

Principal hazard management plans guide

WHS (Mines & Petroleum Sites) Legislation

December 2016

This guide provides a summary of obligations in relation to principal hazard management plans under the Work Health and Safety (Mines & Petroleum Sites) Regulation 2014. This guide does not apply to underground small gemstone mines, opal mines and tourist mines.

Help with principal hazard management plans

This guide aims to assist operators of mines and petroleum sites (operators) developing a principal hazard management plan for a hazard that is not the subject of a code of practice. Where a relevant code of practice has been approved readers should refer to the relevant code.

At the time of writing, the following NSW codes of practice have been approved for dealing with principal mining hazards:

- Inundation and inrush hazard management
- Strata control in underground coal mines.

We plan to develop further NSW codes of practice dealing with principal hazards. Other sources of information about the hazards that may be principal hazards are set out at the end of this guide.

Safety management systems

Principal hazard management plans form part of the safety management system for a mine or petroleum site. For more information about safety management systems see [Safety management systems in mines](#) code of practice¹.

¹ Note: at the time of writing, this code does not apply as a code of practice to petroleum sites. However it may be used as guidance for operators of petroleum sites.

Introduction

The Work Health and Safety (Mines & Petroleum Sites) Regulation 2014 (WHS (MPS) Regulation) identifies principal hazards for special consideration because they are hazards that have the potential to cause an incident with very serious consequences, even where the likelihood of that incident may be low if the risks are well managed.

The mining and petroleum industries have a long history of disasters resulting in the deaths of many workers. In recent years, explosions at the Pike River coal mine in New Zealand and at the Deepwater Horizon offshore oil rig resulted in the deaths of 29 and 11 workers respectively.

As well as hazards that may result in large scale disasters, other hazards that have a reasonable potential to result in multiple deaths in a series of recurring incidents are also principal hazards.

Principal hazards

Principal hazards are any hazards that have a reasonable potential to result in multiple deaths in a single incident or a series of recurring incidents.

What is meant by ‘a reasonable potential’?

A reasonable potential refers to a real possibility or likelihood that the risk might eventuate. If the risk of an incident is theoretically possible but extremely unlikely to occur, it should not be considered to have reasonable potential to occur.

For example, natural seismic activity occurs in Australia but in most cases would not constitute a principal hazard unless a mine is within a zone of significant influence and effect from that activity. However, mines that can induce seismic activity of a magnitude that could affect the safe operation of the mine may have to consider seismic activity as a principal mining hazard.

What is meant by ‘a series of recurring incidents’?

A series of recurring incidents refers to the type of incidents that have the potential to recur because workers will likely be exposed to the same hazard.

Electrocution is a good example of a recurring hazard. Often only one worker is exposed to the electrical hazard at any particular time but if the same work needs to be done on a recurring basis then this may give rise to a series of recurring incidents.

If workers will be exposed to a hazard on a recurring basis that has a reasonable potential to result in a series of fatalities over time you should identify the hazard as a principal hazard.

Specified hazards

The WHS (MPS) Regulation identifies **nine specific hazards for mining** and **two specific hazards for petroleum** as potential principal hazards, shown in Figure 1 below. These specified hazards are in addition to any other reasonably foreseeable hazard you identify that has a reasonable potential to result in multiple deaths in a single incident or a series of recurring incidents.

Figure 1: Principal hazards at mines and petroleum sites

Principal hazards	
Mine sites	
1	Any reasonably foreseeable hazard identified by the mine or petroleum site operator
2	Fire or explosion
3	Roads or other vehicle operating areas
4	Ground or strata failure
5	Inundation or inrush of any substance
6	Mine shafts and winding systems
7	Air quality, dust or other airborne contaminants
8	Spontaneous combustion
9	Subsidence
10	Gas outbursts
Petroleum sites	

Hazards identified by the operator of a mine or petroleum site

The most common principal hazards at mines or petroleum sites have been specified in the WHS (MPS) Regulation but there may be other hazards at the mine or petroleum site that have a reasonable potential to result in multiple deaths in a single incident or a series of recurring incidents. Examples of such hazards include:

- working at heights
- work in confined spaces
- blow-out at a petroleum well. All blow outs have the potential for fire or explosion but there are other hazards associated with blow-outs (such as uncontrolled ejection of tubing) that have a reasonable potential to result in multiple fatalities.

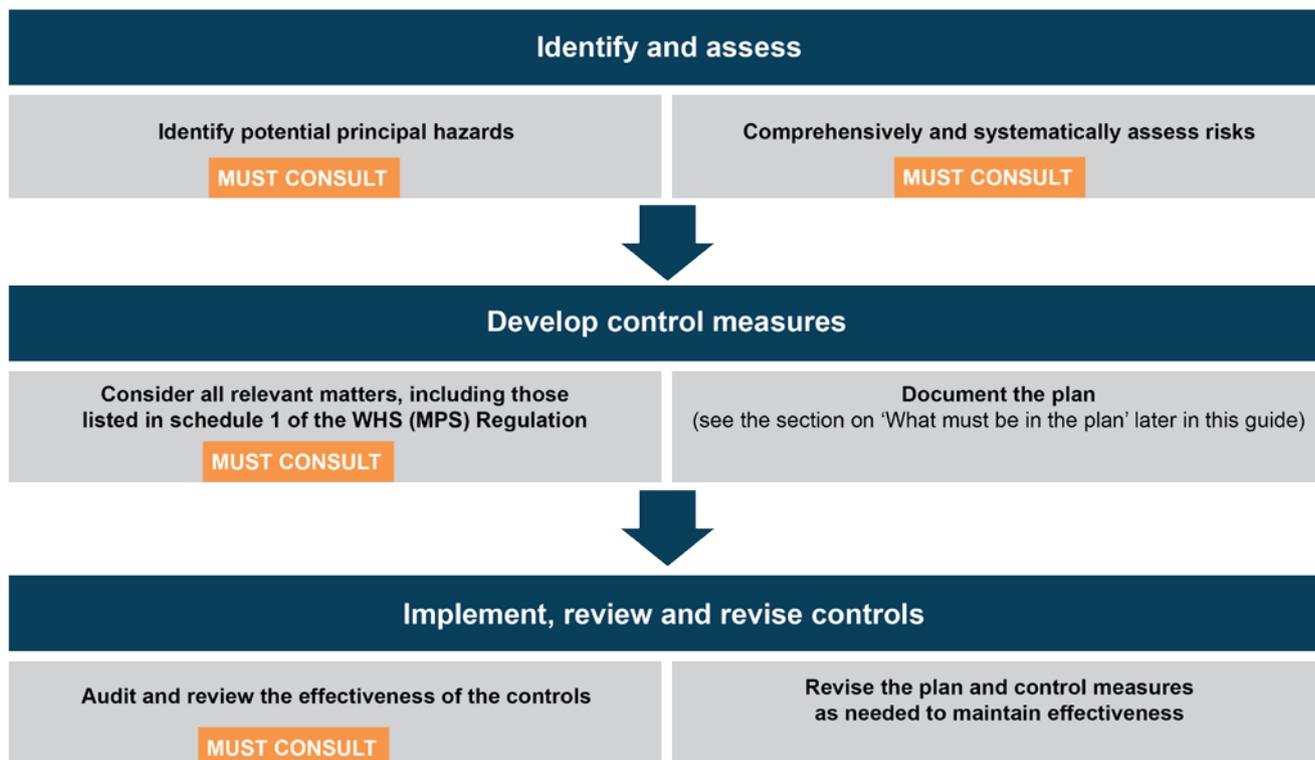
You must identify any such hazards and prepare a principal hazard management plan to help ensure the hazard is adequately managed. In the case of example three above the operator of the petroleum site could combine the plan for this hazard with the plan for fire or explosion as there would be significant overlap. The critical issue is that the hazard is identified, assessed and managed as a principal hazard.

Managing principal hazards

You must manage the risks associated with principal hazards including by complying with particular obligations to identify and assess principal hazards and using a principal hazard management plan to help ensure principal hazards are adequately managed. Figure 2 below provides an overview of these obligations.

You must not undertake mining or petroleum operations that give rise to a principal hazard until a principal hazard management plan for that hazard has been prepared.

Figure 2: Overview of obligations



Role of consultation in managing principal hazards

When managing risks, you must consult with workers and other duty holders at the mine or petroleum site. This includes other persons conducting a business or undertaking such as contractors. Further guidance on consultation, cooperation and coordination can be found in the:

- NSW code of practice: [Work Health and Safety Consultation, Co-operation and Co-ordination](#) published by SafeWork NSW
- Contractors and other businesses at mines and petroleum sites guide
- Consulting workers fact sheet.

Consulting workers

Specific requirements apply to consulting with workers regarding principal hazards, including when:

- identifying principal hazards and considering control measures for risks associated with principal hazards as part of a workers' safety role
- assessing principal hazards
- developing, implementing and reviewing of the safety management system for the mine or petroleum operation (note that a principal hazard management plan is part of the safety management system for the mine or petroleum site).

“A safe workplace is more easily achieved when everyone involved in the work communicates with each other to identify hazards and risks, talks about any health and safety concerns and works together to find solutions. This includes cooperation between the people who manage or control the work and those who carry out the work or who are affected by the work. By drawing on the knowledge and experience of your workers more informed decisions can be made about how the work should be carried out safely”

The NSW code of practice: work health and safety consultation, cooperation and coordination p4 published by SafeWork NSW .

Workers' safety role

Under the WHS (MPS) Regulation you must implement a safety role for the workers at the mine or petroleum site that enables them to contribute to:

- consideration of control measures for risks associated with principal hazards at the mine
- consideration of control measures for risks to be managed under principal control plans
- the conduct of a review of a principal hazard management plan
- identifying principal hazards that are relevant to the work that the workers are, or will be carrying out.

Implementing a workers' safety role does not mean that you have to create particular positions or functions. Rather, it requires you ensure your consultation arrangements include effective consultation on the matters specified.

The idea of the workers' safety role is to help ensure the specific and active participation of workers in consultation on principal mining hazards and the control measures under principal control plans.

Work Health and Safety (Mines and Petroleum Site) Regulation

120 Safety role for workers in relation to principal hazards (cl 675Q model WHS Regs)

The mine operator of a mine must implement a safety role for the workers at the mine that enables them to contribute to:

- (a) the identification under clause 23 of principal hazards that are relevant to the work that the workers are or will be carrying out, and
- (b) the consideration of control measures for risks associated with principal hazards at the mine, and

- (c) the consideration of control measures for risks to be managed under principal control plans, and
- (d) the conduct of a review under clause 25.
(details of penalty omitted)

121 Mine operator must consult with workers (cl 675R model WHS Regs)

For the purposes of section 49 (f) of the WHS Act, the mine operator of a mine must consult with workers at the mine in relation to the following:

- (a) the development, implementation and review of the safety management system for the mine,
- (b) conducting risk assessments for principal hazard management plans
- ...

Identifying principal hazards and assessing associated risks

The risks associated with principal hazards are not always obvious. They must be identified and then assessed separately and in combination in case there are interactions flowing from one to the other. The plan(s) to manage these hazards – principal hazard management plans – must form part of the safety management system to ensure that principal mining hazards are managed effectively and in a systematic way. A principal hazard management plan may be combined with a principal control plan. The box below sets out the specific requirements for identifying and assessing the risks of principal hazards.

Work Health and Safety (Mines and Petroleum Sites) Regulation

23 Identification of principal hazards and conduct of risk assessments (cl 627 model WHS Regs)

- (1) The operator of a mine or petroleum site must identify all principal hazards associated with mining operations or petroleum operations at the mine or petroleum site. (details of penalty omitted)
- (2) The operator must conduct, in relation to each principal hazard identified, a risk assessment that involves a comprehensive and systematic investigation and analysis of all aspects of risk to health and safety associated with the principal hazard. (details of penalty omitted)
- (3) The operator, in conducting a risk assessment under subclause (2), must:
 - (a) use investigation and analysis methods that are appropriate to the principal hazard being considered, and
 - (b) consider the principal hazard individually and also cumulatively with other hazards at the mine or petroleum site.

How to identify principal hazards

There are a number of ways to identify hazards at the mine or petroleum operation. These include:

- consulting with workers, as they can provide valuable information about potential hazards
- conducting a visual inspection of the mine or petroleum site

- reviewing available guidance and information including incident records, trends or common problems from similar types of operations.

It is beneficial to include hazard identification in the early stages of a project as well as at operational stages as it is often more effective and less costly to eliminate or plan for the control of hazards at the design stage. Technical specialists and designers often benefit from direct discussion with people who will be involved in day to day operations.

Hazard identification

Hazard identification is usually a qualitative process undertaken by a group of skilled and experienced people with knowledge of the particular operation or activities being undertaken. A team approach is beneficial because few individuals have expertise on all hazards, and group discussion can help stimulate consideration of hazards that might otherwise be overlooked. Those who will be exposed to the hazards can make a valuable contribution to identifying the hazards.

Although principal hazards include hazards with catastrophic potential it is also important to consider routine activities and occasional activities. For example:

- loading and unloading vehicles such as when setting up for drilling for example has resulted in fatalities at petroleum sites
- work in confined spaces such as reclaim tunnels
- work at heights – any work where elevated working platforms or other arrangements are used for access, such as maintenance on elevated conveyors.

Risk assessment methods for principal hazards

Once a principal hazard has been identified, you must use appropriate risk assessment methods to investigate and analyse each principal hazard before developing the principal hazard management plan. The risk assessment must be conducted by a person or group that is competent to conduct the assessment, having regard to the nature of the hazard. The person or group conducting the risk assessment should individually or collectively have knowledge and experience about the hazard itself and the risk assessment techniques that are to be used to assess the risk.

A comprehensive and systematic process

A process is 'comprehensive' when it includes all operations, activities, areas or phases of operations and addresses all aspects of the hazard (e.g. likelihood and consequence; different ways the hazard may arise or different impacts it may have in different circumstances). A process is systematic if it involves a system or plan, for example applying the same process at each step.

Risk assessment techniques

You can use a range of processes and techniques for assessing risk. Techniques range from 'open' brainstorming workshops and 'closed' sessions using checklists, to more complex, formal techniques such as qualitative and quantitative risk matrix methods, failure modes analysis (top-down fault trees and bottom-up event trees to investigate sequence of events), and layers of protection analysis. In some instances, you may need to use a combination of processes to ensure an assessment is comprehensive.

There are a variety of sources of information on risk assessment techniques and processes, as they are used in many industries. The following websites are a good starting point.

- For an overview of techniques, see [National Minerals Industry Safety and Health Risk Assessment Guideline](#) available on the MIRMgate website.
- Risk gate (www.riskgate.org) is an interactive online risk management tool designed to assist in the analysis of priority unwanted events unique to the Australian coal mining industry. Although prepared for the coal industry much of the information is also relevant to metalliferous and extractives operations.

For more information on managing risks under the WHS (MPS) Regulation, including specific obligations for conducting risk assessments, see [Managing risks in mining](#) and [Managing risks in petroleum operations](#) guides and the NSW code of practice [How to manage work health and safety risks](#).

Choosing risk assessment techniques

Each method and analysis process or technique has limitations and weaknesses and requires different levels of resources, expertise and detail. Some processes may be better suited to particular hazards and types of operations than others. Whatever the process chosen for a principal hazard it should be logical, comprehensive, systematic and repeatable, if it is to be effective.

Some questions you should ask when selecting a process are:

- Is it suitable for the type and complexity of the operation and the nature of all the hazards present?
- Is it workable and not overly complicated for our needs?
- Is it adequate to differentiate between likelihood and consequence?
- Is it able to assist us to understand the hazard and select the risk control measures?
- Is it capable of assessing cumulative risk and the potential effect of risk reduction measures?
- Does it challenge the assumption that no new knowledge is required about the principal hazard?
- Does it provide information that can be understood by those exposed to the principal hazard?
- Does it ensure an appropriate group of workers is consulted and actively involved in the assessment?
- Is it able to identify and address uncertainties?
- Is it consistent with our safety policy and the safety management system?
- Can it document all methods, results, assumptions and data?
- Can it be used for continuous improvement?

You should select a process that:

- provides knowledge, awareness and understanding of the risk of the principal hazard and how to prevent incidents (for inclusion in the principal hazard management plan)
- identifies the major factors contributing to risk
- identifies, evaluates, defines and justifies the selection, or rejection, of risk controls
- allows the adequacy of selected controls to be tested
- demonstrates that risk is eliminated or reduced so far as is reasonably practicable.

Remember that any risk assessment technique is only as good as the questions you ask and needs to be applied to the particular conditions and approaches at your mine or petroleum site. Generic or off-the-shelf risk assessments are likely to miss critical factors that are specific to your site or way of working.

Selecting control measures

The processes around identifying and assessing principal hazards are intended to ensure that the best control measures are adopted for managing the risks associated with the hazard. Schedule 1 to the WHS (MPS) Regulation sets out a range of matters that must be considered when developing the control measures to manage the risks associated with the specified hazards discussed earlier in this guide.

There are also specific control measures (i.e. mandatory control methods) for many principal hazards. You must comply with any specific controls required by the WHS Regulation or WHS (MPS) Regulation.

As with all risks, you must select control measures to:

- eliminate the risks to health and safety so far as is reasonably practicable
- minimise remaining risks so far as is reasonably practicable if it is not reasonably practicable to eliminate them.

Controlling risk

There are many ways to control risks. Some control measures are more effective than others. You must give consideration to the various control options and select the control that most effectively eliminates the hazard or minimises the risk in the circumstances so far as is reasonably practicable. This may involve a single control measure or a combination of different controls that together provide the highest level of protection that is reasonably practicable.

The most effective control measure involves eliminating the hazard and associated risk. The best way to do this is by not introducing the hazard into the workplace. For example, the risk of a fall from height can be eliminated by doing the work at ground level, such as placing an excavator boom as low as possible to the ground before undertaking repairs on it.

Risks can also be eliminated by removing the hazard completely, for example, by using conveyor belts instead of haul trucks. Some changes may initially involve additional costs but have productivity benefits as well as safety benefits that should be considered. It may not be reasonably practicable to eliminate a hazard if doing so means that the task cannot be completed.

If it is not reasonably practicable to eliminate the hazard, then eliminate as many of the risks associated with the hazard as possible.

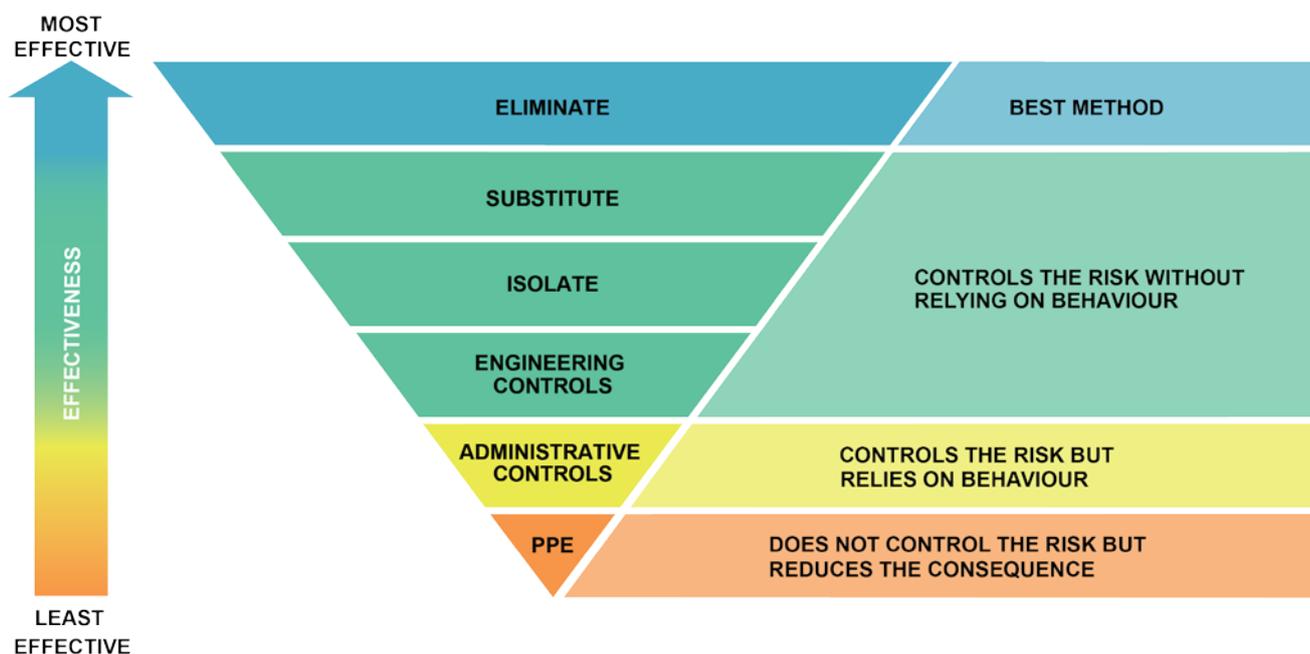
Eliminating hazards is often cheaper and more practical to achieve at the design or planning stage of a product, process or place used for work. For example:

- Design a site so there is no interaction of vehicles travelling in opposite directions or between heavy and light vehicles.
- Design structures so that any areas requiring maintenance can be accessed easily and securely without the need for access equipment or harnesses.

The hierarchy of controls

Where it is not reasonably practicable to completely remove a hazard, you must apply the hierarchy of risk controls (Figure 3) to minimise the risks associated with the hazard. The hierarchy of risk controls is the range of ways of controlling risks, ranked from the highest level of protection and reliability to the lowest. The WHS laws require duty holders to work through this hierarchy when managing risks.

Figure 3: The hierarchy of control showing the highest to lowest level of protection



Note: Control measures that effectively control risks with each hazard are often a combination of various levels of the hierarchy of controls.

Inadvertently introducing new hazards

Sometimes introducing new control measures can introduce new hazards or risk. For example, if you are the operator of a petroleum site and decide to use a remotely controlled device for making up and breaking up pipes to eliminate certain manual handling hazards, you should consider whether you are introducing greater hazards because of the use of a remote controlled plant. The introduction of a remote controlled plant has resulted in fatalities in both the petroleum and mining sectors. Such plant can offer many safety benefits provided the risks associated with its use are recognised and managed.

To help ensure new risks are not introduced it's important to repeat hazard identification and assessment processes when you are selecting control measures.

For more information on controlling risks see:

- NSW code of practice: How to manage work health and safety risks
- Managing risks in mining
- Managing risks in petroleum operations.

About the principal hazard management plan

The WHS (MPS) Regulation establishes a duty on the operator to prepare a principal hazard management plan for each principal hazard and sets out a range of matters that you must include in the plan. The plan must:

- provide for the management of all aspects of risk control for the principal hazard so far as is reasonably practicable.
- be set out and expressed in a way that is readily understandable by persons who use it.

Figure 4: Overview of content of a principal hazard management plan

Overview of content of a principal hazard management plan



General considerations

The matters that you must include in the plan are set out on the next page and are largely self-explanatory. The plan does not need to be compiled in the order listed in the regulation and you can combine elements. You need to document the plan, but it does not have to take the form of a single document. You can refer to a range of other documents such as risk assessments, schedules and procedures documents.

Bear in mind that the plan may be read and used in part or in full by different people, so each part should be complete and appropriate for its potential uses. The use of headings, diagrams and common words may help understanding. The mandatory content is intended to assist you not only in the planning process, but to make it easier for anyone when using and reviewing the plan, so consider what information will be needed.

As part of the safety management system, the level of detail in the plan will depend on the nature, complexity, location and risks of the mining or petroleum operations.

You can keep the plan in electronic form, in hard copy or in a combination of these.

It is not necessary that all components of the principal hazard management plan are physically incorporated in one hard copy or electronic file. Instead, you can reference other documents such as:

- a strata monitoring program
- safe work method statements
- confined spaces permit procedures.

If you refer to other documents such as safe work method statements consider providing a list of the control measures so the reader gains an overall understanding of what controls are to be implemented. Specific details can be provided by reference to separate documents, such as design features or procedures.

Also consider providing summary details for risk assessment of the individual and cumulative effects of the hazard. The details should also include control measures associated with the interaction with other related or associated hazards.

When describing the analysis methods used to identify the hazard or to help select controls it may be helpful to include details of how they were used. For example, who was involved in group review; what resources or information was used (for example codes, technical publications and specific mine data from the operation). This may help anyone using or reviewing the plan.

What must be included in the plan

Work Health and Safety (Mines and Petroleum Sites) Regulation

24 Preparation of principal hazard management plan (cl 628 model WHS Regs)

...

(3) A principal hazard management plan must:

- (a) describe the nature of the principal hazard to which the plan relates, and
- (b) describe how the principal hazard relates to other hazards associated with mining operations or petroleum operations at the mine or petroleum site, and
- (c) describe the analysis methods used in identifying the principal hazard to which the plan relates, and
- (d) include a record of the most recent risk assessment conducted in relation to the principal hazard, and
- (e) describe the investigation and analysis methods used in determining the control measures to be implemented, and
- (f) describe all control measures to be implemented to manage risks to health and safety associated with the principal hazard, and
- (g) describe the arrangements in place for providing the information, training and instruction required by clause 39 of the WHS Regulations in relation to the principal hazard, and
- (h) refer to any design principles, engineering standards and technical standards relied on for control measures for the principal hazard, and
- (i) set out the reasons for adopting or rejecting each control measure considered.

...

Note that there is also a requirement to record the revisions, including any revision of a risk assessment, in writing in the plan.

Proportionality

Principal hazard management plans should contain a level of detail that is appropriate to the risks associated with the hazard. For example, a plan dealing with strata control issues at an underground mine is likely to be more complex and involve more elements than a plan dealing with the hazards associated with confined spaces.

Where you identify a principal hazard you should review the extent to which your existing arrangements and control measures comply with the requirements for principal hazard management plans. For example, if you identify that hazards associated with working at heights constitute a principal hazard at the mine and already have arrangements in place to identify, assess and control the hazard, a gap analysis may highlight the need to ensure that:

- workers have a safety role in relation to working at heights hazards
- the reasons for adopting or rejecting each control measure considered are recorded in the plan.

Audit and review

The safety management system for a mine must be maintained, audited, reviewed and as necessary revised. An audit or review of the safety management systems will include an audit or review of the principal hazard management plan. You should refer to Chapter 5 of the [Safety management systems in mines](#) code of practice for guidance on performance measures, reviews and audits.

Incorporating performance measures in or when developing and implementing the principal hazard management plan will assist you to satisfy your duties in relation to the safety management system and, more critically, to ensure that controls for the principal hazard are effective.

In addition you must ensure that a principal hazard management plan is reviewed and as necessary revised if a control measure specified in the plan is revised under clause 38 of the WHS Regulations or clause 10 of the WHS (Mines) Regulation. Those regulations specify circumstances when control measures must be reviewed and if necessary revised. These circumstances include if:

- the control measure no longer controls the risk (for example, if monitoring or an incident indicates the control measure is not working)
- a change in the workplace is to occur that is likely to change the risks and the effectiveness of the control measure
- a new hazard or risk is identified
- a consultation under the WHS laws indicates a review is necessary
- a health and safety representative requests a review
- an audit of the effectiveness of the safety management system indicates that a control measure is deficient
- a recommendation from a health monitoring report indicates that a worker is required to be moved from a hazard or assigned to different work
- any incident occurs that requires the regulator to be notified.

A change in the workplace could include a change to:

- the workplace itself or the work environment
- the system of work or procedure (for example changes in technology used or changes in the nature of the task).

Health and safety representatives and safety and health representatives at coal mines, may request a review if they reasonably believe that any of the above circumstances have occurred, and control measures have not been adequately reviewed.

If you revise the principal hazard management plan, you must record the revisions in writing in the plan, including any revision of a risk assessment.

Visit resourcesandenergy.nsw.gov.au/safety for guidance on identifying and controlling hazards in the mining industry. The following information may be of assistance in managing the risks of principal hazards:

Codes of practice

- Managing the risk of falls at workplaces code of practice
- Confined spaces
- Excavation work
- How to manage work health and safety risks.

These and other codes of practice are available at SafeWork NSW

(www.safework.nsw.gov.au/law-and-policy/legislation-and-codes/codes-of-practice).

Other guidance

Information from the NSW Department of Industry [Resources and Energy website](#):

- [MDG 1032 Guideline for the prevention, early detection and suppression of fires in coal mines](#)
- [MDG 1006 Spontaneous Combustion Management Guideline](#)
- [MDG 29 Guideline for the management of diesel engine pollutants in underground environments](#)
- [MDG 33 Series of guides on winders](#)
- [MDG 28 Safety requirements for coal stockpiles and reclaim tunnels](#)
- Focus on airborne contaminants.
- Airborne contaminants fact sheet
- Diesel exhaust emissions fact sheet

Information from other sources:

- [Fire or explosion in underground mines and tunnels code of practice](#) – WorkSafe New Zealand
- [Traffic Management Guide](#) – Mining & Quarrying Occupational Health and Safety Committee (South Australia)
- Standards and other publications from the American Petroleum Institute. Over 200 are available to view online free of charge at publications.api.org, or they may be purchased for download and printing
- [Spontaneous combustion in open cut coal mines](#) – ACARP report C17006

- [Mining Topic: Spontaneous Combustion](#) – National Institute for Occupational Safety and Health (NIOSH)
- [Workplace traffic management guidance material](#) available from Safe Work Australia
- [Health and Safety at opencast mines, alluvial mines and quarries](#) – WorkSafe New Zealand
- [Air Quality: Managing Dust and Other Airborne Contaminants](#) – WorkSafe New Zealand draft code of practice.

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