

**DRAFT**

# Code of Practice

## **EMERGENCY RESPONSE**



Image on the right courtesy of Western Australia Department of Mines and Petroleum



**safe work australia**

***Draft***

**Code of Practice**

**EMERGENCY RESPONSE**

**AT AUSTRALIAN MINES**

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## FOREWORD

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This Code of Practice on developing emergency plans for a mine is an approved code of practice under section 274 of the *Work Health and Safety Act* (the WHS Act).

An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulations (the WHS Regulations).

A code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in the WHS Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks which may arise. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and Regulations. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

Compliance with the WHS Act and Regulations may be achieved by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.

This Code has been developed by Safe Work Australia in conjunction with the National Mine Safety Framework Steering Group as a model code of practice under the Council of Australian Governments' *Inter-Governmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety* for adoption by the Commonwealth, state and territory governments.

A draft of this Code of Practice was released for public consultation on [to be completed] and was endorsed by the Workplace Relations Ministers Council on [to be completed].

## SCOPE AND APPLICATION

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This Code provides guidance on how to respond to an emergency at a mine as well as meet the requirements under the WHS Regulations in relation to developing an emergency plan.

This Code assists mine operators to determine how to respond to different types of emergencies at a mine and assists in the development of an emergency plan.

This Code is **not** intended to address the rescue and/or recovery of persons using specialist agencies except to the extent that those services are to be included in the implementation of the emergency response plan as required by Schedule 9.4 of the WHS Regulations.

***Who should use this Code?***

You should use this Code if you are a mine operator. This Code could also be used by mine holders, workers, health and safety representatives and other emergency services when they are involved in developing the emergency plan with the mine operator

***How to use this code of practice***

This Code includes references to both mandatory and non-mandatory actions. The references to legal requirements contained in the WHS Act and Regulations (highlighted in text boxes in this Code) are not exhaustive and are included for context only.

The words 'must', 'requires' or 'mandatory' indicate that legal requirements exist, which must be complied with.

The word 'should' indicates a recommended course of action, while 'may' indicates an optional course of action.

## 1. INTRODUCTION

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### 1.1 Who has duties in relation to emergency response?

All persons who conduct a business or undertaking have a duty of care under the WHS Act to ensure, so far as is reasonably practicable, that workers and other persons are not put at risk from work carried out as part of the business or undertaking.

In addition to this general duty, the WHS Regulations require a mine operator to prepare an emergency plan when establishing and implementing a WHS management system (WHSMS) for the operation of the mine.

The WHS Regulations also require an emergency plan to be prepared if the quantity of hazardous chemicals is handled and used at a mine in quantities greater than the manifest quantity. This emergency plan can be included in the overall emergency plan for the mine. Further information on hazardous chemicals can be found in the *Code of Practice: Managing Risks for Hazardous Chemicals [under development]*.

This Code provides detail for the mine operator to prepare an emergency plan for a mine. Further information on developing a WHSMS can be found in the *Code of Practice: Work Health and Safety Management System*.

#### **Consultation with workers, other persons and emergency services**

Throughout the development and implementation of the emergency plan, the mine operator must consult with their workers and other persons at the mine including other persons conducting a business or undertaking at the workplace.

The WHS Regulations also require the mine operator to consult with the emergency services that have responsibility for the area and the local authority for the area in relation to principal mining hazards that may adversely affect persons in the area surrounding the mine. The mine operator must have regard to the advice and recommendations provided by the persons consulted.

When consulting with the local emergency services, the following should be discussed:

- what resources the local services can contribute to responding to emergencies at the mine
- what resources the mine might need to ensure that the equipment used by the local emergency services is able to function effectively, and
- how long it will take the emergency services to respond to any emergency at the mine.

Further guidance on consultation, cooperation and coordination can be found in the *Code of Practice: Work Health and Safety Consultation, Co-operation and Co-ordination*.

### 1.2 What documents should be kept?

The mine operator is required to document the emergency plan and make it available to

people at the mine. When making the emergency plan available, a mine operator should document key elements and put it on display in and around the mine. The use of pictures and symbols may help to make the plan easier to understand.

The mine operator should also keep the other risk management documents describing:

- the hazards identified, the types of incidents that may occur and the consequences of such incidents
- the risk assessments that underly the emergency plan and the relationship of the emergency plan to any principal hazard management plans for the mine
- records of how, to what standard and when workers were trained in the requirements of the emergency plan
- records developed during an emergency, and
- records relating to the review of the emergency plan.



## 2. THE EMERGENCY PLAN

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### 2.1 What is an emergency plan?

An emergency plan details the primary means of responding to incidents at the mine that involve a serious risk of injury or illness.

The emergency plan must address all aspects of emergency response including ensuring:

- the establishment of a system that enables all persons at the mine to be promptly located
- the provision of adequate rescue equipment, and
- that an adequate number of persons trained in the use of rescue equipment are available (either on-site or on call) if a person is working at the mine.

The emergency plan may be a summary of the many mitigating controls, selected from the risk assessments of the various hazards that must be implemented as a matter of urgency.

The emergency plan must be documented and set out and expressed in a way that is readily accessible and comprehensible to persons who use it.

### 2.2 Contents of the emergency plan

Schedule 9.4 of the WHS Regulations requires the following information to be included in an emergency plan:

- site and hazard details
- command structure and site personnel
- notifications
- resources and equipment, and
- procedures.

Chapters 3 to 7 provide specific detail of what must be included in the emergency plan.

The mine operator should include additional information based on the outcome of the site specific risk management processes. Risk management processes will assist the mine operator to:

- determine what emergency situations may arise
- determine the types of emergency situations: minor, serious or major
- determine the hazards produced as a result of the emergency that workers self escaping and self rescuing may face and what responses are necessary to effect their escape or rescue
- determine the hazards produced as a result of the emergency that trained rescue personnel may face and what responses are necessary to enable them to effect successful rescue operations
- determine what responses and further controls are necessary to prevent an escalation of the hazards or risks that lead to the emergency
- determine what responses are necessary to ensure all people escape safely, such as first response, self-escape, aided escape or aided rescue, and
- determine what other resources may be needed in order to effectively manage emergency situations.

The emergency plan should address all aspects of primary emergency response and preparation for secondary response by outside agencies.

For emergency responses to have any chance of functioning properly, a well thought out and practiced emergency plan should exist together with enough infrastructure and resources to ensure that the plan is operable.

The emergency plan should also, so far as is reasonably practicable provide for:

- developing relevant procedures and training of personnel in those procedures
- identifying people at the mine with functions and responsibility for emergencies
- testing, audit and review of the emergency plan
- strategically positioned and well protected fire and or gas monitoring equipment
- documented triggers for the activation of the emergency plan
- communications to all relevant persons, including inspectors and site and industry health and safety representatives
- measures for isolating the area of an emergency
- provision of rescue equipment
- availability of trained rescue persons and emergency services (including equipment) capable of first response at the mine
- locating and accounting for persons at all times
- identifying triggers for withdrawal from part of a mine to a place of safety, or evacuation from a mine
- emergency evacuation
- first aid and medical assistance including first aid equipment, facilities and personnel trained to recognised standards
- sufficient and compatible fire fighting equipment, and
- notification of local, state and any other relevant emergency services.

### **2.3 Improving emergency response – audit and review**

After each emergency or trial of the emergency plan learning is likely to occur that can result in improvements in emergency responses. The purpose of reviewing or auditing is to check the plan is correct, in place and operable.

To make sure that the mine and its workers are ready in the event of an emergency mine operators should:

- test the plan a number of times each year using mock emergencies
- periodically audit and review the plan
- conduct investigations after any emergency events.
- regularly inspect, check and ensure that all emergency equipment is working including:
  - lifelines and other equipment
  - breathing equipment caches and changeover stations
  - refuge stations and other places of safety
  - fire fighting equipment
  - first aid equipment
  - any other critical equipment contained in the plan
- provide regular mine rescue training for emergency response workers at the mine, and
- recruit, train and retain sufficient emergency response workers to implement the plan.

### 3. SITE AND HAZARD DETAILS

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Schedule 9.4, clause 1 of the WHS Regulations requires the following site hazard detail to be included in the emergency plan:

- the location of the mine, including its street address and the nearest intersection (if any)
- an up-to-date mine plan
- a brief description of the nature of the mine and mining operation
- the maximum number of persons, including workers, likely to be present at the mine on a normal working day
- the emergency planning assumptions, including emergency measures planned for identified incidents and likely areas affected
- the protective resources available to control an incident
- the emergency response procedures, including procedures for isolating areas of the mine in an emergency, and
- the infrastructure likely to be affected by a major incident.

The fastest possible response to an emergency is essential to get people to safety and limit the effects of the emergency. Early identification of the emergency event may enable first response and self escape.

Off site emergency services need to be able to easily find the mine. They also need to know what they might encounter when they arrive in order to effectively support the mine emergency response.

The mine operator should give the location of the mine to all the emergency services that might ever have to attend the mine. As some mines can be in remote locations it may be better to provide the GPS (global position satellite) coordinates. It may be useful to give the emergency services a map of the mine, showing the location of important infrastructure and the location of specific hazards.

The mine operator should invite emergency services to attend the mine for familiarisation both on the surface and underground. Identified emergency services access points should be established for multi-access point and extensive surface operations.

The mine operator should make sure that both the emergency services and key workers at the mine know where essential utilities are located so that electricity can be isolated, water located and communication systems accessed.

The buildings and other facilities at the mine should be clearly identified as to function and whether of special construction, for example, fireproof, positive or negative pressure ventilated, high voltage switchgear, high pressure hydraulics, dangerous substances storage, explosives.

## 4. COMMAND STRUCTURE AND SITE PERSONNEL

Schedule 9.4 clause 2 of the WHS Regulations requires the following command structure and site personnel to be included in the emergency plan:

- the command philosophy and structure to be activated in an emergency, so that it is clear what actions will be taken, who will take these actions and how, when and where they will be taken
- details of the person who can clarify the content of the emergency plan if necessary
- the contact details of, and the means of contacting, the persons at the mine responsible for liaising with emergency services
- a list of 24 hour emergency contacts, and
- arrangements for assisting emergency services with control actions taken in a surrounding area.

During emergency situations quick but considered decisions are needed. To minimise confusion it should also be clear who is in charge and who is responsible for key actions. It might be necessary to put in place a special command structure where people are responsible for specific tasks. These people should be trained and competent in the tasks they are to perform. So that everyone is clear who to turn to, it can help to have the people responsible easily identified. For instance, people undertaking specific tasks might be identified by Australian Standard coloured hard hats or high visibility vests.

An organisation chart just for use during emergencies must be developed. This chart must detail all functions and responsibilities during an emergency.

Issues to consider when determining the emergency command structure include:

- the specific competencies are required for the various tasks
- what to do if the person nominated on a particular shift is un-contactable
- who will be in charge where the supervisors on shift are of equal status
- at what point does a nominated person relinquish the function to a more senior person
- where emergency procedures other system documents will be kept
- transportation capability
- first aid and further medical assistance,
- who the first contact person to receive emergency calls will be,
- who will make contact with necessary agencies that may become involved
- who will be part of the incident control team and control area as necessary
- who speak to family, friends, work colleagues, media and what will be said
- who will account for personnel during and after the response
- what debrief is needed following an emergency, for example, critical incident stress and trauma counselling, and
- how to maintain emergency response coverage 24 hours a day and seven days a week, including relief for key personnel and management of fatigue.

### 4.1 Coordination and control of emergencies

#### ***Control room or dedicated person***

When an emergency occurs at a mine, seconds count and the initial response can be critical to the outcome. Critical information must be conveyed and must be accurate,

precise, from a trusted source, and if possible should come directly from the source rather than through middlemen or an information chain.

Not every mine is equipped with a control room. However, the emergency response functions commonly assigned to a control room will still need to be undertaken by a person with this function when an emergency occurs.

At a mine where there is no control room someone must be the nominated person to take the initial call when an emergency incident occurs. This person must be trained in this function

A core function of a control room operator/dedicated person is to initiate a required response to information received. The control room operator/dedicated person should also maintain a log of any information received and transmitted.

The control room operator/dedicated person should be trained in handling all types of emergency response calls. It might be useful for the control room operator/dedicated person to use a card or annotated logbook system to record important information including:

- name of the person notifying of the emergency
- the location of the emergency
- brief details of what has happened
- who is involved
- the extent of injuries/damage
- details of any action plan
- what help and resources are needed
- is the person able to stay at the phone and send a runner for further information, and
- any other information.

The above information is critical in the early stages of an emergency and greatly assists the level of response. The provision of waterproof paper for record keeping and suitable pens for writing in wet weather should also be considered.

Control room operators/dedicated persons must be able to initiate a full emergency response and initiate and monitor the withdrawal of persons to a place of safety. There should be standing instructions regarding the initiation of the emergency procedures. To ensure timely first response, emergency systems should where possible, be automatically programmed to alarm and commence electronic communications and notifications.

All persons at a mine site must be trained to know the dedicated emergency number and who to contact and the manner and content of information to provide. This initial information is of paramount importance to the degree and success of the emergency response.

### ***Incident control team***

Emergencies may escalate to a situation where a formal Incident Control Team needs to be assembled. Timing of the creation of the incident control team is critical. The assembly of a team that will take control of the emergency would normally only occur after the initial

stages of the emergency have been managed by identified personnel and the control room operators, where available, using the standing instructions.

If an emergency is unresolved by the time significant numbers of external emergency personnel are assembling at the mine then an Incident Control Team is warranted. A formal Incident Control Team should be assembled prior to the arrival of external persons, for example, media, family and community members at the mine property entrances.

The assembly of such a team will proceed more smoothly if it has been planned for. In particular, the communication between this team and other parties involved in an emergency need to be determined and provided for.

It is recommended that a room be able to be used in an emergency that has access to the necessary communications and resources. The establishment of this room should be a specific responsibility in the duties of workers under the emergency plan.

To make sure that incident control team members can locate, initiate and follow through their duties they should not have to refer to other people for instructions or approval. Effective communication between the incident control team, the control room, management, health and safety representatives and external agencies is of critical importance. This communication must be planned for prior to an emergency.



## 5. NOTIFICATIONS

Schedule 9.4 clause 3 of the WHS Regulations requires the following notification procedures as part of the emergency plan:

- in the event of the occurrence of a notifiable incident or an event that could reasonably be expected to lead to a notifiable incident, procedures for notifying any persons whose health or safety may be affected even if the person is located underground or there is no electrical power that can be used in the notification, and the emergency servicers in circumstances where emergency services are required
- on-site and off-site warning systems
- contact details for emergency services and other support services that can assist in providing resources and implementing evacuation plans in an emergency, and
- on-site communication systems.

Many emergencies at a mine might also be notifiable incidents under the *WHS Act*. The mine operator must develop a procedure for the prompt notification of the Regulator as well as any local, state and any other relevant emergency services.

### 5.1 Communication

Communication about the emergency plan should occur before any emergency occurs. Every person at the mine, including visitors, should be aware of basic emergency procedures. The emergency plan must be available, written in plain and simple language, use simple flow charts, diagrams and pictures and be accessible to people at the mine.

### 5.2 Communication - underground mines

Communication systems must be effective during an emergency. In order to achieve this the mine operator must ensure that the communication system:

- incorporates an adequate fail safe, or backup, power supply for the system
- where electrical components are installed underground in a coal mine are suitable for use in an explosion risk zone that may contain greater than 2% methane unless the components are installed in a drift or shaft being driven from the surface in material other than coal
- provides for effective telecommunication to and from
- the entrance underground, and on the surface, of the mine through which a person may enter into a shaft or other excavation used for ingress or egress from the mine workings
- each underground battery charging station, workshop and crib room
- a place close to each switch gear used to isolate or control sections of the underground main electricity distribution system
- a place close to each underground conveyor belt drive head
- a place close to each underground loading or transfer point on the conveyor belt system
- each emergency refuge chamber
- is tested at least once in each week, and
- provides for training workers in verbal and non-verbal communication for escape.



## 6. RESOURCES AND EQUIPMENT

Schedule 9.4 clause 4 of the WHS Regulations requires the following resources and equipment to be included in the emergency plan:

- on-site emergency resources, including first aid equipment, facilities, services and personnel, emergency equipment and personnel, gas detectors, wind velocity detectors, sand, lime, neutralising agents, absorbents, spill bins, and decontamination equipment.
- off-site emergency resources, including arrangements for obtaining additional external resources (specific to the likely incidents), including mines rescue services, as necessary.
- arrangements for mine rescue that state the following:
  - (a) the minimum mines rescue training to be provided
  - (b) the procedure for the mine operator and mine operators of mines in the vicinity to assist each other in an emergency
  - (c) how inertisation equipment is to be used, and
  - (d) the procedures to be followed in carrying out mines rescue.

### 6.1 Minimising the effects of an emergency situation

To minimise the effects of an emergency situation, the mine operator should have adequate resources and equipment available in the event of an emergency. Resources include having sufficient people trained in rescue operations to ensure an emergency response capability across all shifts worked at the mine.

The risk management process used to develop the emergency response plan should identify what rescue equipment is needed and the best location for it at the mine. The location should be sign posted and a list of the equipment available should be displayed. Some mines may choose to have emergency vehicles or trailers parked up in readiness.

### 6.2 Self-rescuers

People must receive regular training in the use of the self rescuers provided. The training should take place every three months or prior to going underground where no training has been given for the last three months. The training should include how to put the self rescuer on and how to use it, including changing over or refilling the apparatus. People should also be trained in how to use this apparatus when there is low visibility during emergency situations, for example, due to smoke or lighting failure.

### 6.3 Fire fighting equipment

The mine operator must provide equipment sufficient and appropriate for extinguishing any potential fire. All fire fighting equipment must be compatible throughout the mine.

Portable fire extinguishers should be located on the intake side for underground mines and on or near equipment and installations which have been identified as potential fire hazards in the risk assessment.

The mine operator must make adequate provision for water storage, water pressure and reticulation to suppress any potential fire in a surface or underground mine. They must also ensure the water storage, water pressure and water reticulation is inspected and tested to enable delivery of sufficient volume and pressure of water to extinguish a fire at or in a mine.



#### **6.4 Fire officers – underground coal mines**

The mine operator of an underground coal mine must appoint at least one person as a fire officer. A fire officer may have the following functions in relation to fire prevention and control at an underground coal mine:

- ensuring the compatibility of fire fighting equipment with fire emergency services on the surface of a mine
- ensuring the compatibility of fire fighting equipment in the parts of an underground mine and the surface of an underground mine
- inspecting, testing and maintaining all fire fighting equipment
- keeping records of inspections, tests and maintenance of fire fighting equipment
- identifying and recommending fire prevention and control training, and
- testing, and reporting on, the conditions of the mine's communication system.

#### **6.5 First aid**

The WHS Regulations require a mine operator to provide for first aid at the mine. The mine operator must make provision for the following:

- the supply and placement of first aid supplies and equipment, including supplies and equipment required for emergencies and other incidents identified by the risk management process at the mine
- appropriate first aid training, including refresher training, emphasising the safety of the person giving first aid as well as the safety of the person receiving first aid
- the availability of a sufficient number of persons at the mine competent in giving first aid
- for accidents involving electricity, the mine operator must ensure that first aid officers are trained to be able to:
  - release a person from an energised low and high voltage conductor
  - resuscitating a person in an electrical environment, and
  - managing a person's flash burn injuries.

## 7. PROCEDURES

Schedule 9.4 clause 5 of the WHS Regulations requires mine operators to include the following procedures in the emergency plan:

- Procedures for the safe evacuation of, and accounting for, all persons at the mine.
- Procedures and control points for all utilities, including gas, water and electricity.
- Procedures in the event of the ventilation system at the mine failing totally for more than 30 minutes.

The mine operator should consider developing written procedures for managing the different types of emergencies that may arise. This section covers the more common matters that procedures might be needed for.

Procedures might relate to the overall management of the emergency and might be categorised according to the severity of the emergency. Procedures might also be directed at particular tasks that might be undertaken during an emergency.

### 7.1 Withdrawal - general

When monitoring of the various signs of any circumstances at or in a mine indicate that an emergency is developing the mine operator may decide to withdraw people from the mine or parts of the mine to a place of safety. In such situations the mine operator should develop procedures for the withdrawal of persons. The mine operator should identify under what conditions people are to be withdrawn, and to remain withdrawn, from the mine or parts of the mine. Withdrawal might be as a precautionary measure when the risk or a threat to health and safety, for example, not amounting to an emergency, warrants such action.

### 7.2 Withdrawal – underground mines

Whenever persons are underground, the mine should have in place a process by which the occurrence of hazards is monitored in order to preempt any emergency situation. This should provide sufficient time for persons to withdraw from the mine or part of a mine before an emergency event. This process should be capable of:

- bringing any alarm or event to the attention of a person whose duty it is to monitor and act on such alarms or events, and
- initiating an alarm or event at predetermined trigger levels.

### 7.3 Trigger levels

Trigger levels should be developed for each condition under which persons are to be withdrawn. Trigger levels should:

- recognise normal or background conditions
- be measurable or observable in both absolute and relative terms, for example, relevant units and as a percentage comparison to normal or background conditions
- be kept current
- be consistent with statutory requirements
- be relevant to the risk being considered
- be directly linked to a specific response action
- be recorded in the health and safety management system and referenced in the emergency plan, and
- be displayed in prominent locations throughout the mine and be easily accessible

to all

## **7.4 Triggers to signal a withdrawal**

### ***Fire***

Possible triggers that might signal a withdrawal include but are not limited to:

- heat or flames
- detection of gaseous products of combustion, smell, heat or infra-red hot-spot indicating a spontaneous heating or fire in a coal mine, and
- sealing part of a coal mine

Note: Carbon Monoxide is an indicator gas for the presence of spontaneous combustion. Hydrogen and higher hydrocarbon gases indicate the presence of a potential ignition source. The precautionary principle is to apply and the presence of Hydrogen, Ethylene and other higher hydrocarbons is to be taken as indicating the presence of an ignition source triggering a withdrawal of persons.

### ***Irrespirable atmosphere***

Possible triggers that might signal a withdrawal include but are not limited to:

- real or perceived risk of the atmosphere being displaced, for example, from atmosphere in unventilated workings
- oxygen deficiency, toxic, dangerous gas outburst
- goaf or waste workings fall
- barometric change
- presence of toxic seam gases or products of combustion
- seal failure
- flammable gas in the explosive range, and
- gas or dust explosion.

### ***Ventilation failure***

Possible triggers that might signal a withdrawal include but are not limited to:

- the development of an explosive atmosphere in a working place of the mine.
- stoppage of the main mine ventilation fan(s) in excess of 30 minutes.
- stoppage of auxiliary fan, airway blockage, appliances failure, bag or ducting blockage or failure, excessive gas emission, and
- shotfiring, for example, excessive blasting fume.

### ***Inrush***

Possible triggers that might signal a withdrawal include but are not limited to:

- an actual or impending inrush from known body of water, either surface or underground
- increased water flow from host rock, geological structures, sedimentary strata, aquifers, old and waste workings, new workings
- flowing material, for example, paste fill, raise bore cuttings, tailings, and
- gas.

### ***Fall of ground***

Possible triggers that might signal a withdrawal include but are not limited to:

- seismic and micro-seismic events
- early signs of ground or strata support failure, for example, bolt, cable or mesh

- deformation
- early signs of ground or strata failure, for example, back, roof, side, wall or floor deformation
- an actual failure of the ground or strata, and
- local, district or mine areas already fallen or indication of imminent failure.

### **Major vehicle or equipment accident**

Possible triggers that might signal a withdrawal include but are not limited to:

- loss of primary escape route
- loss of second means of egress
- winder failure, and
- serious injury to worker.

### **Sealing of part of a coal mine**

Possible triggers that might signal a withdrawal include but are not limited to:

- the development of an explosive atmosphere in a newly sealed area underground, and
- ventilation changed or interrupted, fire present, fire risk present, gas present, explosion risk present, seal design, strata instability, loss of automatic gas monitoring capability.

*Note: The development of an explosive atmosphere in a newly sealed area should be a cause for the mine to be evacuated of all personnel.*

### **Outburst**

A possible trigger that might signal a withdrawal include but is not limited to coal seam gas content above either 9m<sup>3</sup>/tonne CH<sub>4</sub> or 5 m<sup>3</sup>/tonne CO<sub>2</sub> or a proportional amount of each when present as a mixture of both gases.

### **General environmental**

Possible triggers that might signal a withdrawal include but are not limited to:

- loss of second means of egress from the mine or part of the mine for whatever reason
- loss of key controls for major hazards.
- failure of underground communication
- failure of coal mine gas monitoring system
- real or perceived risk of exposure to hazardous substances
- loss of emergency rescue capability
- loss of power to the mine, and
- contaminated water, excessive dust, diseases.

When developing trigger levels there are several issues the mine operator should consider:

- trigger level too low leading to loss of confidence, nuisance triggering
- trigger level too high leading to persons being exposed to unreasonable risk to health or safety
- triggers set without sufficient testing of the mine management ability to respond and determining the time required to respond
- triggers not recognised
- triggers not monitored

- monitoring of triggers fails, and
- triggers not re-evaluated in a timely manner.

## **7.5 Action response plans**

When a trigger level is reached it is important that people know what action to take. It may be useful for the mine operator to develop an action response plan for each trigger level. In identifying the actions to be taken after a trigger is reached, the mine operator should consider:

- minimising inappropriate reaction or nil reaction by people.
- minimising panic or over-reaction
- ensuring competent persons available to identify hazards, triggers and trigger levels
- training for personnel who have specific roles under the withdrawal conditions
- training to include the difference between emergency evacuation and withdrawal of persons as a precautionary measure
- alternative actions when key personnel are not available, and
- relevant guidelines.

## **7.6 Place of safety**

A place of safety is a designated place where persons can assemble without being in any danger from the hazard that triggered the evacuation. The place of safety :

- must be appropriate given the hazard that has initiated the evacuation, and
- must have an effective means of communication.

## **7.7 Route & method of transport**

The route and means of travel from the work place to a place of safety should be defined in the procedures. The route of travel should consider:

- ventilation needed for powered transport
- potential for contamination of escape route by event causing withdrawal
- contingency if the normal route of travel is impassable
- alternate methods of withdrawal
- the distances which persons may need to travel in an emergency situation, for example, walking extended distances is not normally adequate although it should be planned for
- roadway height and grade
- travelling conditions
- fitness of persons underground
- availability of transport
- tactile guidance systems, and
- extent to which the escape route is free of fire risk.

## **7.8 Checking system**

When an instruction pursuant to the withdrawal procedures is given there should be in place mechanisms to check that it has been received, understood and acknowledged by all affected persons.

## **7.9 Monitoring of the location of persons**

Each mine should have a system to monitor:

- persons entering and exiting the mine, and

- the general location of persons while underground.

The system should provide an ability to check that all affected persons have moved to the required place of safety. The system should

- provide adequate detail of location of all people underground, and
- identify places of safety with communication to surface control.

### 7.10 Re-entry to the mine after an emergency

The mine operator should develop a process for re-entry to a mine or a part of a mine after the immediate effects of an emergency have passed.

A clear distinction exists between re-entry operations involving the saving of human life and operations involving the protection and recovery of capital.

After life safety has been assured the threshold limits that apply to normal operations in the mine are re-established. Re-entry is then conducted under the rules associated with normal work. It is essential that the persons who are involved in a re-entry operation understand this.

Re-entry involves the passage of persons from a place of safety to a place where the effects of an adverse event may still be present. This may include failed ventilation and dangerous atmospheres, compromised ground or strata support or any number of hazards that need to be rectified to enable that workplace to be reoccupied for normal operations.

Regardless of the size of the recovery and re-entry operation, the chances of a successful outcome are improved if the process has been planned and correctly resourced. By its very nature a re-entry operation requires the following:

- consultation
- hazard identification and application of the hierarchy of controls
- risk assessment
- risk management, procedures and standards of engineering practice
- information and instruction
- training and competence
- supervision
- monitoring the system of work
- review of the operation, and
- revision of the process as necessary.

The main risks associated with re-entry are:

- persons re-enter a hazardous circumstance with inadequate knowledge of the potential risk and without adequate procedures, standards and equipment
- persons re-enter a hazardous circumstance without adequate backup
- persons re-enter a hazardous circumstance without adequate communication to a control centre
- persons re-enter a hazardous circumstance without an adequate escape strategy
- unrecognised hazard exists as a consequence of the initial withdrawal condition
- persons re-enter in response to a transient dip below withdrawal trigger level

- re-entry triggers are not developed for each withdrawal condition, and
- consideration not given to inspections or remote monitoring prior to general re-entry.

The mine operator should consider the following points when re-entering a mine regardless of the size of the area, the size of the recovery group or the nature of the event that resulted in a withdrawal of persons:

- thorough pre-planning to develop standards and procedures using risk assessment methods will enhance the chances of a safe and successful outcome
- any remaining hazards or conditions that would allow a hazard to be triggered by the re-entry process
- contingency retreat plans
- physical and environmental conditions to be encountered underground
- isolation of affected areas
- ventilation; including:
  - composition of atmosphere,
  - re-ventilation method.
  - progressive re-entry,
  - condition of ventilation appliances,
  - monitoring trends of mine gases and control of atmosphere and dilution of gases.
- radio and/or telephone communication between control centres, fresh air bases and operational teams is essential
- electricity, including:
  - flame proof enclosures in coal mines
  - cables
  - conditions to enable restoration of power
- state of ground or strata support and local and regional stability of the mine.
- water, and
- access.

### **7.11 Emergency evacuation - general**

The emergency plan should provide for evacuation from the mine when conditions of potential or imminent emergency requiring escape from a mine are identified. The appropriate alarm must be communicated to persons who may be endangered. When developing a monitoring system that will trigger evacuation, the mine operator should consider:

- monitoring system adequately designed, maintained and calibrated
- detection points positioned and alarms initiated in appropriate locations
- different alarm settings for different levels of emergency
- early warning systems and associated decision making protocols
- integrity and protection of the system during an event
- contingencies in the event of a failure of the primary monitoring system, and
- availability of competent people to operate systems and analyse results.

### **7.12 Emergency telephone procedures**

The mine operator should consider developing an emergency telephone number and a protocol for non-verbal communication across intercoms, telephones and other communication equipment or other means.



The communication systems should be augmented by a minimum of one secondary communication system. At least one of these should be independent of the mine power. Provision needs to be made to enable the communication systems of external agencies to be quickly connected to the mine's system.

### **7.13 Self-rescuer apparatus procedures**

Persons underground must be provided with respiratory protection apparatus to allow safe egress from the mine through any irrespirable or irritant atmospheres.

Where the self rescuer worn is a CO filter type or a Compressed Air type caches of sufficient numbers of self rescuer apparatus, with the capability of providing oxygen, must be readily available at change over points.

The first cache should be in close proximity to working faces. The locations of subsequent caches need to be determined by the undertaking of "walk out trials" based on a worst case vision and heat environment from the mine. This involves consideration of the "rated duration" of the self-rescuer under consideration.

The escape plan should be underpinned by a risk assessment which considers the manufacturers recommendations on the equipment along with the results of any credible published trial of the equipment. The risk assessment should consider applying a safety factor to the rated duration.

### **7.14 Change-over stations (COS) procedures**

Safe storage/caches of self-rescuer units should be placed along escape ways where efficient change over of self-rescuers occurs. The first change-over station from a production unit should facilitate safe assembly of escaping persons and communication.

Change over stations should generally be located between intakes and returns with trap doors to both intake and return.

### **7.15 Refuge procedures**

The mine operator should consider the installation of refuge chambers at the mine. In an emergency in an underground coal mine, the preferred option is to escape the mine. However circumstances may arise that prevent this. In these circumstances there needs to be a "place of safety" where miners can shelter until rescue occurs. A place of safety can only be where there is good ventilation and protection from fire.

Refuge chambers need to be practical and have the basic elements necessary to sustain life for significant periods of time following a fire or explosion. All refuge options must include the assessment of and means to recover, in a safe and timely manner, all persons who use the system.

Places of safety need to be assessed under a variety of circumstances. This would include assessment under a variety of conditions, for example:

- a major fire
- a major ground or strata failure including air or wind blast
- inrush
- fan on



- fan off
- failure of ventilation appliances
- gas and or coal dust explosion, and
- coal mine outburst.

The condition of the atmosphere and atmospheric contaminants are of prime consideration. Other considerations that a mine operator should assess include:

- where refuge chambers are provided there is a pre-planned strategy to rescue the occupants
- RC are located and constructed such that they will resist damage during normal operations and emergency use
- where RC are supplied, there is a maintenance/inspection program
- monitoring device is available to indicate the atmosphere inside RC is safe to breathe and operate the refuge
- occupants of RC have means of communication to surface, and
- where RC are provided the competency based training scheme includes access to RC and the requirements of their use.

### 7.16 Boreholes procedures

The mine operator should consider the use of boreholes in communications and air supply to refuge stations and/or respirable air change-over stations, and in the recovery of personnel from underground workings. When considering this option the mine operator should ensure:

- a suitable rig is available within appropriate timeframe or borehole is pre drilled
- where a borehole is part of planned rescue strategy the surface location is available, secure, surveyed, cleared, consolidated and provided with all weather access
- where a borehole is part of planned rescue strategy the underground target site is surveyed, suitably supported, cleared and marked, and
- where a borehole is part of planned rescue strategy the depth, stratigraphy, hole stability and drill-ability should be known.

### 7.17 Guidance system and lifelines procedures

A system should be provided to aid people escape in conditions of reduced visibility. Paths of egress should be marked so that people who are not familiar with a route can safely travel it in conditions of poor visibility.

*Note: mines sometimes focus on second egress marking and forget about the primary egress. Primary egress marking should be in place to assist transport drivers in low visibility.*

When developing guidance system procedures the mine operator should consider:

- that people might not find the guidance system
- locations of caches/ changeover stations/ refuges might not be found in conditions of poor visibility
- guidance system might not survive the incident
- guidance system might not indicate the direction of travel in conditions of poor visibility
- the use of contractors and other highly mobile workers may be unfamiliar with the life line system at the mine

- guidance system needs to be readily accessible
- there are clearly identifiable access points to escapeways
- easy access to, or a means of reaching, the start of the guidance system
- the guidance system provides continuous directions to a place of safety
- the guidance system leads the escaping person along a path unhindered by obstacles
- people are trained in the use of the guidance system
- all means of egress should be fitted with lifelines
- a tactile system is more reliable in a smoke filled atmosphere than visual or audible cues, although visual and audible cues are useful and warranted, and
- lifelines need to penetrate as close to the working area as possible.

### **7.18 Escape ways & transport aided escape procedures**

The WHS Regulations require that a mine operator provide at least two escape routes from each part of the mine to the surface so that in the event one becomes impassable another is always available for travel.

When developing the escape way transport procedure the mine operator should ensure there are sufficient types and numbers of transport or alternate escape means, in combination with escape equipment, to allow the safe evacuation of persons.

Provision of high speed vehicular escape or equivalent should be considered the primary object of any emergency escape system. The escape functions of all vehicles must be considered in their selection and configuration.

Systems that rely on long walks through difficult conditions may be insufficient to ensure that people safely escape the mine.

A primary and secondary means of egress, that is trafficable on foot, should be maintained in the event that vehicular or other rapid transport fails. These should be able to be negotiated in poor visibility and smoke.

*Note: Mines should consider providing segregated intake second means of egress in main headings. It is preferable that the second means of egress can be driven – at least in the main headings.*

The risks and other factors that the mine operator should consider when developing the procedure are:

- escapeways not trafficable
- fire or explosion destroys stoppings/seals between segregated escapeways
- fire occurs on equipment located in escapeway
- the environmental conditions during and after the incident preclude the use of a transport vehicle
- available transport does not cater for the maximum number of persons in the area
- transports used as part of escape strategy collide in poor visibility conditions
- lifelines, caches of breathing apparatus and charging stations might not be found or properly understood
- there is a primary (intake) and alternate escapeway nominated from all districts to the surface or a place of safety
- can the primary escapeway be maintained in good trafficable condition.



- can escapeways be segregated by substantial, fire-resistant stoppings
- fire sources in escapeways have been identified and controlled
- where transports form part of escape strategy, they cater for the maximum number of persons likely to be in the are.
- where transports form part of escape strategy, a guidance system is implemented together with an effective signalling system or control mechanism to address the hazard of collision.
- a competency based training scheme addresses choice of escape routes, access to escapeways, conditions in escapeways and location of equipment within escapeways, and
- where new hazards are introduced to the escapeway a reassessment of the escape strategy is triggered.

## 7.19 Sealing and inertisation procedures

The mine operator of an underground coal mine should make provisions that each entrance from the surface to the underground coal mine is capable of being sealed at the following locations:

- the surface portals without requiring persons to travel in front of the entrance to seal it, and
- at a vertical shafts; immediately above or in a roadway at the bottom of the shaft.

The procedure for sealing a mine should ensure:

- at least one of the entrances has a mine entry airlock capable of withstanding a pressure pulse of 70 kPa passing through the entrance while the airlock is open.
- when sealed, the mine has facilities allowing:
  - the use of inertisation equipment from a safe position
  - monitoring the atmosphere behind the seal from the safe position
  - persons to re enter the mine through the entrance
  - large mobile equipment to enter or exit the mine through an airlock
- each airlock installed for an entrance at the mine is tested, other than pressure tested, on a regular basis and at least once a year
- the connection point for using the inertisation equipment is tested at appropriate intervals
- each airlock and seal required to be used with the inertisation equipment is regularly tested, and
- water and cleared areas are available for use with inertisation equipment.

## 7.20 Fire fighting – general procedures

The mine operator should ensure that fire fighting procedures consider the following:

- The safety of persons required to conduct fire fighting activities
- action to be taken when a fire is discovered at the mine including actions which are to be taken by a person who first discovers a fire at the mine
- when emergency services external to the mine are required to be activated, and
- sufficient persons trained in fire fighting to provide a fire fighting resource across all shifts worked at the mine.

## 7.21 Fire fighting – underground mines

When developing procedures for fighting fires in underground mines, the mine operator should consider:



- the extent of the mine workings and connections to the surface or workings in other seams
- water reticulation lines in the mine together with hydrant and valve sites
- fire stations and depots
- ventilation control devices
- atmospheric monitoring sites, stations and sampling lines
- the location of communication lines and telephones
- gas drainage ranges and drainage bore holes in coal mines
- stored pressure vessels
- the location and type of refuges
- the location and content of caches of self rescuers
- the direction of the ventilating air currents
- primary escapeways
- a longitudinal section along each extraction panel and main trunk panel showing the relationship between the underground mine workings and the surface of the coal mine, and
- a longitudinal section from each development or production face and rise to the main decline or shaft to the surface of the mine.

## **7.22 Locating persons in the event of an emergency – general procedures**

The mine operator should develop a procedure to accurately identify and record all persons at the mine at any time, and their likely location.