hazard Management Plan for minimising the risks in Mining Operations arising from gas outbursts, taking in to consideration:
- (1) the potential for gas release into the working area of a mine from both natural and introduced sources in a concentration that could lead to fire, explosion or asphyxiation;
 - (2) the potential for accumulation of gases in existing and abandoned areas of the mine;
 - (3) the nature of the gas that could be released;
 - (4) gas levels in the material being mined; and
 - (5) gas seam pressures.
- 7.2 The risk of gas outburst exists where the total insitu gas content and gas composition, measured in accordance with AS 3980 or an equivalent standard, is greater than 9 cubic metres per tonne of methane or 5 cubic metres per tonne of carbon dioxide, or for a mixture of these two gases a gas content in the proportion of the percentages of each gas between these two limits.
- 7.3 The Principal Mining Hazard Management Plan for gas outbursts at the Mine must contain the determined risk of gas outbursts, measuring such factors as the in-situ methane and carbon dioxide gas levels per tonne of material/coal and the specific geological risk features identifiable in the area to be mined.
- 7.4 Without limiting the generality of the above, the Principal Mining Hazard Management Plan must provide for control processes for eliminating or minimising the risk of gas outburst in underground mining including monitoring of:
- (1) carbon dioxide and methane gas levels,
 - (2) seam gas pressure and content;
 - (3) ventilation;
 - (4) gas drainage;
 - (5) pre-drainage of coal seams;
 - (6) in-seam drainage and post drainage;
 - (7) strata de-stressing;

(8) bore hole surveying; and

(9) mining development rates,

compared with the pre-determined gas thresholds and the mining rates adopted in the principal mining hazard management plan.

7.5 The principal mining hazard management plan must ensure that the highest level of control relevant to the risk which has been identified is implemented, including worker physical protection and remote mining.

7.6 In determining such risks and controls, the Mine Operator must gather information by undertaking activities of in-situ gas sampling, geotechnical investigation and analysis, and statistical analysis of the data obtained, as part of a technical review, in order to determine what gas thresholds for safe mining should be applied at the mine.

7.7 The Principal Mining Hazard Management Plan for gas outbursts must ensure that a Permit to Mine system is implemented by the mine operator. A Permit to Mine system must include the following requirements:

(1) at least 2 hourly readings of the general body gas concentration at the face area;

(2) constant identification of geological structures;

(3) modification of the rate of roadway advance;

(4) survey and sample drill holes;

(5) training of workers in the identification of outburst signs and dangers;

(6) training of workers in outburst rescue and escape procedures; and

(7) provision of physical protection for workers operating continuous miners.

7.8 A Permit to Mine system must ensure that mining is only undertaken after verification by a designated competent person that all information necessary for work health and safety has been obtained, and all the necessary control measures have been implemented.

8. Spontaneous Combustion Principal Mining Hazard Management Plan

- 8.1 The Mine Operator must develop a principal mining hazard management plan for spontaneous combustion where the risk of spontaneous combustion at the mine exists.
- 8.2 The Mine Operator must conduct a risk assessment to determine whether the risk of spontaneous combustion exists.
- 8.3 Without limiting the generality of 8.2 (the above requirement), in undertaking the risk assessment, the Mine Operator must have regard to the following indicators:
- (1) gas analysis based indicators and
 - (2) sensory or observation based indicators.
- 8.4 Without limiting the generality of 8.2, the Mine Operator's risk assessment must include, but is not limited to, the following matters:
- (1) evaluating the spontaneous combustion related history of the mine and any adjacent or prior operations in the same seam and/or coal measures;
 - (2) evaluating external information including:
 - (a) review of the industry experience,
 - (b) regular review of available information, and
 - (c) regular review of emerging technology.
- 8.5 The Mine Operator must maintain, for the life of the mine, written records of all spontaneous combustion events including surveyed locations and other details of all known incidents on spontaneous combustion on or in the vicinity of the mine and mine specific spontaneous combustion characteristics.
- 8.6 The Mine Operator must use the information gathered through the risk assessment process to develop mine specific gas analysis and sensory indicators of spontaneous combustion risk for the mine pursuant to 8.3 above.
- 8.7 The Mine Operator must consider the indicators when making an evaluation/decision as to whether the risk of spontaneous combustion exists.
- 8.8 The Mine Operator must use the indicators developed for the mine as an internal standard against which the risk of spontaneous combustion is assessed.

- 8.9 The principal mining hazard management plan for spontaneous combustion which must contain:
- (1) details of the risk assessment
 - (2) information which adequately describes the mine and defines the “mine characteristics” as they relate to the control of spontaneous combustion
 - (3) detail of the authorities and duties of all persons who have responsibilities under the Principal Mining Hazard Management Plan.
 - (4) details of strategies to ensure that all persons who have responsibilities under the Principal Mining Hazard Management Plan have up to date knowledge of spontaneous combustion prevention, detection and control
 - (5) details of an inspection program for spontaneous combustion that includes taking recordings and making a written report on findings
 - (6) details of strategies to ensure all workers are trained in to maintain standards and work practices that may impact on potential spontaneous combustion heatings
 - (7) details of an audit program detailing a schedule of internal and external audit to ensure the effective verification of the plan.
 - (8) a review schedule that ensures the plan’s continued suitability and effectiveness in managing spontaneous combustion related risks at the mine.
 - (9) details of all controls to eliminate or manage the risk of spontaneous combustion
 - (10) details of the monitoring program that triggers any control
 - (11) details of actions to be taken in response to a spontaneous combustion event
 - (12) detail of corrective action to be taken where non conformance with the plan is identified.

Audit

- 8.10 The Mine Operator must ensure that internal audits are conducted by persons independent of those with direct responsibility for implementing the plan.
- 8.11 External audits must be conducted by persons independent of the mine’s operations.
- 8.12 The mine operator must ensure that records of all audits are maintained for 7 years.

Review

8.13 The Mine Operator must prepare a review protocol conforming to the following requirements:

- (1) a re-evaluation of the spontaneous combustion related risks and all aspects of the Plan;
- (2) identify persons to participate in reviews (indicate who should decide if significant change has occurred, and to what criteria that decision is to be made);
- (3) define time based and event based review triggers including:
 - (a) failure of the plan to control spontaneous combustion,
 - (b) significant change in mining systems,
 - (c) change of equipment,
 - (d) change of management structure.

8.14 The Mine Operator must ensure that records of all reviews are maintained for 7 years.

8.15 The Mine Operator must ensure that where the conduct of any review indicates that the plan is no longer suitable and effective in managing spontaneous combustion related risks corrective action is taken to amend the plan to make it suitable and effective for this purpose.

Controls

8.16 Where a risk of spontaneous combustion exists, the Mine Operator must consider the following matters when developing controls to effectively eliminate the risk of spontaneous combustion so far as reasonably practicable:

- (1) mine design parameters including how the mine design and/or mining methods control the spontaneous combustion hazard;
- (2) available external resources such as off-site or mobile gas analysis services, Mines Rescue response, inertisation unit, or external expertise;
- (3) Spontaneous Combustion Treatment - including inertisation, flooding, sealing;
- (4) Goods/Services Acquisition Control – ensuring the equipment used for the management of a spontaneous combustion event to be fit for purpose and any contracted services are consistent with the plan; and
- (5) mine standards and procedures based on the site specific details, developing mine standards, and procedures for the following:
 - (a) seal standards and maintenance;

- (b) sealed area monitoring;
- (c) ventilation monitoring;
- (d) gas monitoring system and locations;
- (e) gas sampling and analysis;
- (f) physical indicator observation and reporting; and
- (g) inspection.

Monitoring

8.17 The Mine Operator must monitor for signs of spontaneous combustion and put in place appropriate controls triggered by the monitoring.

8.18 The Mine Operator must consider the following monitoring strategies:

- (1) Early detection of the onset of spontaneous combustion including gaseous & physical indicators (such as smell, haze, etc) and detection of changes in the mining environment;
- (2) Inspections;
- (3) Gas Sampling and Analysis –including bag sampling; and
- (4) Continuous Gas Monitoring such as continuous monitoring from boreholes or seals, or within mine airways and goaves, including the appropriate calibration of gas monitoring instruments.

Response

8.19 The Mine operator must define the triggers which will invoke responses to manage spontaneous combustion events.

8.20 The Mine Operator must ensure that response action is taken to mitigate the effects of spontaneous combustion events.

8.21 The Mine Operator must ensure that personnel responding to spontaneous combustion events have sufficient authority to implement decisions and appropriate expertise.

8.22 The Mine Operator must maintain, for the life of the mine, an event log to record issues, decisions, actions and consequences of those actions as a result of a spontaneous combustion event.

- 8.23 The Mine Operator must ensure that withdrawal is triggered when potentially life threatening situation arises from a spontaneous combustion event.
- 8.24 The Mine Operator must develop and implement processes for the rapid sealing of areas of risk in response to a spontaneous combustion event.
- 8.25 Without limiting the generality of the above requirement, the processes for the rapid sealing of areas of risk in response to a spontaneous combustion event referred to above must include:
- (1) details of sealing procedures and type D seal design; and
 - (2) minimum inventory of materials to be maintained on-site, or to have guaranteed ready availability, at all times.

Corrective Action

- 8.26 The mine operator must maintain, for 7 years, written records of all non conformances with the Principal Mining Hazard Management Plan, causes of non-conformance and corrective action taken.

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