# Risk Management

## PURPOSE

U.S. mining has improved overall safety performance as reflected in injury statistics, but continues to experience high severity events that seem resistant to both regulatory and company-specific intervention. The human tragedy has produced enormous suffering for the affected families and the entire mining community.

The persistence of high severity events suggests a new approach—rooted in safety management systems—is needed in order to have different mine safety outcomes. The backbone of this effort is the risk management process, which identifies risks associated with specific mining activities and ways to proactively mitigate those risks to prevent injuries and fatalities. The risk management process has been used by other industries and mining in other countries to successfully improve safety and health performance.

**The following is a broad outline of the risk management process and its components.**

## THE RISK MANAGEMENT PROCESS

Risk management is the term that describes the coordinated activities an organization uses to assess and control risk. The process of risk management involves a series of logical steps:

- Risk identification
- Risk analysis and assessment
- Selection and implementation of the appropriate risk posture and tactics
- Monitoring and review of the ”controlled” risks.

The term “risk” is often confused with hazard, so it is important to recognize they are not interchangeable. Hazard is defined as a source of potential harm, injury or detriment. Risk is defined as exposure to the consequences of uncertainty. It has two dimensions: the likelihood of something happening, and the consequences if it were to happen.

There are several steps to the risk assessment process. Each step is critical to the success of the effort, and management teams should assure adequate resources and time to give credibility to the outcomes. Risk management can be used at four levels: the entire operation, a specific process or installation, a task or set of job tasks, and the last level—personal risk assessment, e.g., SLAM, Take 5, etc.

The risk assessment process:

- Sets clear direction to solve specific at-risk problems
- Focuses on priority concerns(hazards and risks)
- Gains commitment from a cross-section of the facility’s work force through their active participation in the process

(CONT.)

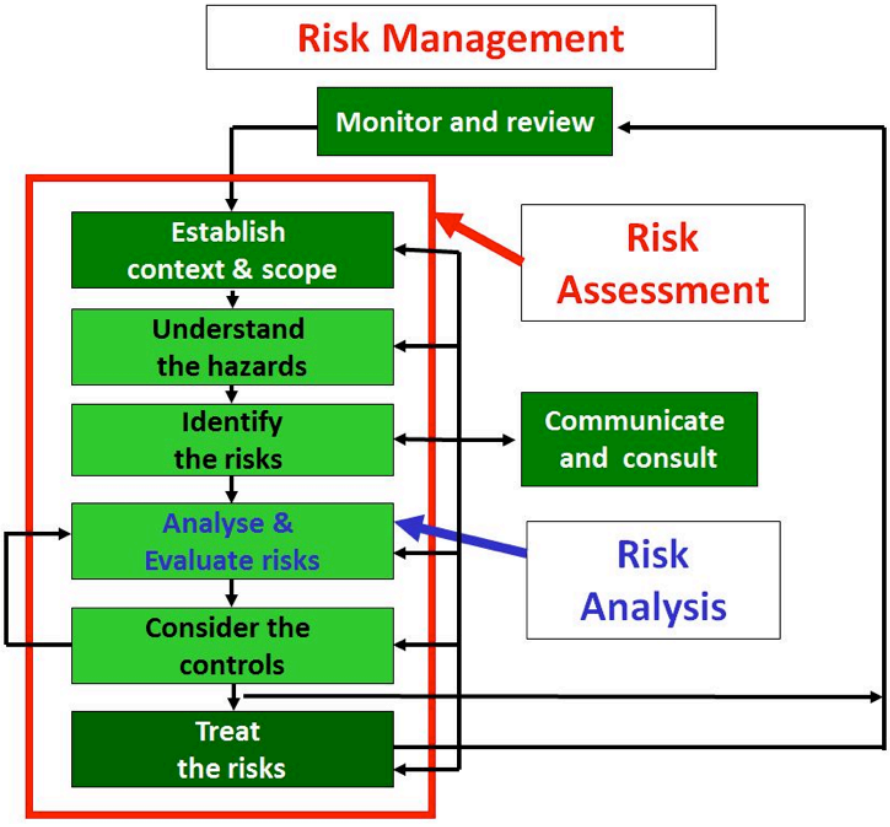
**The risk assessment process: (cont.)**

- Decreases potential losses for operations
- Helps build teams to solve major problems and improve the safety culture
- Goes beyond simply complying with existing standards and regulations

The challenges to the process are:

- The focus is on changing the existing way the operation conducts business and alters its priorities
- It takes time away from activities directly related to production
- It uses an operation's "best people"
- There is an initial cost to implement new prevention controls and recovery measures
- It is inconsistent with a strict regulatory compliance approach

This flow chart represents the entire spectrum of the risk management process. It includes establishing the context and scope under which the operation is to conduct its business, the actual risk assessment and risk analysis, the development of an action plan to treat the risks and an audit function to assure the process is properly implemented and addresses the hazard.



## Establish context & scope ↓

The risk assessment design or scope is best defined prior to the exercise. Hazards to be discussed, decisions on risk assessment team membership, and time allotment for the activity are best addressed with a scoping document. This document provides an opportunity to break down the process into reviewable parts and define goals.

A fundamental element of risk management is the risk assessment team. For major hazards, e.g., new mine, new development in an existing mine, new equipment, new mine process, etc. that tend to be complex, a full team of people is justified. However, for the small operator, the risk management process must be scalable. When a team is formed, it must include an appropriate cross-section of knowledgeable persons familiar with the hazards to be investigated. The team must be capable of identifying all relevant hazards, unwanted events and possible controls.

The facilitator is responsible for following a quality risk assessment process designed to meet the risk assessment scope and is responsible for making sure the team and the process remain focused on a quality output. The facilitator can be internal or external to the company, but must be someone with the appropriate qualifications, knowledge and experience. It is also important to consider non-management/labor entities for team participation. Miners responsible for performing tasks that are part of the work processes under review can validate information and provide insight, perspective and ideas that are invaluable to a quality output. These team members are also helpful in communicating adherence to existing prevention controls and recovery measures and in embracing changes brought about by the application of new ideas.

## Understand the hazard ↓

The first step is to identify all relevant hazards or possible problems that could lead to a potential event. If the list is incomplete, the risk assessment will be inadequate. There are many tools to help compile the list, including input from workers and managers, injury records, worker's compensation records, near miss reports, process flow diagrams, brainstorming and hazard identification. Risk assessment processes such as hazard and operability studies (HAZOP), fault tree analysis (FTA) and bow tie analysis (BTA) can also be effective.

The types of hazard that should be identified are best thought of as uncontrolled releases of energy that have the potential to cause significant harm. Energy that is not completely controlled leads to some level of risk, depending on the likelihood of release and the consequences should the energy be released. When the unwanted release occurs, it can cause serious injuries.

## Identify the risk ➔ Analyse & Evaluate risks ↓

After a comprehensive list of hazards is identified and characterized, a broad-brush risk assessment tool is used to rank the potential unwanted events. Depending on the topic, the individual hazards should be broken down using a process mapping technique or by the geographic location within the operation. For each step in the work process or for each geographic location within the operation, a likelihood of occurrence and a consequence for each potential hazard are determined. Below is a generalized risk ranking matrix.

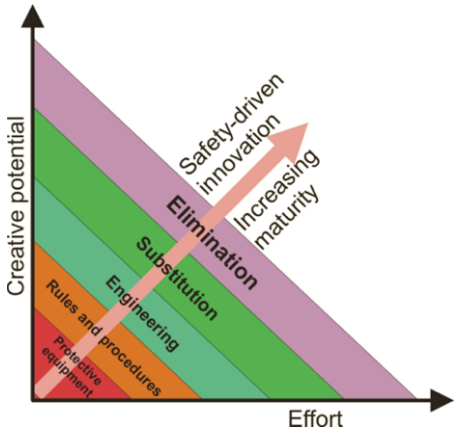
| Likelihood | Consequence | | | | |
|---|---|---|---|---|---|
| | 1 Catastrophic | 2 Major | 3 Moderate | 4 Minor | 5 Insignificant |
| A Certain | Extreme | Extreme | Extreme | High | High |
| B Likely | Extreme | Extreme | High | High | Medium |
| C Possible | Extreme | Extreme | High | Medium | Low |
| D Unlikely | Extreme | High | Medium | Low | Low |
| A Rare | High | Medium | Medium | Low | Low |

## Consider the controls ↓

Additional risk assessment tools are used to help determine what prevention controls and recovery measures are currently being used. The same process that identifies existing prevention controls and recovery measures is used to identify new prevention controls and recovery measures. When a hazard is eliminated, the risks associated with the hazard are also eliminated. This should always be the first action of the risk assessment team – to investigate how to eliminate the hazard. However, this is usually difficult to do, since a hazard can owe its origin to many different factors. If it is not possible to eliminate the hazard, attempts must be made to mitigate the potential effects of the hazard.

Mitigation consists of actions to minimize the hazard, most often with engineering methods, or to use physical barriers capable of separating the hazard from the worker or the work process. Warning devices are often used to assess the performance of engineering controls, and physical barriers are used to prompt a change in administrative or work processes.

Controls that are largely focused on operational and work processes include procedures and personnel skills and training. Procedures can often rely on the personnel skills and training of the worker. Reliance on worker behavior increases the potential for human error and reduces the effectiveness of the risk reduction control when compared to mitigation efforts.



This Consideration of controls is a crucial step, since it potentially produces a list of actions to be investigated that are capable of further risk reductions at a site. It is important for management to consider the merits of each new idea suggested by the risk assessment team. At the end of this step, a detailed list of all prevention controls and recovery measures for the hazard in question are documented so they can be monitored and audited on some regular basis.

## Treat the risk ➔

The important output of the risk assessment team is the list of existing and new controls. Assessing the quality of this output can only be accomplished when the effectiveness of these controls is understood. The team should be cautious of an over-reliance on warning devices that require manual readings, administrative procedures, and the personnel skills and training of the work force. In general, treatments should strive to go beyond the standards and regulations for mining.

## Monitor and review ↓↑

A re-assessment of the site's hazards and an evaluation of the implemented risk mitigation program should be done on a regular basis by skilled and experienced personnel. This can be accomplished at three levels:

- A site assessing its own controls using its own people (1st party)
- A site assessing its own controls using someone from the outside (2nd party)
- Site controls are assessed by an external entity (3rd party).

An audit and review should, at minimum, determine the status of the risk management plan and make recommendations for improving potential deficiencies in the plan. Tools, such as a risk checklist, are sometimes used to help with auditing and reviewing important controls at a mining operation. Once a risk mitigation program has been implemented, the change management procedure should be followed to ensure any new changes made to the operation don't introduce new hazards, alter existing risk or negatively affect controls.

## SUMMARY

The risk management process is a comprehensive method to identify, rank, and mitigate employee and community exposure to risks associated with the mining process. It must be scalable to all sizes and stages of mining operations and to every level of sophistication in the safety continuum.

This is an introduction to the process. Additional resources are available in the CORESafety resource section. Like any new tool, using risk management takes time and patience, but can be a game-changer in terms of the degree of control and the positive impact on a company's safety culture and performance.