CDC
Workplace Safety and Health

Focus on Prevention

Conducting a Hazard Risk Assessment

Risk Analysis

Probability			
High			
Medium			
Low			
	Low	Medium	High
	Severity		

Department of Health and Human Services
Centers for Disease Control and Prevention
National institute for Occupational Safety and Health

NIOSH

Focus on Prevention:
Conducting a Hazard Risk Assessment

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July 2003

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Focus on Prevention: Conducting a Hazard Risk Assessment

Overview: The first step to emergency preparedness and maintaining a safe workplace is defining and analyzing hazards. Although all hazards should be addressed, resource limitations usually do not allow this to happen at one time. Risk assessment can be used to establish priorities so that the most dangerous situations are addressed first and those least likely to occur and least likely to cause major problems can be considered later.

Purpose: This training package was developed to assist instructors as they (1) determine how to use risk assessment to improve safety preparedness and (2) present risk assessment concepts and tools to trainees. The concepts and tools presented here can be applied to any mine hazard.

Audience: Information in this package is appropriate for workers from all types of mines. A risk analysis can be conducted by anyone familiar with the location being studied.

Why Conduct a Hazard Risk Assessment?

During a risk assessment, hazards are evaluated in terms of the likelihood that a problem may occur and the damage it would cause if such an event did occur. Adequate mine safety and emergency preparedness requires considering all of the possible hazards that could be encountered. Some hazards, however, are more likely to cause problems than others at a given mine and some would result in greater damage than would others. These differences are identified by conducting a risk analysis. The outcome of the analysis can be used to target resources at the types of events that are most likely to occur and/or are most destructive. Emergency situations that are very likely to happen and would do considerable damage to people and property should be targeted for immediate remediation and/or plans should be made for effective response if remediation isn't possible. Potential situations that are less likely or that would have less severe consequences are identified for attention after the more serious hazards have been addressed.

What is the First Step?

Step 1: Choose the group who will conduct the analysis.

The people involved in this activity should be knowledgeable about the area of the mine that is being assessed. Groups you may want to include might be emergency response teams, mine examiners, safety committee representatives, safety professionals, supervisors, and/or maintenance personnel. Another possibility is to have work crews from each area conduct the analysis. If you have many people conducting analyses, be sure to assign people to areas that they know well. You can then combine the findings from various sources for a detailed mine site analysis.

What work areas should be considered?

Step 2: Define the geographic area to be included.

Some examples of areas that could be selected for analysis include: a working area underground, maintenance and repair areas, mineral preparation and processing plants, the pit, or all mine property.

If a large area is selected, it is best to subdivide it into smaller parts and then later combine the results. One way to choose the areas to be included is to ask the group where they think hazards would cause the most problems. Conduct an analysis of each "problem" area they identify. Combining these results will provide information about the hazards in the larger area.

What Should Be Included in the Analysis?

Step 3: Identify all of the possible hazards that exist in the area selected for study.

One way to accomplish this is to start by determining all of the sources of hazards in the study area. The attached form called "Potential Hazards" can help organize the sources. Across the top of the form are labels for general types of hazards, such as transportation and electrical. Under each general label, trainees should list all of the specific sources of hazards of this type that can be found in the geographic area being analyzed. For example under the label *electrical,* items such as power substations or conveyor drive motors might be listed. Under *transportation*, someone might identify sources such as haul truck accidents. The items should be as specific as possible. A blank "Potential Hazards" is included should you choose to write in other hazard categories.

How Are Hazards Analyzed?

Step 4: Evaluate the risks.

While there might be many ways of assessing risk, literature suggests using the two concepts of probability of occurrence and severity of effects [DeVaul 1992; Hau 1993]. For each hazard identified in Step 3, a judgment needs to be made about the probability of a hazard resulting in an emergency event and the severity of the consequences if the situation did happen.

The attached "Hazard Risk Matrix" can be used to record a risk rating for each hazard in the terms high, medium, and low. To use the assessment several concepts must be understood.

Hazard – Any situation that has potential to cause damage. (Take these from the "Potential Hazards" form.)

Probability – Likelihood that the particular hazard will result in damage at this location.

Severity – An estimation of how serious the potential problem might be in terms of harm to people and/or damage to property.

It should be kept in mind that secondary incidents can occur as a result of the initial incident. For example, a small fire on the surface at an underground coal mine may cause electric power interruption to one mine fan in a multiple fan ventilation system. This may, in turn, cause major changes in ventilation

underground and result in accumulations of methane in areas of the mine where it commonly is not found. An explosion hazard would now exist. Secondary incidents should also be considered during the rating process.

In summary, to assess risk: (a) identify potential hazards; (b) determine whether the probability is high, medium, or low that the source will actually cause damage; and (c) determine if the seriousness to life, property, and the environment of such a hazard would be high, medium, or low.

What Is Done With the Results?

Step 5: Use the hazard ratings during resource allocation.

Using this model, those hazards that would lead to situations with the greatest probability for occurring and the greatest severity to the operation would be considered as high/high-risk hazards. They would be the first priority for future training, mitigation, and/or response preparation efforts.

One way to organize your findings is to first take all of the completed "Hazard Risk Matrix" forms and order them from high/high-risk to low/low-risk. Put the ordered forms in a notebook. As a hazard is addressed, the corresponding form can be moved to the back of the notebook and the focus can turn to the hazard on the next page. When you have worked through the entire book, you will have looked at all of the identified hazards.

What Happens When You Are Finished?

Step 6: The task of risk assessment is an ongoing activity. Any time the work environment changes, the risk assessment will need to be updated and the priorities reevaluated. Your risk assessment will be most useful to you if you never consider it finished. Instead, always think of it as a draft document that needs to be updated as things change.

Sources for More Information

DeVaul RE [1992]. Emergency response plan formulation and implementation. In: Proceedings of the 23rd Annual Institute on Mining Health, Safety and Research. Blacksburg, VA: Virginia Polytechnic Institute and State University, pp. 67-74.

Hau ML [1993]. Coordinating your facility's emergency response. Port Clinton, OH: M. L. Hau and Assoc., Inc., pp. 1-17.

Potential Hazards

Planned	Nature	Transportation	Electrical	Geological	Other
ex: welding	ex: winter storm	ex: haul truck accident	ex: power centers/ transformers	ex: rock slide	ex: fire

1. Mine Section or Area _____

2. Date _____

Hazard Risk Matrix

1. Hazard: _____

2. Potential Location(s): _____

_____

_____

_____

RISK ANALYSIS				
Probability	**HIGH**			
	MEDIUM			
	LOW			
		LOW	**MEDIUM**	**HIGH**
		Severity		

NOTES:

3. Mine Section or Area _____

4. Date _____

Potential Hazards
Blank Sheet

1. Mine Section or Area _____

2. Date _____

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DHHS (NIOSH) Publication No. 2003-139