



**NSW
Resources
Regulator**

GUIDE

Preparing a principal hazard management plan

Work Health and Safety (Mines and Petroleum Sites)
Regulation 2014

Document control

Published by NSW Resources Regulator

Title: Guideline: Preparing a principal hazard management plan

First published: December 2016

Authorised by: Chief Inspector

CM9 reference: PUB16/481/DOI

AMENDMENT SCHEDULE

Date	Version	Amendment
December 2016	1	First published
May 2018	2	Updated to reflect amendments made on 13 April 2018 to the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 to apply consultation and workers' safety role requirements to petroleum sites.
July 2019	2	Republished
January 2020	3	Document rewrite, update safety management system and critical control elements and performance standards.

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1. Introduction

This guideline gives operators of mines and petroleum sites a summary of their obligations to assist in preparing a principal hazard management plan (PHMP) under the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014.

Note: This guideline does not apply to underground small gemstone mines, opal mines or tourist mines.

2. What is a principal hazard?

The WHS (MPS) Regulation defines a principal hazard as an activity, process, procedure, plant, structure, substance, situation or other circumstance relating to mining operations that has a reasonable potential to result in multiple deaths in a single incident or a series of recurring incidents.¹

Principal hazards have been identified in legislation for special consideration because they are hazards that have the potential to cause an incident with very serious consequences, even when the likelihood of that incident occurring may be low.

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.

2.1. What is meant by a ‘reasonable potential’?

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

For example, natural seismic activity occurs in Australia but, in most cases, it would not constitute a principal hazard unless a mine is within a zone of significant influence and effect from that activity. However, mines where mining operations 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.

2.2. 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 continue to be exposed to the same hazard.

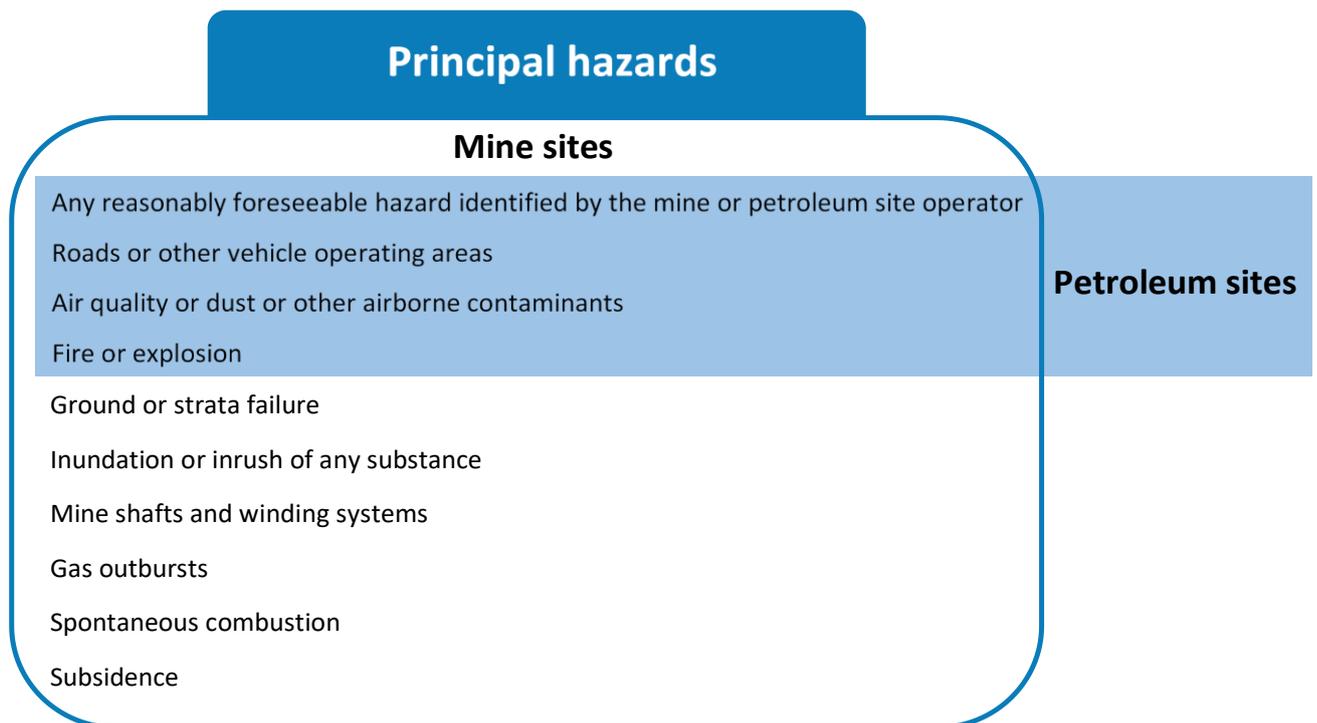
¹ clause 5 WHS (MPS) Regulation

Heavy and light vehicles interaction is an example of a recurring hazard. Sometimes only one or two workers are exposed to the interaction of heavy and light vehicles at any time but if the same work needs to be done on a recurring basis, this may give rise to a series of recurring incidents.

2.3. Specified principal hazards

The WHS(MPS) Regulation identifies nine specific hazards for mine sites and three specific hazards for petroleum sites as potential principal hazards, if the hazards exist at the site. These are shown in figure 1. These specified hazards are in addition to any other reasonably foreseeable hazard that mine operators 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



3. What is a principal hazard management plan?

A PHMP is a document that sets out how operators will manage risks to workers' health and safety associated with a principal hazard that has been identified at the mine or petroleum site. It forms part of the overall safety management system (SMS). For more information about SMSs see the [Safety management systems in mines](#) code of practice.

Operators must prepare a PHMP for each principal hazard that has been identified at the site. This not only includes those specified in the WHS (MPS) Regulation but also any hazards that operators have identified have a reasonable potential to result in multiple deaths in a single incident or a series of recurring incidents (as explained at 2.1 and 2.2).

A PHMP must detail how the operator will manage the risks associated with each identified principal hazard at the site and must be set out and expressed in a way that is easily understood by people who use it. Each PHMP must provide for compliance with any requirements of the work, health and safety laws that relate to the principal hazard.

A PHMP should contain a level of detail that is appropriate to the risks associated with the hazard.

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

Where a code of practice or guideline exists for a principal hazard, operators should also refer to those documents.

At the time of writing, the NSW Resources Regulator has published the following guidance materials for dealing with principal mining hazards:

- [Inundation and inrush hazard management](#) code of practice
- [Strata control in underground coal mines](#) code of practice
- [Mine shafts and winding systems](#) code of practice
- [Airborne contaminants](#) principal hazard management plan guide

3.1. What needs to be included in the PHMP?

Before writing the PHMP, operators should consider how the PHMP is to be prepared, implemented and integrated with other plans. The operator must ensure the development and review of the PHMP be undertaken by, or under the supervision of, a competent person². The preparation and review must also involve consultation with relevant workers and their representatives.

Before a PHMP is prepared, operators should consider the matters below:

- relevant information
- nature and complexity of the operation
- intended audience
- identification of the hazards
- existing plans and procedures or generic documentation
- any legacy monitoring data.

Operators must eliminate risks to health and safety, so far as reasonably practicable.

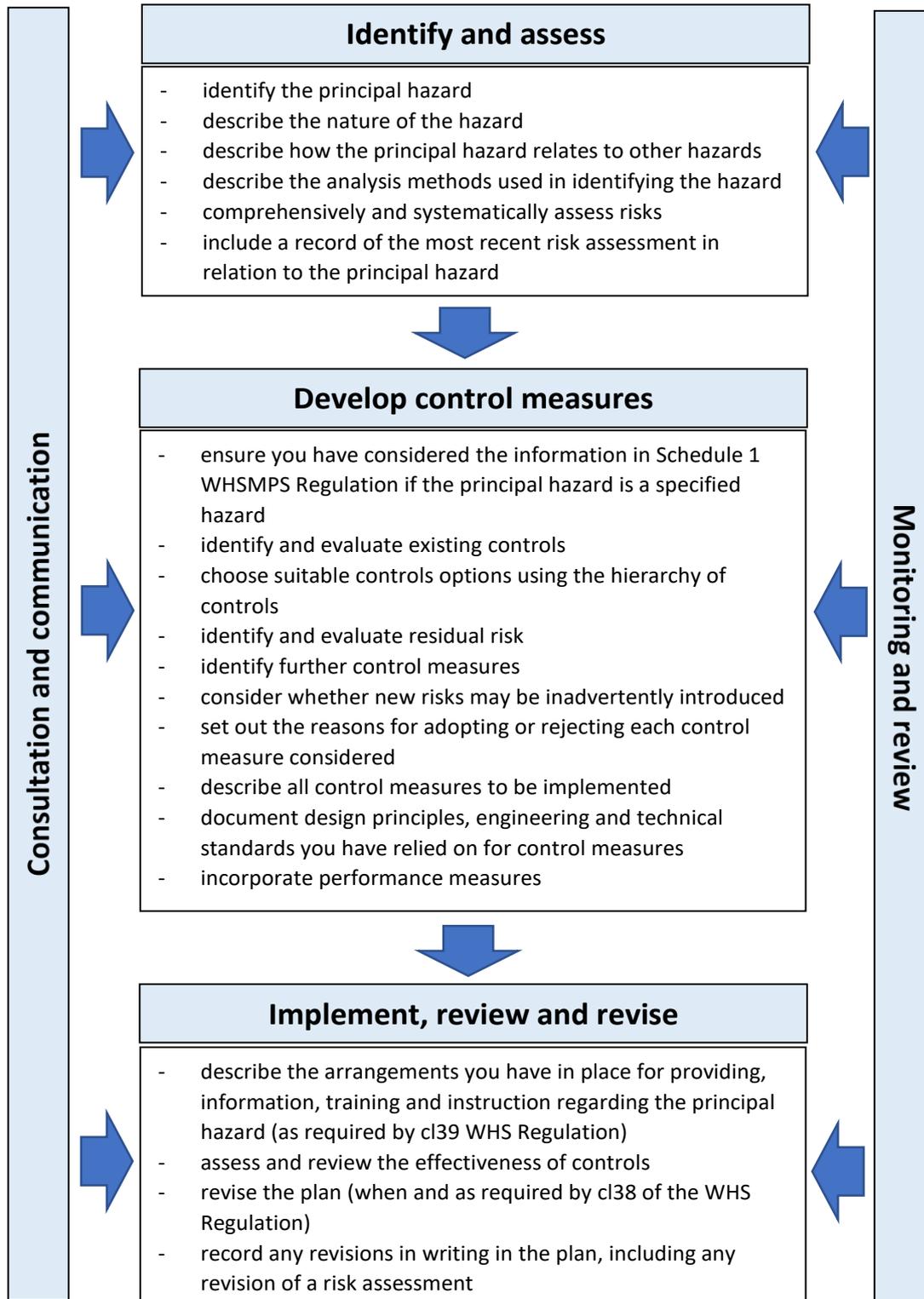
The PHMP must:

- identify and describe the hazard at the mine or petroleum operation
- assess the risks of health and safety to workers from the hazard
- describe the control measures required to manage the risks associated with the hazard.

Clause 24 of the WHS (MPS) Regulation provides for matters to be considered in the preparation of the PHMP. Figure 2 provides an overview of what should be addressed in preparing the PHMP.

² a person who has acquired through training, qualification or experience the knowledge and skills to carry out the tasks (clause 5 WHS Reg)

Figure 2 Overview of what to address in preparing the PHMP



3.2. Interaction with other plans

All mine and petroleum site operations must have a SMS. A PHMP is an essential part of that system.

The PHMP must:

- be developed, documented, implemented and maintained in accordance with the SMS
- interact with other PHMPs and principal control plans (PCPs)
- be easily understood and used by all workers
- provide for engagement with workers when preparing and reviewing the PHMP
- provide consistent advice (i.e. ensure that information is consistent across all management plans).

Figure 3 Safety management system elements



3.3. Does the PHMP need to be documented?

The PHMP must be documented and expressed in a way that can be readily understood by the people who use it. This may require technical content for certain workers and non-technical content for others.

PHMP documentation should be version controlled. The document may be kept in an electronic or paper form, or combination of both, however the most up-to-date version must be easily accessible to all workers.

3.4. What consultation is required?

Operators have a duty to consult with workers at the site in relation to developing, implementing and reviewing the site's SMS and when conducting risk assessments for PHMPs.³

The WHS (MPS) Regulation states that operators must implement a safety role for their workers that enables them to contribute when:

- identifying principal hazards relevant to the work they will be carrying out
- considering control measures for risks associated with a principal hazard
- considering control measures for risks to be managed under principal control plans
- reviewing PHMPs.

Operators must also consult with health and safety representatives and/or health and safety committees where applicable. In the case of a coal mine, the site safety and health representative (SSHR) and the industry safety and health representative (ISHR) must also be consulted.

General guidance on the duty to consult under the WHS Act can be found in the *NSW code of practice: Work health and safety consultation, cooperation and coordination* (SafeWork Australia) and for mines specifically, the *NSW code of practice: Safety management systems in mines*.

³ clause 121 WHSMPS Regulation

4. Identifying hazards

In identifying principal hazards, an operator should consider the principal hazard individually and in combination with other hazards, in case there are interactions between them.

Hazard identification is usually a qualitative process undertaken by a group of skilled and experienced people with knowledge of the operation or activities being undertaken. Those who will be exposed to the hazards can make a valuable contribution to identifying the hazards.

There are several ways to identify hazards at a mine or petroleum site. These may include:

- consulting with workers
- incident investigations
- workplace inspections and observations
- safety committee recommendations
- workers' complaints/suggestions
- historical safety records
- safety audits.

While the most common principal hazards at mines or petroleum sites have been specified in the WHS (MPS) Regulation, there may be other hazards at the 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 may include:

- working at heights
- working in confined spaces
- a 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.

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, the hazard should be identified as a principal hazard and a PHMP must be prepared.

4.1. How to assess risks

Once a principal hazard has been identified, an operator must use appropriate risk assessment methods to investigate and analyse each principal hazard before developing the PHMP. 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.

Each risk assessment must involve a 'comprehensive' and 'systematic' investigation and analysis. 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.

4.1.1. Competent persons

Each of the individuals should have knowledge and experience in the hazard itself and the risk assessment techniques that are to be used to assess the risk. The PHMP should identify the competence of individuals who will participate in the risk assessment for a principal hazard.

4.1.2. Risk assessment techniques

Operators can use a range of processes and techniques for identifying and 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 sequences of events), and layers of protection analysis. In some instances, operators 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 used in many industries. The following guidance may provide further information:

- [National Minerals Industry Safety and Health Risk Assessment Guideline](#)
- www.riskgate.org. This website 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 other extractives operations.
- Guide: [Managing risks in mining](#)
- Guide: [Managing risks in petroleum operations](#)

- SafeWork NSW code of practice: [How to manage work health and safety risks](#)

4.1.3. 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. The process chosen for a principal hazard should be logical, comprehensive, systematic and repeatable to ensure it is to effective.

Some questions operators should ask when selecting a process for their site 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 help us understand the hazard and select the risk control measures?
- Is it capable of assessing cumulative risk?
- Is it capable of assessing the effect of risk reduction measures implemented to manage another risk?
- 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 appropriate workers are consulted and actively involved in the assessment?
- Does it identify and address uncertainties?
- Is it consistent with the safety policy and the SMS?
- Can it document all methods, results, assumptions and data?
- Can it be used for continuous improvement?

Operators 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 PHMP)
- 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 minimised so far as is reasonably practicable.

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

5. Control measures

Operators should ensure that control measures identified in risk assessments are clearly defined to ensure that they are measurable and auditable, and to ensure that their intent or specification is clearly documented in the PHMP.

Tip: ensure that the PHMP clearly refers to the identified hazard.

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 control measures to manage 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.

5.1. Controlling risks

There are many ways to control risks. Some control measures are more effective than others. You must consider the various control options using the hierarchy of controls and select the control that most effectively eliminates the risk 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.

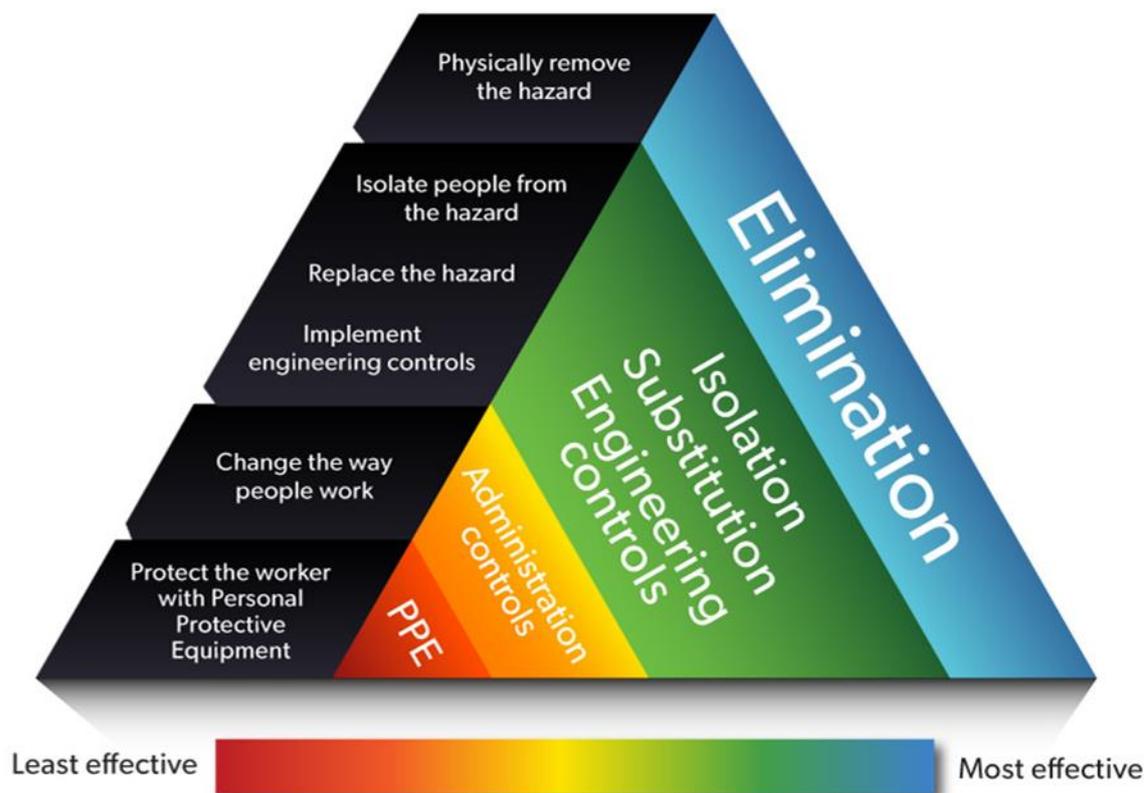
The most effective control measure involves eliminating the hazard. This will then eliminate any associated risk. This may initially involve additional costs but have productivity benefits, as well as safety benefits, that should be considered.

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.

5.2. The hierarchy of controls

Where it is not reasonably practicable to eliminate a hazard, you must apply the hierarchy of risk controls⁴ (figure 4) 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 operators to work through this hierarchy when managing risks.

Figure 4 The hierarchy of controls showing the highest to lowest level of protection



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

⁴ clause 36 WHS Regulation

5.3. Inadvertently introducing new hazards

Sometimes introducing new control measures can introduce new hazards or risk. For example, if you are a mine operator and decide to use a remote-controlled device to eliminate certain manual handling risks, you should consider whether you are introducing additional risks with greater consequences because of the use of the remote-controlled plant. The introduction of 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 is important to repeat hazard identification and assessment processes when you are selecting control measures.

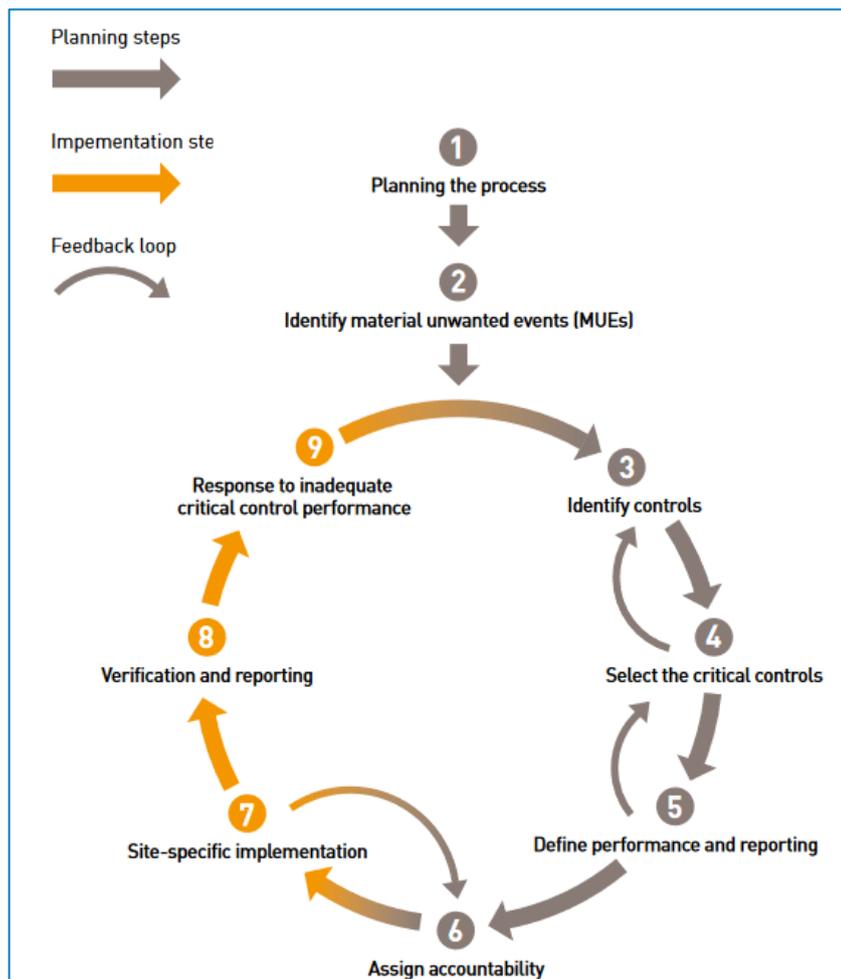
The guidance materials referred to above at 4.1.2 will also provide information on controlling risks.

5.4. Measuring the effectiveness of controls

A critical control is a control that is crucial to preventing an event, or mitigating the consequences of an event, such that its absence or failure would significantly increase the risk despite the existence of the other controls. They are considered important enough to warrant additional monitoring and reporting to ensure they are implemented and maintained to high levels of effectiveness.

The nine-step framework (developed by the International Council on Mining and Metals) may assist operators to drive the [critical control management](#) (CCM) process, which is shown in figure 5. The first six steps cover the planning phase of the CCM process. This helps to identify the critical controls needed to prevent fatalities and defines performance and assurance criteria for the critical controls. The final three steps address implementation, verification and reporting to achieve critical control effectiveness.

Figure 5 ICMM's Critical Control Management process



It is imperative that control checklists are compiled to enable a site to validate that a control has been properly implemented and is functioning as designed. These checks must be carried out at a sufficient frequency to ensure the controls are remaining effective.

6. Performance standards and audit

As part of the SMS, a PHMP needs to continue to be effective, relevant and compliant to the legislation.

Clauses 13-17 of the WHS (MPS) Regulation sets out the requirements for the establishment, implementation, monitoring and review of the SMS and must include:

- (a) performance standards for measuring the effectiveness of all aspects of the SMS that:
 - (i) are sufficiently detailed to show how the operator will ensure the effectiveness of the SMS,
 - and

- (ii) include steps to be taken to continually improve the safety management system
- (b) the way in which the performance standards are to be met
- (c) a system for auditing the effectiveness of the SMS for the mine or petroleum site against the performance standards, including the methods, frequency and results of the audit process.

6.1. Performance standards

Performance standards provide a reference comparison designed to enable operators to determine how effective the planning, execution and implementation of the mine or petroleum site's PHMP risk management approach is, and, continues to be.

Risks covered in the PHMP must be controlled to as low as is reasonably practicable.

An example of a performance measure is where there is an exposure standard that must not be exceeded. This is essentially a performance standard that pertains to personal exposure monitoring and health monitoring of workers.

When preparing a PHMP, operators should include triggers for shutdown, review or investigation and ensure that any actions required for absent or ineffective control measures are documented.

6.2. Use of trigger action response plans

A trigger action response plan (TARP) is an integral part of a PHMP that provides guidance on the actions to be taken by workers when a change in mine or petroleum site conditions occur that are no longer considered normal.

However, a TARP should be put in place only after a risk assessment has verified the selection of the most effective control measures in relation to the hazard.

For a TARP to be applied effectively it should:

- consider actions to be taken at specified levels of risk, relative to the risk posed by the hazard
- be simple and robust to ensure immediate actions are understood and able to be implemented by workers
- consider the workers and equipment required to implement actions.

6.3. Auditing the PHMP

Competent people should undertake audits of the PHMP on a regular basis. Operators should consider both internal and external audit programs. Audits need to examine the adequacy, implementation and compliance with the PHMP.

The areas that may be audited include:

- hazard identification and risk assessment
- compliance with occupational exposure limits and biological indices
- results of personal exposure monitoring
- results of health monitoring
- quality and supply of consumables.

The final audit report needs to include the findings of the audit, recommendations and the actions that will be taken to correct the issues raised. The person(s) responsible for implementing the corrections should be stated in the audit report.

Records of the audit of the PHMP must be kept in accordance with requirements of the SMS. Records should be made available to worker representatives.

For further guidance on performance measures, reviews and audits refer to Chapter 5 of the [Safety management systems in mines](#) code of practice.

7. Review

7.1. Reviewing the PHMP

Operators must review the PHMP at least once every three years (clause 17 of the WHS (MPS) Regulation) or after an incident or other circumstance as outlined in clause 10 of the WHS (MPS) Regulation.

The review determines whether the controls continue to be suitable, consistent with current good practice and effective in managing the risks associated with the principal hazard.

The PHMP must also be reviewed and revised, as necessary after:

- the control measures no longer control the risk (e.g. if monitoring or an incident indicates the control measure is not working)

- a change in the workplace occurs (this could include the workplace itself or the work environment or changes to the system of work or procedures)
- a new hazard or risk is identified
- a consultation under the WHS laws indicates a review is necessary
- the occurrence of any event specified in the PHMP as requiring a review of the PHMP
- an audit of the SMS indicates a control measure is deficient
- if requested by a health and safety representative for workers at the workplace if they believe it affects or may affect the health and safety of a member of the work group (clause 38(4) of the WHS Regulation)
- any incident occurs that requires the NSW Resources Regulator to be notified.

When reviewing the PHMP, the risk assessment used and referred to in the PHMP should be reviewed first. There may be new risks that need controls, or existing risks that have changed, requiring controls to be changed, or new methods to control a risk.

During the review, the operator needs to consider any other relevant information gathered during:

- routine risk appraisals and assessments
- monitoring and results of inspections by the operator or the Regulator
- a review of TARPs
- investigations of incidents or near misses
- feedback from workers, ISHRs or other health and safety representatives.

The PHMP and supporting documents might need to be revised and reissued after the review. Make sure that workers are informed about any updated documents and are trained or retrained when required. New employees will be inducted and trained in the risks and controls implemented by the operator.

Operators must keep records relating to the review and revision of the PHMP in writing in the PHMP (clause 25 WHS(MPS) Regulation).

8. Further information

Visit the Regulator's website for guidance on identifying and controlling hazards in the mining and petroleum industry.

www.resourcesregulator.nsw.gov.au

The following websites contain information:

- Codes of practice at [SafeWork NSW](#)
- International Council of Mining and Metals www.icmm.com/en-gb/health-and-safety/safety
- The National Institute for Occupational Health and Safety (NIOSH) www.cdc.gov/niosh/mining/index.html.