

Mine Rescue Handbook

Emergency Response Procedures, Practices and Responsibilities

Preface

In the aftermath of the tragic underground coal mine disasters that occurred in early 2006, the U.S. coal industry, under the auspices of the Bituminous Coal Operators' Association and the National Mining Association and in conjunction with representatives of the U.S. Department of Labor's Mine Safety and Health Administration and the U.S. Department of Health and Human Services' National Institute for Occupational Safety and Health, initiated a review of existing mine rescue procedures to determine if existing practices and protocols remain operative given the structural changes that have occurred across the industry.

The multi-faceted review process culminated in the development of the following generic mine rescue handbook, which can serve as a guide for those developing mine rescue protocols and procedures as well as a review tool for those who have established procedures in place.

The industry extends its thanks and sincere appreciation to the following dedicated mine safety professionals, whose cumulative years of safety experience and commitment to the safety and health of miners has resulted in the development of a recommended mine rescue organizational structure that should culminate in the expeditious delivery of mine rescue services, should that become necessary:

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It is the industry's sincere hope that the continued adoption of enhanced safety practices in companies' operating procedures, coupled with the safety benefits derived from today's generation of new mining equipment, will significantly reduce, if not entirely eliminate, the necessity for mine rescue services. In the event that such services are required, this handbook can serve as a pre-event planning template that will expedite the delivery of mine rescue services in an efficient, effective manner.

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Command Center

- I. **Organization**
- II. **Function**
- III. **Resource Needs**
- IV. **Recommendations**

Command Center needs to be based on:

- A. Initial/Immediate and;
- B. Extended work/projects

I. **Organization**

Secure the Command Center

- Physically secure the area.
- Law enforcement should be contacted for assistance, if needed.
- Secure communications flow.
- Keep information in command center.
- Communications to and from the command center must remain protected from outside monitoring.
- Restrict personal outside calls (cell phones will be prohibited in the command center).
- Restrict phone/speaker system/access except to persons designated by the command center to receive information.
- Command Center should be isolated from outside interference (i.e. political visitors should be limited/restricted and referred to Multifunctional Centers).

Limit the number of persons in a Command Center

The following titles are recommended to be present in the Command Center. It is recommended that only one representative for each title is allowed in the working Command Center. The person representing the individual groups will have the latitude to ask for assistance when and if needed to make a decision. The consensus, however, is to reduce the number of Command Center personnel to the absolute minimum necessary to meet the needs of the event.

- Command Center Communications Person – (1)
 - Should be experienced
 - Should be undisturbed
 - Should talk directly to the working teams
 - Facilitate information flow to others in the Command Center
- State Inspections Representatives – (1)
- MSHA Representatives – (1)
- UMWA/Miner's Rep. – (1)
- Mine Rescue Team Trainer (Communications Person) (of working teams underground) – (1)
- Company Representatives – (1)
- Recorder – (1)
 - Notes should be taken verbatim of what is said (not paraphrased)

Command Center

Communication issues

- Designate the primary underground communications system to be used by Mine Rescue Teams and Fresh Air Base (FAB).
- Identify backup communications available during the emergency.
- Designate Command Center phone number for the teams and FAB. Designate an outside line for Command Center use only, which is routed through the Activity Center. (number of phone lines is not an issue – control of information is).
- Control entrance and exit of Command Center personnel. Leaving Command Center creates confusion.
- Designate an individual who will communicate from the Command Center to the Activities Center.

Scheduling Recommendations

In the initial phase of a mine emergency there is a need for knowledgeable personnel available at the mine site. Until adequately staffed, or until the initial phase of the emergency is under control, these decision makers should be limited to one 12 hour shift per day. To insure the continuance of appropriate decision making, the Command Center has a goal to establish its rotation schedule (i.e. eight to nine hour rotation schedule) within the first twenty-four hours of the emergency.

- Schedule Command Center team rotations (i.e. A, B, C). (Template would be useful).
- Shifts suggested were from eight to 12, depending on number of persons available and their level of training.
- Within 24 hours of the emergency, develop and post a Command Center shift rotation schedule.

Shift rotation schedules facilitate progress and prevent Command Center personnel from becoming fatigued. Command Center rotations should also be designed with a one hour overlap for transferring information from one shift to another. During shift transition, Command Center personnel should be exchanged one at a time. All Command Center personnel should not be engaged in briefing/exchanging activities at the same time. They should be staggered to ensure that information being received from the teams is not overlooked or compromised.

Shift hours

Command Center: 8-9 hour shift with an hour overlap for communication with replacement before and after shift.

Mine Rescue Teams: If resources permit, 8-9 hours shift with an hour overlap for communication, briefing and debriefing. Teams need to be assured that they are provided with enough rest to resume activities during their next scheduled shift.

Comments:

Stress and fatigue are key issues affecting mine rescue teams and Command Center personnel influencing concentration, decision-making, and physical abilities. Appropriate scheduling can facilitate the best results in these areas.

Command Center

Briefing before a mine rescue project followed by debriefing the team(s) after their shift adds value to the planning as well as providing psychological release for the team members. It is recommended that, when possible, the entire team is included in the briefings and debriefings rather than only the team captain or a couple of representatives from the team. Including everybody in this exchange of information can be invaluable to the success of the project.

Training

Pre-disaster training for command center personnel is important and highly recommended. Some suggested content includes:

- Command Center Protocol
- Judgment decision-making under stress
- Leadership in emergency situations
- Information and Communication (with mine rescue teams and with Activity Center) personnel
- Human behavior during stress (Flight or Fright)
- Critical Incident Stress Management
- Mine Emergency Response

II. Functions

- Consider Team Safety at all times.
- Coordinate and direct mine rescue activities.
- Coordinate and track team's underground activities. This includes continuous tracking and location of teams at all times.
- Maintain constant communications with fresh air base.
- Send and receive information as needed. Communicate clearly! Ensure accuracy of the information being sent or received. Accurate information from teams, fresh air base (FAB) and Command Center is required.
- Respond to needs of teams.
- Communicate with Activity Center on a regular basis.

Note: Due to the nature of the event, the following two bullets require a different approach or strategy.

- Coordinate the rescue of survivors and recovery of victims.
- Recovery of mine.

III. Resource Needs

- Mine map for Command Center communications person
- Develop visual support for mine maps to identify location of working teams (i.e. magnetic backing on map and icons to represent team locations) (Use of maps with entries numbered as A, B, C, etc. and crosscuts numbered as 1, 2, 3, etc. in a grid system would eliminate confusion when referring to mine locations during communications with team members and Activities Center personnel.) (Three methods were mentioned: Grid System, Spad Nos., and Block Nos.) (Place visual examples of these methods in final document)(Where possible interactive communications between the Command Center and Activities Center would be very useful, e.g. Barometric Readings, Gas Readings, Team

Command Center

Locations, etc.)

- Continuous update of maps for teams/projects
- Activities Center Committee will identify and supply resources to teams.

IV. Recommendations

- Prepare for communicating with multiple teams or FABs.
- FAB person(s) with experience.
- Backup communications system readily available.

Activities Center

I. Recommended Areas of Focus and Responsibilities

Activities Center

1. Evaluate information and communicate with the Command Center.
2. Insure proper record keeping of all activities.
3. Direct purchase/supply coordination.
4. Direct engineer support coordination.
5. Direct maintenance support coordination.
6. Direct gas analysis coordination.
7. Direct mine rescue-personnel coordination.
8. Direct Command Center liaison.

Communications

1. Ensure timely and accurate communication between the Command Center, Multifunctional Center and the Activities Center.
2. Coordinate all information shared with the Command Center and Multifunctional Center.

Recording/Mapping

1. Maintain confidentiality of operations within the Activities Center.
2. Serve as general secretary.
3. Collect and keep complete, accurate and permanent record of communications with the Command Center and Multifunctional Center.
4. Update mine map of any changes made by the mine rescue teams.
5. Track mine rescue team rotation.
6. Track bench rotation.

Mine Rescue-Personnel Coordination

1. Provide sufficient number of mine rescue teams to complete task at hand.
2. Schedule rotation of mine rescue teams to complete task at hand.
3. Provide adequate housing, meals and clothing for all mine rescue teams.
4. Provide necessary parts, supplies and support for mine rescue equipment.
5. Provide mine rescue expertise to assist emergency responders deal with unexpected events.
6. Oversee briefing and debriefing of mine rescue teams.
7. Provide mine rescue team's debriefing information, comments and suggestions to Activities Center Chief to assist the Command Center with the safe direction of the mine rescue teams and their activities.

Engineering Support Coordination

1. Provide engineering support services during emergency operations as requested by Center Chief.
2. Provide requested engineering maps and plans of mining systems to assist in emergency planning and decision making.

Activities Center

3. Update engineering plans as required as emergency operations unfold.
4. Provide engineering expertise to assist emergency responders deal with unexpected events.

Gas Analysis and Data Coordination

1. Provide gas analysis and data gathering during emergency operations as requested by the Activities Center Chief.
2. Provide necessary equipment for gas sampling, analysis and calibration and data analysis to complete task at hand.
3. Provide gas analysis and data gathering expertise to assist emergency responders deal with unexpected events.

Maintenance Support Coordination

1. Provide maintenance support services during emergency operations as requested by Center Chief.
2. Provide requested maintenance logs of mining equipment and systems to assist in emergency planning and decision making.
3. Update maintenance plans as required as emergency operations unfold.
4. Provide maintenance and repair expertise to assist emergency responders deal with unexpected events.

Purchasing Coordination

1. Ensure legal compliance with company purchasing policies.
2. Direct the distribution of supplies ordered.
3. Insure proper record keeping of all supplies ordered.
4. Direct the vendors on deliveries of supplies.
5. Direct all purchases.

II. Recommended Personnel and Responsibilities

Mine Rescue-Personnel Coordinator

Plans, directs and implements all facets of the Emergency Activities Center Mine Rescue-Manning Sub-group. Coordinates mine rescue-manning activities and needs of the Emergency Activities Center by interacting with the Activities Center Chief and the other Activities Center coordinators and directing any personnel assigned to the Mine Rescue-Manning Sub-group.

1. Provides mine rescue-manning services during emergency operations as requested by the Activities Center Chief.
2. Works with other Activity Center coordinators as needed to achieve Activity Center objectives.
3. Provides sufficient number of mine rescue teams to complete task at hand.
4. Schedules rotation of mine rescue teams to complete task at hand.
5. Provide adequate housing, meals and clothing for all mine rescue teams.
6. Provide necessary parts, supplies and support for mine rescue equipment.
7. Provides mine rescue expertise to assist emergency responders deal with unexpected events.

Activities Center

8. Provides mine rescue team's comments and suggestions to Activities Center Chief to assist the Command Center with the safe direction of the mine rescue teams and their activities.
9. Directs individuals assigned to the Mine Rescue-Manning Sub-group.
10. Reports findings of Mine Rescue-Manning Sub-group to Activities Center Chief

Purchasing Coordinator

Plans, directs and controls all facets of the purchasing process. Coordinates the needs of the recovery effort by directing personnel in the purchasing and distribution process.

1. Ensure legal compliance with company purchasing policies.
2. Direct the distribution of supplies ordered.
3. Insure proper record keeping of all supplies ordered.
4. Directs the vendors on deliveries of supplies.
5. Direct all purchases.

Recorder/Mapper

Collects information and keeps a complete, accurate and permanent record of all communications between the activities center, command center and multifunctional center.

1. Maintains confidentiality of inter-workings of the Activities Center.
2. Serve as general secretary.
3. Collects and keeps complete, accurate and permanent record of communications with the Command Center and Multifunctional Center.
4. Updates mine map of any changes made by the mine rescue teams.
5. Tracks mine rescue team rotation.
6. Tracks benchmen rotation.

Gas Analysis and Data Coordinator

Plans, directs and implements all facets of the Emergency Activities Center Gas Analysis and Data Sub-group. Coordinates gas analysis and data gathering activities and needs of the Emergency Activities Center by interacting with the Activities Center Chief and the other Activities Center coordinators and directing any personnel assigned to the Gas Analysis and Data Gathering Sub-group.

1. Provides gas analysis and data gathering services during emergency operations as requested by the Activities Center Chief.
2. Works with other Activity Center coordinators as needed to achieve Activity Center objectives.
3. Provides necessary equipment for gas sampling, analysis and calibration and data analysis to complete task at hand.
4. Provides gas analysis and data gathering expertise to assist emergency responders deal with unexpected events.
5. Directs individuals assigned to the Gas Analysis and Data Sub-group.
6. Reports findings of analysis of gas analysis and data gathering Sub-group to Activities Center Chief.

Activities Center

Activities Center Chief

Plans, directs and controls all facets of the Emergency Activities Center. Coordinates activities and needs of the Emergency Command Center by directing personnel in the Emergency Activities Center.

1. Ensure safe and legal compliance of activities of the Emergency Activities Center.
2. Evaluate information and communicate with the command center.
3. Insure proper record keeping of all activities.
4. Plan and coordinate Emergency Activities Center.
5. Direct purchase supply coordinator.
6. Direct engineer support coordinator.
7. Direct maintenance support coordinator.
8. Direct gas analysis coordinator.
9. Direct manning coordinator.
10. Direct command center liaison.

Maintenance Support Coordinator

Plans, directs and implements all facets of the Emergency Activities Center Maintenance Support Sub-group. Coordinates maintenance activities and needs of the Emergency Activities Center by interacting with the Center Chief and the other Activities Center coordinators and directing any personnel assigned to the Maintenance Support Sub-group.

1. Provides maintenance support services during emergency operations as requested by Center Chief.
2. Works with other Activity Center coordinators as needed to achieve Center objectives.
3. Provides requested maintenance logs of mining equipment and systems to assist in emergency planning and decision making.
4. Updates maintenance plans as required as emergency operations unfold.
5. Provides maintenance and repair expertise to assist emergency responders deal with unexpected events.
6. Directs individuals assigned to the Maintenance Support Sub-group.
7. Reports findings of Maintenance Support Sub-group to Center Chief.

Liaison Officer

Plans, directs and controls all facets of the communication between the Command Center, Multifunctional Center and the Emergency Activities Center.

1. Ensure timely and accurate communication between the Command Center, Multifunctional Center and the Activities Center.
2. Coordinate all information shared with the Command Center and Multifunctional Center.
3. Responsible for communications between Command Center, Multifunctional Center, and other parties.

Activities Center

Engineering Support Coordinator

Plans, directs and implements all facets of the Emergency Activities Center Engineering Support Sub-group. Coordinates engineering activities and needs of the Emergency Activities Center by interacting with the Center Chief and the other Activities Center coordinators and directing any personnel assigned to the Engineering Support Sub-group.

1. Provides engineering support services during emergency operations as requested by Center Chief.
2. Works with other Activity Center coordinators as needed to achieve Center objectives.
3. Provides requested engineering maps and plans of mining systems to assist in emergency planning and decision making.
4. Updates engineering plans as required as emergency operations unfold.
5. Provides engineering expertise to assist emergency responders deal with unexpected events.
6. Directs individuals assigned to the Engineering Support Sub-group.
7. Reports findings of Engineering Support Sub-group to Center Chief.

Multi-Function Group

Responsibilities

I. PRELIMINARY ACTIVITY

Logistical

- Update and maintain current list of key internal and external contacts.
- Identify various off-site locations near all operations to house family members, news media or other outsiders.
- Initiate and maintain contact with key, local medical facilities and personnel, emergency response teams and public safety staff, including mental health professionals, counselors and the America Red Cross.
- Train and equip site spokespersons to gather current information to initially update family members and media until relieved by corporate communications staff, if available and appropriate.
- Identify potential spokesperson from among executive management for possible press briefings.
- Identify adequate nearby food and lodging facilities for staff, mine rescue teams and family members.
- Coordinate with local emergency response personnel, including police and fire officials, on potential evacuation of nearby commercial, civic and residential areas.
- Become acquainted with various relief services offered by local county or municipal governments and the procedure for alerting them in the event of an emergency.

Technical

- Maintain copies of current maps of underground operations.
- Identify and train potential experts/spokespersons from various engineering, mine and corporate management, safety and support staff.
- In the event of an emergency situation at another operation, set policy to decline comments on specifics of the emergency and limit any public statements to the media to strictly general information on the industry.
- Establish policy with workforce that comments and statements related to any mine emergency should be left to trained and designated corporate personnel.
- Compile and maintain a list of initial responders in addition to mine rescue personnel, such as mine safety, corporate communications, government affairs and human resources staff to aid with emergency and also to notify family members in best available manner, preferably in person or by phone, if necessary.
- Cache adequate log books for cataloging events; visitors; family member names, information and briefings; media statements, (spell out), etc.
- Compile advanced list of potential action items and assigned areas of responsibility to consider in an emergency situation and have copies available for appropriate mine management and staff.
- Identify staging and triage area on the surface property for use by emergency response personnel, including air ambulances.
- Identify on- or off-site facility as temporary morgue for any possible decedents.
- Maintain updated list and information on any previous incident, safety performance and any violations in order to explain reasons.

Multi-Function Group

- Ensure that operations have adequate phone and data communications services available, including wireless communications, if required.
- Identify and become acquainted with various agency communications personnel through personal visits or phone conversations, if possible.

II. REACTIONARY

Initial Emergency

- Ensure that all necessary mine and corporate management are apprised of the situation and given regular updates as they become available.
- Identify individual(s) who will contact federal and state regulatory personnel, including those agencies mandated by law.
- Notify local emergency response and public safety personnel for immediate aid or for possible evacuation of nearby areas.
- Contact local and/or regular corporate spokesperson(s) or alternates to be available at the operations either for temporary or on-going duty.
- Coordinate with various regulatory agencies the release of statements to the media and also updates to family members.
- Post company and/or public safety personnel at main and alternate entrances to the operation to coordinate and limit access to the site, and consider providing company personnel with photo identification cards. Maintain log of any visitors arriving at or departing the site. Enlist the aid of state and local public safety personnel for security.
- Along with appropriate personnel, spokesperson gathers and maintains current and pertinent information to compose regular statements for family members and the media, either hourly or more frequently, if necessary.
- Spokesperson makes immediate, initial contact with any gathered family members and media and plans regularly scheduled briefings for both groups, with family members getting priority and more detailed information.
- Include representatives from regulatory agencies and any other pertinent personnel as either participants or observers at all press briefings, if possible and appropriate.
- Direct or escort arriving family members to identified facilities, and keep them as isolated as possible from other company staff and media.
- Make arrangements for medical, emotional, financial and any other vital or comfort needs identified by family members.

On-Going Emergency

- Maintain cycle of regular briefings for family members and news media.
- Coordinate and schedule group press briefings which would include corporate spokesperson(s) including experts and executive management, as well as representatives from pertinent regulatory agencies, if possible and appropriate.

Multi-Function Group

- Coordinate family and media briefing statements with federal and state regulatory, emergency response and public safety personnel.
- Ensure that food and other comfort needs are made available for family members, company staff, mine rescue teams, other responders, etc.
- Coordinate food and comfort needs with American Red Cross, if responding.
- Ensure that clergy, grief counselors and mental health professionals are available, if necessary, and provide them supervised access to family members or company staff, if necessary.
- Be prepared to respond to potentially hostile family members if emergency situation continues for several hours or days.

Post-Emergency

- Gather personal belongings of deceased or injured personnel and place them in an adequate container.
- Coordinate financial needs of family members with human resources personnel.
- If necessary, aid family with possible hospital or funeral arrangements, including financial support.
- Coordinate disposal of possible decedents with local coroner or state medical examiner, including deliberations on “cause of death.”
- Determine how and when to confirm names and other information on deceased personnel.
- Due to current privacy laws, defer any reports on condition of injured personnel to family members or hospital staff.
- Meet with individual families, if necessary and warranted.
- Provide access to operations for grieving family members, if appropriate.
- Identify and provide area for public grieving, such as gatherings of friends and family members, displays of condolences, etc.
- Consider providing access for de-briefing for the media involving mine rescue team members in a controlled manner.
- Coordinate with MSHA Public Affairs Officer on briefing with family, company, press briefings, etc.

Note: Defining specific personnel types and responsibilities may be helpful in this section.

Checklist would be helpful to ensure that all areas have been covered.

Mine Rescue Equipment & Training

Guidance for Establishing, Equipping and Training Mine Rescue Teams

I. Introduction

This portion addresses a variety of issues related to establishing a mine rescue team including a summary of current federal regulations governing mine rescue teams, needed equipment, training requirements, training methodologies, the psychological aspects of mine rescue.

II. Summary of Federal Regulations

Title 30 Code of Federal Regulations, Part 49 stipulates requirements for mine rescue teams for all underground mines in the United States. 30 CFR 49 covers important elements including availability of mine rescue teams (§ 49.2); alternative mine rescue capability for small and remote mines (§ 49.3); alternative mine rescue capability for special mining conditions (§ 49.4); mine rescue station designation (§ 49.5); equipment and maintenance requirements (§ 49.6); physical requirements for mine rescue team members (§ 49.7); and mine rescue team training (§ 49.8). Interpretation of selected portions of 30 CFR 49 can be found in the corresponding portions of MSHA's Program Policy Manual, Volume III (MSHA, 2003). Additional requirements for training and mine rescue competitions have also been spelled out in the 2006 MINER Act.

III. Equipment and Maintenance

Underground mine rescue teams must be adequately staffed and equipped with all necessary equipment in order to comply with applicable federal regulations. As stated in 30 CFR §49.2(2)(b), each rescue team is to be comprised of five members and at least one alternate who are properly qualified, trained, and equipped for undertaking mine rescue service. Based criteria set forth in 30 CFR §49.6(a), Table I presents an itemized list of the minimal equipment and materials that would be needed to equip a typical mine rescue team comprised of five members plus an alternate (adapted from Conti, 2003). Estimated costs (2006 dollars) are also included.

Mine Rescue Equipment & Training

Table I – Mine rescue equipment list and estimated cost

Equipment/Material (cf. 30CFR49.6)	No.	Est. cost each	Est. total cost
SCBAs			
Self-contained breathing apparatus (SCBA) (Typically Dräger BG4 or BioMarine*)	6	\$8,000	\$48,000
Soda Sorb for canisters (per year)	12	\$110	\$1,320
Spare oxygen cylinders	6	\$700	\$4,200
Oxygen pump/cascade system	1	\$7,500	\$7,500
SCBA testing kit	1	\$500	\$500
Repair/replacement parts		\$1,000	\$1,000
Other equipment and supplies			
Cap lamps and chargers	12	\$500	\$6,000
Multi-gas detectors	4	\$1,200	\$4,800
Lightweight, collapsible and/or wheeled stretcher	1	\$800	\$800
First aid bag and supplies	1	\$400	\$400
Personal protective equipment (hard hats, boots, etc.)	6	\$200	\$1,200
Portable communication system	1	\$2,000	\$2,000
Misc. tools, replacement parts and other materials		\$2,500	\$2,500
Mine rescue trailer for equipment transport	1	\$8,000	\$8,000
			\$85,220
SCBA maintenance per year (parts only)	6	\$1,000	\$6,000
		Estimated total	\$94,220
<i>* Mention of a specific product or brand name does not constitute endorsement by NIOSH.</i>			

As mentioned above, this is the minimal equipment that a five member team would need. Costs for this equipment will vary depending on the type and quantity selected. There is also a cost associated with training of teams. This will be covered in the section on training and education.

All equipment must be adequately maintained to make certain that it is ready for immediate use. According to 30 CFR §49.6(b), all apparatus must be tested and inspected every 30 days by a person trained in the use and care of the apparatus. Written records of each inspection must be kept.

IV. Training and Education

Before undertaking any mine emergency response activity, rescue team member must be adequately trained. For the purposes of this document, training will be addressed from several perspectives. These are: 1) the minimum training requirements as specified in 30 CFR §49.8; 2) suggestions for supplemental training; and 3) methodologies for enhanced mine rescue training. Training costs will also be discussed.

Mine Rescue Equipment & Training

Training requirements

Before serving on a mine rescue team, each member must complete at least 20 hours of instruction in the use, care, and maintenance of the type of SCBA and other equipment used by the mine rescue team. Besides in-depth training on SCBAs, rescue team members must receive at least 40 hours of refresher training each year. This training is to be given at least four hours each month or in eight-hour blocks every two months. This 40 hour refresher training must include the following elements:

- 1) At least one underground training session every six months.
- 2) Wearing of the team's SCBAs under oxygen by all members for at least two hours every two months
- 3) Mine map training and ventilation procedures.
- 4) If applicable, the use, care and limitations of auxiliary mine rescue equipment or different breathing apparatus.
- 5) Advanced mine rescue as prescribed by the MSHA Office of Educational Policy and Development.

While 30 CFR 49 specifies broad content domain that must be covered in mine rescue team training, the law does not prescribe specific methodologies for conduct mandated training. In a parallel vein, the law also does not specify content for supplemental and/or training or methodologies for conducting the training.

Supplemental training

In 2006, members of the Mine Emergency Task Force on Emergency Preparedness looked into selected issues in mine rescue including training. Among other things, the group suggested mine rescue training be conducted to better represent real mine emergency situations. The task force suggested the use of non-toxic smoke in rescue team training. The group also suggested team members should be training in using fire extinguishers to put out real fires.

If a mine does not have a fire brigade, mining companies should also consider additional, more in-depth fire fighting training for their rescue team members. This would include training in fighting conveyor belt and other large structure and equipment fires using fire hoses, nozzles and other related equipment. Should a mine operator want to conduct this more intense training, they will need to equip rescue team members with appropriate personal protection equipment including fire fighter turnout gear, hoods, gloves and other related items.

Enhanced mine rescue training

Beginning in the 1990s, researchers from the NIOSH Pittsburgh Research Laboratory began looking at mine rescue related issues including potential new technologies for rescue teams and the viability of realistic training simulations. Working initially through cooperative training efforts with the Pennsylvania Bureau of Deep Mine Safety and expanding to several cooperating mining companies, PRL researchers have conducted a number of realistic training simulations at the NIOSH Lake Lynn Laboratory experimental mine (Conti, et al, 1998; Conti, 2000). While this type of training has been done by NIOSH at the Lake Lynn Experimental Mine facility, simulations of the type described below can be conducted by operators at their own mines.

For each training event, a typical problem scenario is developed. The problem is then presented to mine rescue

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teams who work the problem underground and, if possible, in smoke. Teams are exposed to nontoxic theatrical smoke that limits visibility to less than three feet to provide a realistic environment for working in mine fires. The mining section or a suitable mock-up is set up with various props, mining equipment and obstacles such as water, roof falls and other impediments similar to those a team would encounter during exploration at a real emergency. Teams must search for and locate victims, render first aid and emergency care as required, map the problem area, take gas readings, re-establish proper ventilation, set roof support, communicate to the briefing officer at the fresh air base and make decisions regarding how to reach a solution.

The training should be developed and guided by experienced mine safety and emergency management professionals who will be able to provide the rescue team members with all necessary support and expertise to make the training meaningful and effective. It is important that teams learn from mistakes in a constructive environment and that they understand how their decisions affect the safety of the team members as well as the safety of the victims that are being rescued.

At the end of each training simulation, the team members should provide feedback to the trainers by answering a series of questions that included demographics, usefulness of the fresh air base briefing, evaluating how the team members made decisions and describing anxiety levels and physical demands of the rescue operation. The rescue team is then debriefed by the mine rescue trainer in charge of the exercise, who will analyze the performance of the team, reinforce things that were done well and provide assistance with weaknesses that need to be addressed. Conducting the debriefing in an open forum atmosphere offers an opportunity for team members to engage in lively and productive conversation about the simulation and the lessons learned.

Mine rescue team members, company personnel and state officials all agree that simulations of this type are extremely beneficial. Several mining companies whose teams have participated in underground training at the NIOSH Lake Lynn Experimental Mine, have credited these simulation exercises as having been beneficial in helping their teams manage actual events that occurred after training. Underground mine operators should consider developing similar simulations for use in teaching important concepts to rescue teams at their respective operations. While this kind of training has been done by NIOSH at its Lake Lynn facility, simulations of the type describe can be conducted by companies at their own mines.

In 2007, researchers at NIOSH PRL plan to package and disseminate a suite of three mine rescue training exercise modules which include specific teaching points, instructor's guides with a "how to" conduct the exercise and background material, plus team and solution maps. These exercises have been developed in cooperation with several coal mine operators, MSHA and state mining agencies.

Training costs

As mentioned earlier, there are costs associated with training a mine rescue team that are in addition to the costs of equipping a team. Table 2 lists estimated yearly costs for training a six person mine rescue team. It is assumed that the rescue team will participate in two mine rescue competitions each year – this is typically done to provide the team members with opportunities to gauge their performance against other teams, to learn from other mining companies and to network with neighboring mine rescue teams who might be called for help in an emergency.

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Table 2 – Estimated yearly costs for mandated training

Item	Est. cost
Monthly training (based on 6 members, avg. hourly rate of \$25, 8 hours per day, 12 days per year)	\$14,400
Competition training (based on 6 members, avg. hourly rate of \$25, 8 hours per day, 3 days and 2 competitions)	\$7,200
Competition travel (based on 6 members traveling to two competitions per year for 3 days each)	\$4,500
Estimated total	\$26,100

V. A Word about Psychological Aspects

Emergency response can pose substantial psychological and emotional challenges for the responders, their families and the support personnel assigned to the rescue operation. Mental health is becoming a central issue in emergencies with recent examples in the United States of the aftermath of 9-11 and the 2004 and 2005 hurricane seasons in Florida and the Gulf Coast, most notably the dramatic events in New Orleans. Globally, the issue of mental health in disasters became prominent after the 2004 tsunami in Southeast Asia and the 2005 earthquakes in Pakistan. Similar trends have been identified in the mining community as well, especially after the Quecreek inundation of 2002, the 2001 explosions at Jim Walters Resources No. 5 Mine and the events in 2006.

There is increasing recognition that the psycho-social consequences, (particularly stress) of major emergency events may adversely impact individuals, their families, communities and work organizations. When pursuing the assembly of a mine rescue team, mine operators need to consider the psychological component of mine rescue. Kowalski (1995) presented a rationale for considering stress as a significant factor in the management of emergencies. It is proposed that critical incident stress debriefing in a disaster can improve the effectiveness of response teams on site, their turnaround time on site and post-disaster time off the job.

VI. Resources

A number of web-based resources are available that may be useful to companies forming new mine rescue teams. One excellent source is the Mine Safety and Health Administration's Mine Rescue Home Page (<http://www.msha.gov/MineRescue/rescue.HTM>). The page offers links to mine rescue contest problems, various mine rescue associations and a link to the Mine Emergency Operations (MEO) database. The database contains information about mine emergency services, mine emergency teams and federal, state and local contacts in proximity to a specific mine. The United States Mine Rescue Association website (<http://www.usmra.com/>) has links to a variety of resources including equipment manufacturers, training materials and numerous reference sources. NIOSH has a selection of mine rescue resources available including publications that discuss much of the relevant research. These can be accessed through the NIOSH Mining Web Site at <http://www.cdc.gov/niosh/mining>. Mine operators should also consult their respective state mine safety agency about mine rescue resources.

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VII. Summary

This document was designed to look at issues related to establishing a mine rescue team. It addressed a variety of issues related to establishing a mine rescue team including a summary of current federal regulations governing mine rescue teams, needed equipment, training requirements, training methodologies, and the psychological aspects of mine rescue. This document addresses some of the basics of assembling a mine rescue team and it is hoped that it will serve to enlighten mine operators regarding issues they need to consider.

VIII. References

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