

# Coal Mine Safety

Terrance V. Newhouse  
Editor



NOVA



# COAL MINE SAFETY

No part of this digital document may be reproduced, stored in a retrieval system or transmitted in any form or by any means. The publisher has taken reasonable care in the preparation of this digital document, but makes no expressed or implied warranty of any kind and assumes no responsibility for any errors or omissions. No liability is assumed for incidental or consequential damages in connection with or arising out of information contained herein. This digital document is sold with the clear understanding that the publisher is not engaged in rendering legal, medical or any other professional services.



# **COAL MINE SAFETY**

**TERRANCE V. NEWHOUSE**  
**EDITOR**

**Nova Science Publishers, Inc.**  
*New York*

Copyright © 2009 by Nova Science Publishers, Inc.

**All rights reserved.** No part of this book may be reproduced, stored in a retrieval system or transmitted in any form or by any means: electronic, electrostatic, magnetic, tape, mechanical photocopying, recording or otherwise without the written permission of the Publisher.

For permission to use material from this book please contact us:

Telephone 631-231-7269; Fax 631-231-8175

Web Site: <http://www.novapublishers.com>

#### **NOTICE TO THE READER**

The Publisher has taken reasonable care in the preparation of this book, but makes no expressed or implied warranty of any kind and assumes no responsibility for any errors or omissions. No liability is assumed for incidental or consequential damages in connection with or arising out of information contained in this book. The Publisher shall not be liable for any special, consequential, or exemplary damages resulting, in whole or in part, from the readers' use of, or reliance upon, this material.

Independent verification should be sought for any data, advice or recommendations contained in this book. In addition, no responsibility is assumed by the publisher for any injury and/or damage to persons or property arising from any methods, products, instructions, ideas or otherwise contained in this publication.

This publication is designed to provide accurate and authoritative information with regard to the subject matter covered herein. It is sold with the clear understanding that the Publisher is not engaged in rendering legal or any other professional services. If legal or any other expert assistance is required, the services of a competent person should be sought. FROM A DECLARATION OF PARTICIPANTS JOINTLY ADOPTED BY A COMMITTEE OF THE AMERICAN BAR ASSOCIATION AND A COMMITTEE OF PUBLISHERS.

#### **LIBRARY OF CONGRESS CATALOGING-IN-PUBLICATION DATA**

Available Upon Request

ISBN: 978-1-60741-410-0 (E-Book)

Published by Nova Science Publishers, Inc. + New York

# CONTENTS

<b>Preface</b>		<b>vii</b>
<b>Chapter 1</b>	Mine Safety: Better Oversight and Coordination by MSHA and Other Federal Agencies Could Improve Safety for Underground Coal Miners <i>GAO</i>	<b>1</b>
<b>Chapter 2</b>	Mine Safety: Additional Guidance and Oversight of Mines' Emergency Response Plans Would Improve the Safety of Underground Coal Miners <i>GAO</i>	<b>67</b>
<b>Chapter 3</b>	Coal Mine Health and Safety in the United States <i>Dennis O'Dell</i>	<b>115</b>
<b>Chapter 4</b>	"Two Years after the MINER Act: How Safe Is Mining Today?" <i>Jeffery Kohler</i>	<b>129</b>
<b>Chapter 5</b>	Statement of Richard E. Stickler Acting Assistant Secretary of Labor Mine Safety and Health Administration before the Subcommittee on Employment and Workforce Safety Committee on Health, Employment, Labor and Pensions United States Senate June 19, 2008	<b>137</b>
<b>Chapter 6</b>	Statement of Richard E. Stickler Assistant Secretary of Labor Mine Safety and Health Administration before the Committee on Education and Labor U.S. House of Representatives May 16, 2007	<b>151</b>
<b>Chapter 7</b>	Testimony of Bruce Watzman Vice President of Safety and Health, National Mining Association before the Committee on Health, Education, Labor and Pensions Subcommittee on Employment and Workplace Safety of the United States Senate June 19, 2008	<b>161</b>

<b>Chapter 8</b>	Coal Mine Safety and Health <i>Linda Levine</i>	<b>165</b>
<b>Chapter 9</b>	Coal Mine Safety <i>Edward Rappaport</i>	<b>179</b>
<b>Index</b>		<b>185</b>



## **PREFACE**

Dramatic mine accidents early in 2006 have led to passage of the first major amendment to federal mine safety law since 1977. The Mine Improvement and New Emergency Response Act requires each mine to have an emergency plan, increased supplies of oxygen, and improved rescue teams. Penalties for violations have also been increased. Although the bill had wide support in Congress, some Members have characterized it as only a “first step,” to be followed by additional measures that would include a lower maximum limit on dust concentrations, underground refuges, communications and tracking devices, and greater emphasis on enforcement of standards. On January 2, 2006, the nation was reminded of the dangers of underground mining, as 12 miners died in an explosion and fire in the Sago mine in West Virginia.

Subsequently, the Mine Safety and Health Administration (MSHA) issued new regulations; Congress has passed the first major revision of the mine safety law since 1977 and has taken further bills under consideration; and state legislatures in West Virginia, Kentucky, and Illinois have tightened their own laws. These responses have emphasized factors thought to have played a part in the Sago tragedy, including emergency oxygen supplies, tracking and communication systems, and deployment of rescue teams. There have also been proposals to increase the penalties for violations of safety standards.



*Chapter 1*

**MINE SAFETY: BETTER OVERSIGHT AND  
COORDINATION BY MSHA AND OTHER FEDERAL  
AGENCIES COULD IMPROVE SAFETY FOR  
UNDERGROUND COAL MINERS\***

*GAO*

**ABBREVIATIONS**

ALJ	administrative law judge
APA	Administrative Procedures
Act CLR	conference litigation representative
ETS	Emergency Temporary Standard
MINER Act	Mine Improvement and New Emergency Response
Act of 2006 MSHA	Mine Safety and Health Administration
MSIS MSHA	Standardized Information System
NIOSH	National Institute for Occupational Safety and Health
SCSR	self-contained self-rescuer

May 16, 2007 May 16, 2007  
Congressional Requesters

In January 2006, the Sago mine accident in West Virginia brought the nation's attention to the perils workers face in underground coal mining when 12 men lost their lives after an explosion prompted them to barricade themselves in the mine to await rescue—an effort that took close to 2 days to complete. In total, 47 coal miners lost their lives in 2006, interrupting a 10-year trend of declining fatalities in this industry. Coal, which is used to produce almost 50 percent of the nation's electricity, is becoming more and more important to the nation's

---

\* Excerpted from GAO Report GAO-07-622, dated May 2007.

energy policy as the demand for electricity increases. Mining productivity is at an all-time high—averaging more than 6 tons per coal miner per hour, or more than 48 tons in an 8-hour day. As production increases, safety and the oversight of mines' working conditions assume even greater significance than before. In January 2006, the Sago mine accident in West Virginia brought the nation's attention to the perils workers face in underground coal mining when 12 men lost their lives after an explosion prompted them to barricade themselves in the mine to await rescue—an effort that took close to 2 days to complete. In total, 47 coal miners lost their lives in 2006, interrupting a 10-year trend of declining fatalities in this industry. Coal, which is used to produce almost 50 percent of the nation's electricity, is becoming more and more important to the nation's energy policy as the demand for electricity increases. Mining productivity is at an all-time high—averaging more than 6 tons per coal miner per hour, or more than 48 tons in an 8-hour day. As production increases, safety and the oversight of mines' working conditions assume even greater significance than before.

Through the Department of Labor's (Labor) Mine Safety and Health Administration (MSHA), the federal government enforces the provisions of the Federal Mine Safety and Health Act of 1977, as amended (Mine Act) and the recently enacted requirements of the Mine Improvement and New Emergency Response Act of 2006 (MINER Act). Under these laws, MSHA is responsible for approving training programs for mine workers; promulgating regulations regarding training requirements for rescue teams; approving certain technology devices used underground; and inspecting underground coal mines at least four times each year, which can result in citations and penalties for safety and health violations. The Department of Health and Human Services' National Institute for Occupational Safety and Health's (NIOSH) Office of Mine Safety and Health shares some responsibilities for improving mine safety. It identifies the causes of work-related diseases and injuries; researches, develops, and tests new technologies and equipment designed to enhance mine safety and health; and recommends safety and health standards. In addition, many states maintain mine safety agencies that conduct inspections and require mines to adhere to state safety and health laws and regulations. Finally, mine operators maintain responsibility for implementing safety and health standards to ensure that their workers are working under safe conditions on a daily basis. In response to concerns about the safety of underground coal mines, spawned by the recent increase in fatal mine accidents, you asked us to review several aspects of mine safety oversight. Through the Department of Labor's (Labor) Mine Safety and Health Administration (MSHA), the federal government enforces the provisions of the Federal Mine Safety and Health Act of 1977, as amended (Mine Act) and the recently enacted requirements of the Mine Improvement and New Emergency Response Act of 2006 (MINER Act). Under these laws, MSHA is responsible for approving training programs for mine workers; promulgating regulations regarding training requirements for rescue teams; approving certain technology devices used underground; and inspecting underground coal mines at least four times each year, which can result in citations and penalties for safety and health violations. The Department of Health and Human Services' National Institute for Occupational Safety and Health's (NIOSH) Office of Mine Safety and Health shares some responsibilities for improving mine safety. It identifies the causes of work-related diseases and injuries; researches, develops, and tests new technologies and equipment designed to enhance mine safety and health; and recommends safety and health standards. In addition, many states maintain mine safety agencies that conduct inspections and require mines to adhere to state safety and health laws and regulations. Finally, mine operators maintain

responsibility for implementing safety and health standards to ensure that their workers are working under safe conditions on a daily basis. In response to concerns about the safety of underground coal mines, spawned by the recent increase in fatal mine accidents, you asked us to review several aspects of mine safety oversight. We examined (1) the challenges underground coal mines face in preparing for mine emergencies, (2) how well MSHA oversees mine operators' training efforts, (3) how well MSHA and NIOSH coordinate their efforts to enhance the development and approval of mine safety technology, and (4) how civil penalties are assessed when underground coal mine operators violate safety and health standards.

To conduct our work, we reviewed relevant laws and regulations that govern MSHA, the Federal Mine Safety and Health Review Commission, and NIOSH, as they applied to our research. In addition, we reviewed relevant decisions issued by the Commission and its administrative law judges. We consulted with outside experts, including industry associations, union representatives, mine company officials, academics, a technology manufacturer, and other stakeholders to obtain their views on each topic. We also surveyed a sample of active underground coal mines regarding the current state of mines' operations and the challenges they face in preparing for and responding to mine emergencies. We sent questionnaires to a stratified random sample of 342 of the 665 active underground coal mines. Our sample size was reduced because of mine closures; therefore, survey estimates are representative of only those mines open for the entire period. Ultimately, 146 mines completed questionnaires for a response rate of 69 percent. Our confidence in the precision of the results from the sample is expressed in 95 percent confidence intervals. As a result, we are 95 percent confident that each of the confidence intervals in this report will include the true values in the in-scope population. All percentage estimates for our sample have margins of error—widths of confidence intervals—of plus or minus 8 percentage points or less, at the 95 percent confidence level.

In addition, we analyzed quantitative data from MSHA on citations and penalty amounts for penalties assessed from January 1996 through October 2006. The data provided by MSHA were assessed and found sufficiently reliable for our purposes. We also visited three underground coal mines, spoke with MSHA officials in 6 of its 11 coal mine districts, and interviewed state mine agency officials in the four states that contain almost 90 percent of all underground coal mines in the United States—Kentucky, Pennsylvania, Virginia, and West Virginia. Finally, we attended a mine rescue competition to observe training exercises and interview rescue team members, and visited field locations where MSHA and NIOSH conduct their research and interviewed the officials responsible for these activities. We completed our work between June 2006 and March 2007 in accordance with generally accepted government auditing standards. For an additional discussion of the scope of our work and the methods used to conduct it, see appendix I.

## **RESULTS IN BRIEF**

Underground coal mine operators face significant challenges preparing for emergencies, including ensuring that miners receive realistic training and organizing mine rescue teams that satisfy new requirements. Mine operators recognized the importance of providing emergency

training in a simulated environment. However, on the basis of our survey results, an estimate of 81 percent of mine operators considered the availability of special training facilities for providing such training as a challenge, and 70 percent considered the costs of providing simulated training as a challenge. While MSHA has some materials for providing hands-on training, such as guides on practicing donning and transferring emergency breathing devices, it does not provide all mine operators with information and tools for training under simulated emergency conditions. Our survey results also indicate that an estimate of 77 percent of mines conducted evacuation drills in 2006 in which miners practiced donning breathing devices, which were part of MSHA's emergency temporary standards implemented in March 2006. However, an estimate of 44 percent of mines that conducted these drills did not have their miners practice inserting the device's mouthpiece. Initially, MSHA permitted miners to simulate this activity. However, final rules issued in December 2006 require miners to insert the mouthpiece. In addition to the challenges of providing miners with realistic training, mine operators reported that they anticipated challenges in implementing the new mine rescue team requirements of the MINER Act. For example, depending on how MSHA defines the requirement for rescue teams to train at least annually at every mine they serve, some states that currently provide mine rescue services reported that they may choose to stop providing these services because of resource constraints. As a result, affected mine operators will then have to identify and train new rescue teams. To help mines train their workers under simulated emergency conditions, we recommend that the Secretary of Labor direct MSHA to publicize information and available tools for training mine workers under such conditions. In addition, MSHA should periodically review and update this information, as appropriate.

MSHA approves mine operators' training plans and inspects their training records, but its oversight of miner training is hampered by several factors, including (1) inconsistent instructor approval standards, (2) inaccuracies in its database that maintains information on all instructors, (3) the lack of continuing education requirements for instructors once they are approved, and (4) limited agency monitoring of training sessions. MSHA has general guidelines for items to be considered when approving new instructors, but allows districts to determine an instructor's qualifications in different ways. For example, MSHA requires that applicants prove their experience in one of three ways, and the districts have the discretion to grant provisional approval until the instructor is designated otherwise, but this approach is not consistent across districts. MSHA also does not have continuing education requirements for instructors. In addition, MSHA does not have current information on its approved instructors and does not ensure that they keep their knowledge and skills up to date. Further, MSHA does not adequately monitor instructors or evaluate training sessions, and does not assess how well miners are learning the skills being taught. To help ensure that mine workers are adequately prepared for emergencies, we recommend that the Secretary of Labor direct MSHA to strengthen its monitoring of training. This monitoring should include

- reviewing and standardizing districts' procedures for approving new instructors;
- establishing continuing education requirements for instructors to help instructors maintain or improve their knowledge and skills;
- improving the data in its records on approved instructors; and
- developing a process for monitoring miner training that includes regularly evaluating training sessions, assessing how well learning objectives are being met, and providing feedback to instructors.

Coordination between MSHA and NIOSH is primarily informal and inconsistent, and such coordination may not be sufficient given the pending retirements and other challenges both agencies face. Despite their complementary roles, MSHA and NIOSH lack a current memorandum of understanding or other formal policy to guide their agencywide coordination efforts. In addition, they do not regularly involve each other in their strategic planning efforts, including planning for research. As a result, officials told us that coordination has primarily been at the initiative of some individuals at both agencies and, as such, has not always been consistent. MSHA and NIOSH have worked together on temporary projects, such as developing a new device to monitor the amount of coal dust and other irritants to which miners are exposed, but these efforts have been temporary, limited to specific issues, and not part of either agency's standard operating procedures. Given the challenges the two agencies face, coordination based on working relationships developed between individual staff or temporary projects may not be sufficient. For example, many engineers and scientists at MSHA and NIOSH will be eligible to retire in the coming years, and informal coordination efforts may not continue after they leave. To improve the effectiveness of information sharing between MSHA and NIOSH, we recommend that the Secretaries of Labor and Health and Human Services direct their respective agencies to work together to establish a formal memorandum of understanding to guide their coordination. In addition, the agencies should periodically review and update the memorandum, as appropriate.

While most of the penalties proposed by MSHA are paid by mine operators without opposition, a small percentage of the cases involving more serious and higher-dollar penalties are appealed, and many of those appealed are reduced significantly. MSHA proposes penalties using a standard formula established in its regulations designed to assess higher penalties for more serious violations. Recently, MSHA finalized revisions to its standard formula and expects these changes to more than double the amount of all proposed penalties. Between 1996 and 2006, MSHA proposed assessing mine operators 506,707 penalties for violations of underground coal mine safety and health standards—at an average penalty amount of \$234 per violation. While mine operators pay most penalties without opposition they appealed about 6 percent of all penalties assessed by MSHA. Of those appealed, about half of the penalties were reduced by an average of 49 percent, regardless of the gravity of the violation and the degree of the operator's negligence. The entities involved in the appeals process—the Department of Labor's Office of the Solicitor (Solicitor's Office), MSHA's conference litigation representatives (CLR), and administrative law judges (ALJ) with the independent Federal Mine Safety and Health Review Commission—are required by law to apply the six statutory factors specified in the Mine Act. However, they are not legally obligated to use any particular method to determine a new penalty amount when they determine that a reduction from MSHA's proposed penalty is appropriate. As a result, they have considerable discretion in deciding on the final penalty amount. The recent penalty increases implemented by MSHA increase the likelihood that more penalties will be appealed. In order to ensure that there is transparency in penalty determinations, we recommend that the Solicitor's Office, MSHA, and the Commission take steps to ensure that the specific rationale for all final penalty amounts, including reductions from MSHA's proposed penalties, are adequately documented.

We obtained comments on a draft of this report from MSHA, Labor's Office of the Solicitor, NIOSH, and the Commission. Each entity agreed with the recommendations. MSHA provided additional information about actions the agency has either begun or plans to

take in response to the recommendations. For example, MSHA stated it will develop a Web page dedicated to providing information on available training resources and will issue an information bulletin to mine operators about this Web-based resource. In addition, the agency provided information on its plans for improving oversight of miner training, including exploring the option of establishing continuing education requirements for approved instructors. However, the agency noted that this requirement may necessitate a regulatory change before it can be finalized. Both MSHA and NIOSH supported developing a memorandum of understanding to better guide their coordination efforts. MSHA, the Office of the Solicitor, and the Commission agreed with the need for transparency in the appeals process that includes specifying the rationale for each penalty reduction.

## BACKGROUND

Coal mining remains one of the nation's most dangerous professions. The deadly explosion at the Sago mine in West Virginia brought national attention to the many hazards facing underground coal miners. In response, Congress enacted the MINER Act of 2006, which required mine operators and MSHA to undertake a variety of reforms, including enhancing mine rescue teams, developing up-to-date accident response plans, and instituting higher penalties—including a criminal penalty—for the most serious violations.[1] In March 2006, MSHA also issued an Emergency Temporary Standard (ETS)[2] aimed at instituting immediate health and safety improvements.[3] Among other requirements, these standards required operators to provide safety training on the mine's evacuation routes and provide opportunities to learn how to react in certain kinds of simulated emergency situations, install lifelines along mine escape routes, and store supplemental breathing devices underground. The elements of the ETS became a permanent regulation in December 2006, although the final regulations do modify and clarify some elements of the ETS.[4]

The underground mining industry is highly concentrated in the Appalachian region, east of the Mississippi River. Approximately 87 percent of all underground coal mines in the United States are located in Kentucky, Pennsylvania, Virginia, and West Virginia. Eight of MSHA's 11 district offices are located in these states, and MSHA's headquarters is located in Arlington, Virginia.

MSHA plays a key role in ensuring the education and training of miners, mine inspectors, and other industry stakeholders. MSHA's Directorate of Educational Policy and Development provides technical support to mine operators through its Educational Field Services, which has staff located in many of MSHA's district offices. The directorate also operates the National Mine Health and Safety Academy (Mine Academy) in West Virginia, which primarily serves as the training center for MSHA mine inspectors but is also available to federal and local government and industry personnel for training on a variety of mine health and safety topics. The Mine Academy also provides nearly all of the classroom training for newly hired MSHA mine inspector trainees and technical specialists. In addition, MSHA regulations govern the training and retraining of miners and mine rescue team members. Mine operators are required to provide at least 40 hours of training to new underground mine workers and at least 8 hours of annual training to experienced miners. The training must cover a variety of topics, such as learning the layout of the mine and proper safety procedures, and



must be conducted by an MSHA-approved instructor. Miners who volunteer for mine rescue teams are generally required to pass a rigorous physical examination, complete an initial 20 hours of training on the breathing apparatus used by the team, and an additional 40 hours of annual training on issues such as reading mine maps, understanding ventilation systems, and the use of mine rescue equipment.[5]

Both MSHA and NIOSH are responsible for getting new technology into the mines. MSHA performs this role by certifying certain equipment used in a mine is safe for underground use. MSHA also provides technical support to mine inspectors and mine operators in a number of areas, such as electrical and ventilation systems, roof control, and control of coal dust. In conducting its health and safety research and development, NIOSH consults with a number of different entities, including MSHA and the mining industry. NIOSH is also responsible for developing or adapting new technologies for use in the mining industry. Before the passage of the Mine Act in 1977, both mine enforcement and research were the responsibility of the Bureau of Mines, which was located in the Department of Interior. After the passage of the act, MSHA was created when the enforcement function was moved from the Bureau of Mines to the Department of Labor. In 1997, following the closure of the Bureau of Mines, mine research was placed under the auspices of the Department of Health and Human Services' Centers for Disease Control and Prevention and became a part of NIOSH.

The federal government's enforcement of mine safety and health is shared by two independent agencies—MSHA and the Commission—in a split-enforcement model that is relatively uncommon in the federal government. While MSHA is responsible for inspecting mines for safety and health violations, the Mine Act grants authority to the Commission to assess all civil penalties for violations found by MSHA. In practical terms, MSHA proposes the initial penalty based on the findings of its inspectors.[6] However, these proposals are subject to review by the Commission, and no proposed penalty that has been contested by a mine operator can be settled without the approval of the Commission. The Commission includes five members appointed by the President and confirmed by the Senate. ALJs assist in carrying out the responsibilities of the Commission and are authorized by the Administrative Procedures Act (APA) and the Mine Act to independently review MSHA's enforcement actions. ALJ decisions are considered final decisions of the Commission unless it decides to review a case within 40 days of the ALJ decision. If MSHA or the mine operator disagrees with the Commission decision, either can appeal the case to the appropriate U.S. Court of Appeals.

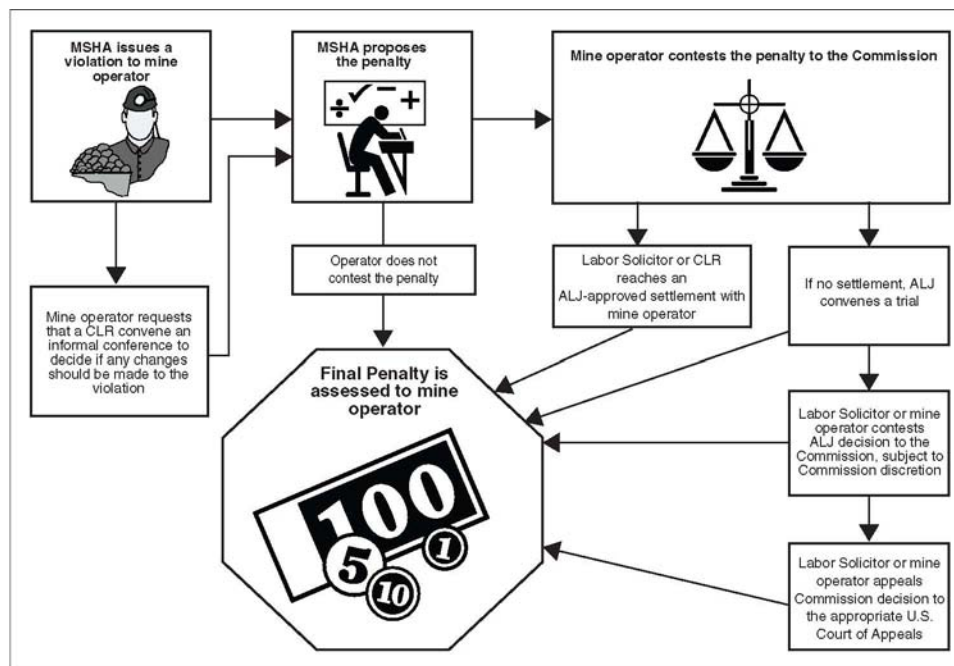
In assessing penalties, the Mine Act requires both the Commission and MSHA to consider six statutory factors:

1. the mine operator's history of previous violations,
2. the appropriateness of the penalty to the size of the mine,
3. whether the mine operator was negligent,
4. the effect on the operator's ability to continue in business,
5. the gravity of the violation, and
6. the demonstrated good faith of the mine operator charged in quickly remedying the situation after being notified of a violation.

MSHA's Coal Mine Safety and Health Administration is responsible for carrying out enforcement activities related to surface and underground coal mines. As of January 2007, MSHA employed approximately 550 underground coal inspectors in its 11 coal districts. MSHA's principal enforcement responsibility for underground coal mines is fulfilled by conducting a minimum of four comprehensive inspections of every underground coal mine each year.[7] When MSHA inspectors observe violations of federal health and safety standards, they are required to issue a citation to the coal mine operator.[8] However, even if an operator does not agree with the violation, the operator must resolve the problems within the time frame set by the inspector.

Under new MSHA regulations that took effect in April 2007,[9] the amount of a civil penalty that MSHA can assess for violation of an underground coal mine safety and health standard generally ranges from \$112 to \$60,000.[10] However, the MINER Act introduced a new "flagrant violation," which carries a maximum civil penalty of \$220,000.[11] The MINER Act also established criminal penalties for certain willful or knowing violations of the Mine Act.[12]

Once a penalty is proposed, a mine operator can (1) accept the proposed penalty and pay it or (2) formally contest the penalty before the Commission (see figure 1 for a more detailed view of the process).



Source: GAO analysis.

Note: If the citation or order is vacated by the Commission or the courts, no civil penalty is assessed.

Figure 1. Penalty Assessment Process for Mine Operators That Are Cited for Violating Safety and Health Standards.

---

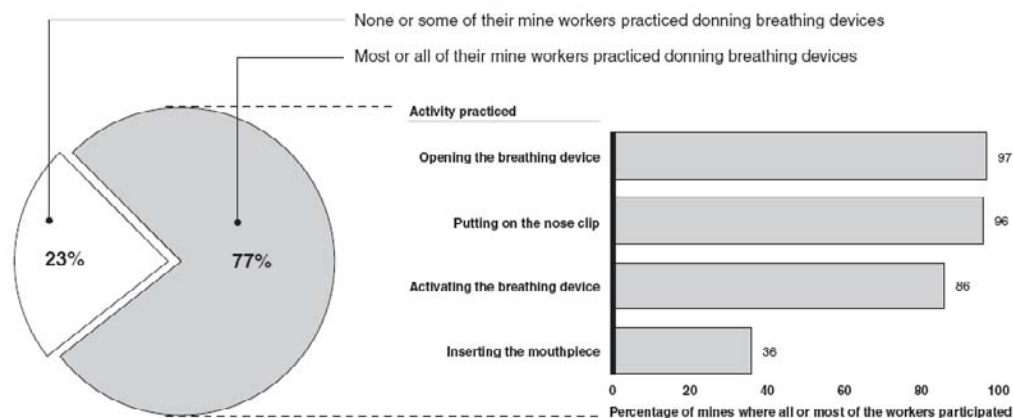
## **UNDERGROUND COAL MINES FACE CHALLENGES IN PREPARING MINE WORKERS AND RESCUE TEAMS FOR EMERGENCIES**

Underground coal mine operators face significant challenges preparing for emergencies, including ensuring that miners receive realistic training and organizing mine rescue teams that satisfy new requirements. Limited access to facilities for training miners under simulated emergency conditions and the cost of such training challenge many mine operators. While MSHA has some materials for providing hands-on training, it does not provide all mine operators with information and tools to assist them in training miners under simulated emergency conditions. In preparing mine rescue teams to respond to emergencies, mine operators reported costs and training as key challenges, and indicated that implementing new requirements in the MINER Act may exacerbate these challenges.

### **Emergency Preparedness Training of Miners Is Limited by Few Opportunities to Train under Simulated Emergency Conditions**

Although new MSHA requirements instruct mine operators to conduct emergency preparedness training that includes realistic mine emergency evacuation drills, many mine operators had not implemented these requirements as of the end of 2006. MSHA's ETS issued in March 2006 required mine operators to provide hands-on training in the complete donning of the breathing devices miners carry with them into underground mines in the event that the breathable air becomes contaminated.[13] On the basis of our survey, we estimate that 77 percent of underground coal mines conducted evacuation drills where most or all of their workers practiced donning a breathing device during the drill in 2006.[14] However, we estimate that out of those mines, 44 percent did not have their workers practice inserting the mouthpiece. Although the March ETS permitted miners to simulate the insertion of the mouthpiece in training exercises, the final rule in December clarified that actual insertion is required.[15] MSHA requires all miners to practice each step in the process of donning the device, including opening and activating the device and inserting the mouthpiece. The purpose of this training is to familiarize miners with the process of operating a breathing device and the sensations of breathing through it, such as resistance when breathing and the heat generated by the unit.[16] However, not all mines have trained miners in all of these steps (see figure 2).

Based on our survey, we estimate that of the mines where most or all of the workers practiced donning a breathing device in 2006, only 36 percent practiced inserting the mouthpiece, a result that could be due to miners' reluctance to share used mouthpieces. According to mine safety and training officials, even when the mouthpieces are sterilized between uses, many miners are reluctant to use them because of the fear of infection. In addition, the March ETS and the December regulations require that miners practice switching from one breathing device to another in the event that they have to use more than one device during an emergency, but an estimate of 42 percent of all mines did not conduct such exercises in 2006.



Source: GAO analysis of survey data.

Figure 2. Estimated Extent of Training Conducted with Breathing Devices at Mines in 2006.

In addition, we estimate that about half of mines had not conducted drills in environments that simulate actual emergency situations, and many cited providing such training as one of the greatest challenges they face in preparing workers for mine emergencies. MSHA's new training requirements direct mine operators to conduct quarterly mine emergency evacuation drills; install directional lifelines to help miners find their way out of a dark mine; and instruct miners in the procedures for evacuating the mine in emergencies, such as those involving fires or explosions.[17] On the basis of our survey, almost all mines conducted evacuation drills and installed lifelines in 2006. However, we estimate that half of the mines had not conducted drills in environments that simulated actual emergency situations. According to our survey, the greatest challenges in preparing miners for and responding to mine emergencies related to simulated mine emergency training. Specifically, the three most commonly reported challenges were the availability of training centers that can simulate an emergency situation, the availability of training in a simulated mine emergency situation, and the cost associated with providing simulated mine emergency training (see figure 3).

Although mine operators recognized the importance of simulated emergency training, many mines faced challenges conducting such training due to their limited access to special facilities and the high cost of such training. We estimate that 81 percent of mines viewed the availability of training in a simulated mine emergency situation as a moderate to major challenge. According to mine training officials and experts, emergency training is best conducted in simulated conditions that are as close to the actual conditions present during an emergency as possible because it builds miners' confidence and enables them to respond appropriately during an actual emergency. The Mine Academy in Beaver, West Virginia, provides some facilities for training under simulated emergency conditions, but it is used primarily for mine rescue training and, according to some mining industry officials, is often not a viable training option because of its limited capacity and distance from many mines. In addition, mine operators can use a mobile training facility developed for various simulated emergency conditions, but it is not always available, in part because of limitations on instructors' time.[18] The high cost of providing simulated training is another challenge, particularly for smaller mines. On the basis of our survey, we estimated that small mines were less likely to have performed such drills than larger mines.[19] In addition, the cost associated

with providing simulated mine emergency training is more of a challenge for small mines than larger mines. According to our survey, small mines were more likely than larger mines to consider the cost of the training to be a major challenge. According to MSHA officials, small mines are less likely than larger mines to employ a full-time safety director who can devote time to developing training under simulated emergency conditions.

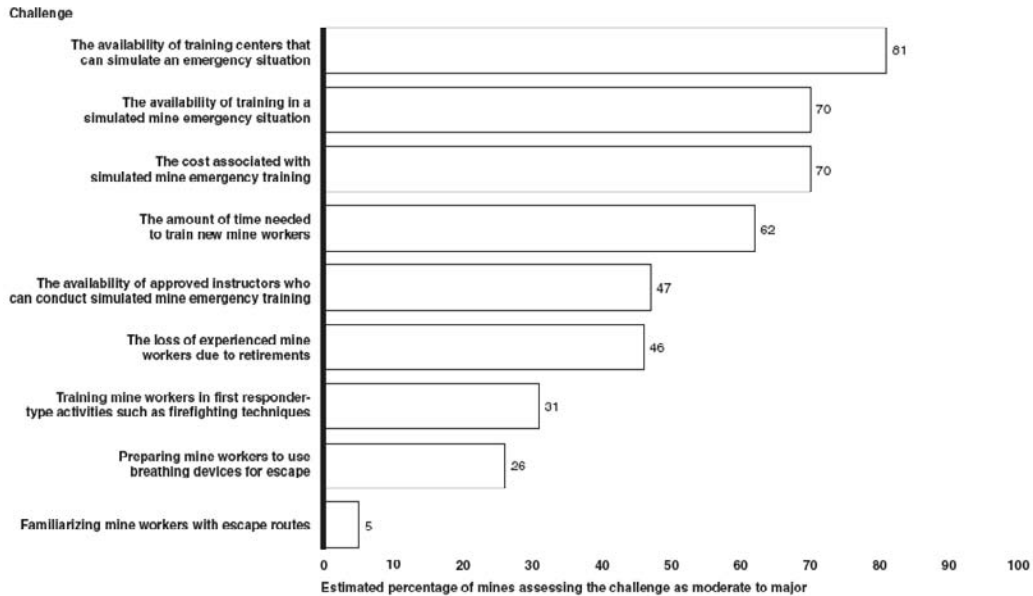


Figure 3. Mines’ Assessment of Challenges in Preparing Workers for Mine Emergencies.

Although MSHA has materials that mine operators can use to provide hands-on training on specific topics, it does not provide all mine operators with information and tools for training under simulated emergency conditions. MSHA has a catalog of various training tools, including classroom exercises, which mine operators can obtain upon request. For example, to support the March ETS requirements for training with breathing devices, MSHA distributed a training packet to all underground coal mines and appropriate state grantees.[20] However, MSHA does not provide all mine operators with examples of how to provide training in simulated emergency environments such as smoke-filled mines or information on resources available for providing such training. Mine operators use a number of techniques to simulate emergency conditions, but other mine operators may be unaware of them. One mine operator we interviewed reported using a maze in a garage-sized tent filled with artificial smoke to allow workers to safely practice evacuating a smoke-filled mine, and other operators reported using darkened goggles during evacuation drills to simulate the limited visibility miners would experience in a smoke-filled mine. While MSHA has five artificial smoke machines that mine operators may use to help train their workers in evacuating a smoke-filled environment, many mine operators may not know about them because MSHA does not list them in its catalog of training products or communicate their existence to all mine operators. Based on our survey, we estimate that about half of the mines received no assistance from MSHA in preparing for a mine emergency, such as help developing drills in simulated emergency environments. In addition, several mine operators commented that they viewed

MSHA as enforcing safety regulations rather than serving as a resource for developing or providing training.

### Mine Operators Face Challenges Funding and Training Rescue Teams and Anticipate Further Challenges Implementing New Requirements

Mine operators reported costs and training as key challenges in preparing rescue teams to respond to mine emergencies, and indicated that implementing new requirements in the MINER Act may exacerbate these challenges. According to our survey, cost concerns and opportunities to conduct simulated training with all stakeholders are the greatest challenges in preparing rescue teams for mine emergencies (see figure 4).

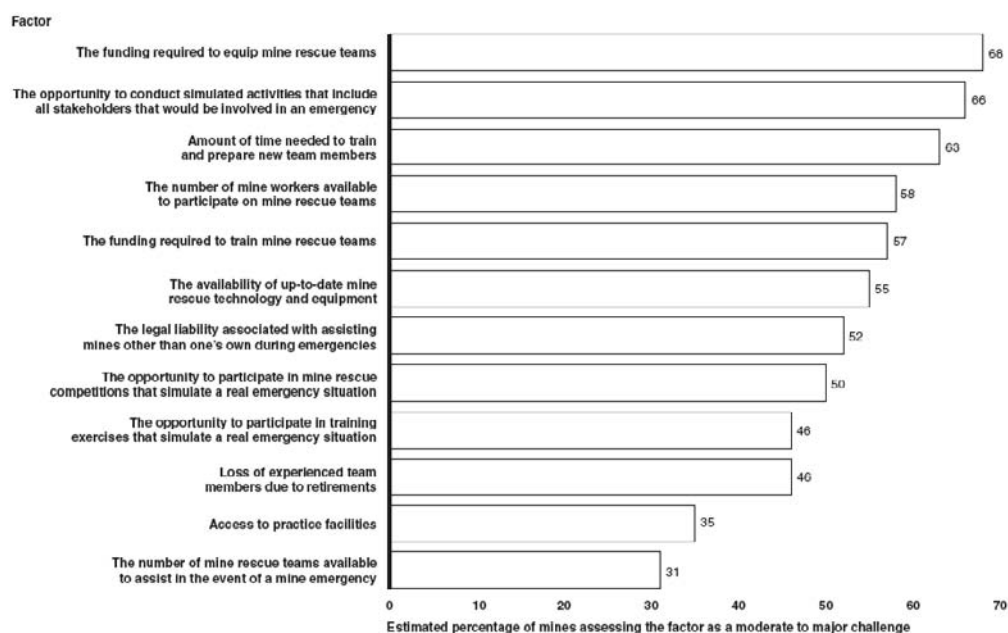


Figure 4. Mines' Assessment of Rescue Team Challenges in Preparing for Mine Emergencies.

An estimate of 68 percent of mines considered the funding required to equip mine rescue teams as a moderate to major challenge in their ability to prepare them for emergencies. For example, mine rescue teams need special breathing devices, gas detectors, and communication equipment. According to a 2006 industry study, the cost of equipping a typical new mine rescue team is over \$90,000, which may be expensive for some mine operators.[21] In addition, all equipment must be maintained to ensure that it is ready to be used, and therefore must be inspected every 30 days, according to MSHA regulations.

Limited opportunity to conduct training in simulated emergency environments with each stakeholder who could be involved in an emergency response effort is a moderate to major challenge for an estimated two-thirds of mines. When a mine emergency occurs, several entities take an active role in the decision-making process that requires quick action and familiarity with the procedures and actions of the other players. For example, the mine

command center set up at the beginning of the response to a mine emergency includes officials from the affected mine, a representative of the miners, and MSHA and state officials who are responsible for overseeing the rescue efforts and communicating with the rescue team members underground. In 1995, a panel of mine experts recommended that rescue teams, labor unions, state agencies, and federal agencies join together to participate in mine emergency response exercises. However, MSHA officials told us that while they have developed a process for conducting these exercises, few are carried out at mines each year.[22]

The time required to train and prepare new mine rescue team members was also cited as a significant challenge by many mines. We estimate that two-thirds of mines considered the time required to train and prepare new mine rescue team members a major or moderate challenge in implementing the requirements of the MINER Act. Under current regulations, before serving on a mine rescue team, each member must complete 20 hours of instruction in the use and maintenance of the types of breathing apparatus and other equipment used by the team. In addition, mine rescue team members must have at least 40 hours of refresher training each year, which includes, among other things, all team members donning breathing devices for at least 2 hours every 2 months and at least one underground training session every 6 months. Because many mines rely on mine workers to constitute their designated mine rescue teams and because such training can conflict with employees' regular work, some mine operators may feel that it lowers productivity.

In addition to these challenges, mine operators reported that they anticipated further challenges stemming from new requirements in the MINER Act. We estimate that half of underground coal mines anticipate changing the composition of at least one of their designated mine rescue teams as a result of the MINER Act. Of the provisions related to mine rescue, the one that mine operators most anticipated necessitating significant change is the requirement that teams train at least annually in the mines they are responsible for covering. In part, this change is attributed to the way mine rescue services are provided to many mines in several key coal mining states. According to respective state officials, all mines in Kentucky and many in Virginia and Pennsylvania rely on the state to provide or arrange for mine rescue services. In Kentucky, for example, mines receive rescue services from state teams composed of state mine inspectors whose primary duties are to inspect coal mines. According to a state official, a Kentucky team would be required to conduct 120 training exercises annually under the MINER Act, compared to the 12 exercises it currently conducts. Depending on the final regulations developed by MSHA to implement the requirements of the MINER Act, officials in Kentucky said they might stop offering mine rescue services because of the amount of time that will be needed to meet the training requirements outlined in the MINER Act. Similarly, according to state mine safety officials and rescue teams in Virginia, the state will probably have to stop contracting with larger mines to provide rescue team services for many small mines in the state because of the amount of time that teams would be required to train at each mine. According to state mining officials in Pennsylvania, smaller mines would be most affected if the state stops providing rescue teams because, unlike larger mines, they tend not to have their own mine rescue teams.

Some mine operators have started making changes to their mine rescue teams based on the MINER Act, while others are taking a cautious approach, given the costs to train and equip new rescue teams. For example, one company operating multiple mines reported that it was creating new backup mine rescue teams that will satisfy the new 1-hour travel time

requirement of the act. In other cases, however, according to mine and industry officials, mines were waiting to see how MSHA implements the new mine rescue requirements before changing their team designations.[23] For example, the extent of the required training at each mine could affect how mine operators designate rescue teams. According to state mining officials, this requirement might involve the entire team training underground and activating breathing devices at each mine or something less resource-intensive, such as training aboveground at each mine. Some state mining officials and mine operators told us they feared that mines that create new rescue teams will staff them with less experienced people who may not be able to adequately protect miners during an emergency. However, officials with the United Mine Workers of America, the coal miners' union, told us that MSHA should move forward in requiring mines to meet the requirements of the act more quickly, including establishing mine rescue teams at each mine without waiting for the regulations to be finalized. They said they believed that the requirements of the act are clear.

### **MSHA REVIEWS MINES' TRAINING PLANS AND INSPECTS TRAINING RECORDS BUT DOES NOT ADEQUATELY MONITOR INSTRUCTORS OR TRAINING**

MSHA has the authority to oversee certain aspects of miner training to help ensure that miners work safely and are prepared for potential emergencies, but its oversight of training is hindered by several factors, including having inconsistent instructor approval standards. As part of its oversight role, MSHA reviews and approves the training plans that mine operators are required to prepare and inspects training records. As part of its stated mission, MSHA's Educational Field Services office helps develop mine operators' training plans and evaluates instructors and training programs. Educational Field Services staff also provide input to district managers who are responsible for approving new instructors.

MSHA has general guidelines for items to be considered when approving new instructors, but allows districts to determine an instructor's qualifications in different ways. To become an approved instructor, MSHA requires that an applicant prove his or her mining and teaching experience in one of three ways: by (1) submitting written qualifications, (2) attending new instructor training, or (3) teaching a class monitored by MSHA under provisional approval from an MSHA district manager. MSHA suggests factors that district managers may use in determining an applicant's skills, but it does not have firm criteria that new instructors must meet. For example, to assess an applicant's mining qualifications, the district manager may consider, among other factors, the applicant's work experience, state certifications, and completion of MSHA courses. To assess an applicant's teaching skills, a district manager may consider prior teaching experiences and evaluations from teaching sessions at MSHA's instructor training course. In addition, approval procedures are not standardized across MSHA's 11 coal districts, according to MSHA officials. For example, some districts grant provisional approval whereby individuals are allowed to teach specific courses subject to subsequent approval based on MSHA's monitoring of their teaching skills. However, according to MSHA officials, some of these districts may not monitor these instructors' teaching skills. In other districts, provisional authority is only granted to new



instructors if they can be monitored by MSHA staff. According to MSHA officials, staff resources limit districts' ability to monitor applicants' teaching skills.

Another factor that hampers MSHA's ability to monitor training is the fact that it does not have current information on all of its instructors. MSHA maintains a database of approved instructors that includes contact information for each instructor, the courses they are approved to teach, and whether they have full or provisional authority to teach the courses. But according to MSHA officials, the database contains outdated contact information because some instructors move without notifying MSHA. Without accurate information on its instructors, MSHA cannot ensure that instructors receive training policy updates and cannot determine whether there are enough qualified instructors to meet mine operators' needs.

In addition, MSHA does not have continuing education requirements for its instructors. Once instructors are approved, according to an MSHA official, they are not required to demonstrate that they are staying current on emerging mining issues. As a result, MSHA cannot ensure that instructors are keeping their mining knowledge and skills up to date, including their knowledge of emerging safety and health issues and new training tools. For example, although MSHA did send its new training guides on transferring and donning emergency breathing devices to all underground coal mines, it did not send them to the instructors who conduct the training.

MSHA also does not adequately monitor instructors or evaluate training sessions and does not assess whether miners are learning what is being taught in training sessions. According to MSHA guidance, Educational Field Services and district inspection staff should monitor as many training sessions as resources permit. MSHA's guidance includes an instructor evaluation form and a list of steps that staff should take in monitoring instructors, but according to MSHA officials, the agency monitors few miner training sessions relative to the number conducted. According to mine operators and trainers, MSHA rarely oversees training and monitors sessions primarily for enforcement purposes rather than in an attempt to enhance instructors' knowledge and abilities. According to MSHA officials, instructor evaluations occur on an ad hoc basis by MSHA inspectors who happen to be present or by Educational Field Services staff who attend in response to a specific request. In addition, many of the training sessions occur on the weekends, when MSHA staff do not work, limiting their ability to monitor training. MSHA does not collect or analyze training evaluations obtained from miners to help gauge whether learning objectives are taught effectively, and an estimate of 80 percent of mines do not elicit feedback on training sessions from their workers. Because MSHA does not regularly monitor training and because most mines do not elicit feedback, MSHA cannot determine how well miners are learning the skills taught by MSHA-approved trainers and recommend corrective measures as necessary.

## **MSHA AND NIOSH LACK A FORMAL AGREEMENT TO GUIDE MINE SAFETY COORDINATION**

MSHA and NIOSH have a common mission to improve the safety and health of coal miners, but do not have a formal agreement, such as a memorandum of understanding, to guide agencywide coordination efforts or formally involve each other in their strategic planning efforts. As a result, coordination between the two agencies is largely informal and

inconsistent. Most of the coordination that occurs is initiated by individual staff members or by outside parties, such as labor unions. Such informal coordination may not be sufficient given the pending retirements of engineers and scientists and other challenges that both agencies face.

### **Despite Complementary Roles, Coordination between MSHA and NIOSH Is Primarily Staff-Initiated and Inconsistent**

MSHA and NIOSH have complementary roles in improving the safety and health of coal miners, but coordination between the two agencies is largely informal and inconsistent due to a lack of a formal agreement or policies to guide their efforts. MSHA is primarily involved in setting health and safety standards and enforcing them through mine inspections that can result in citations and penalties, whereas NIOSH's mining program is focused on research into the causes of and ways to prevent the safety and health hazards miners face.[24] While MSHA and NIOSH have different functions, their roles are complementary in a number of respects. Both are involved in providing training and technical assistance for mine inspectors and operators. For example, officials told us that NIOSH researchers help develop training modules and products on a variety of safety and health topics that MSHA makes available to mine operators and inspectors through the Mine Academy. In addition, NIOSH may recommend that MSHA issue new safety and health standards based on research findings.

Further, MSHA and NIOSH are both responsible for getting new safety technology into the mines. After determining a need for a new safety technology, NIOSH either works directly with manufacturers to develop a new product or to adapt one used in another industry to the mining environment, or develops a market-ready technology and encourages manufacturers to produce it on a larger scale. For certain kinds of mining products, the manufacturer must get MSHA's approval before the technology can be used in mines. Before approving it, MSHA's technical experts evaluate and test products to ensure that they will not cause a fire or explode in an underground coal environment. See table 1 for an illustration of MSHA's and NIOSH's complementary roles.

Given their roles, MSHA and NIOSH have different perspectives that can inform each other's work. Through inspections, its role in reviewing and approving miner training, and the technical assistance it provides to mine operators, MSHA officials told us the agency has knowledge of the day-to-day workings of a mine that can help inform NIOSH research. MSHA officials also told us that NIOSH, under the Centers for Disease Control and Prevention, has the capacity to conduct longer-term scientific research and benefits from the perspective of the wider occupational safety and health community.

However, MSHA and NIOSH do not have a current formal agreement, such as a memorandum of understanding or other policy, to guide their coordination efforts, a practice we have identified as effective in prior work.[25] In 1978, NIOSH's predecessor in the Bureau of Mines and MSHA had a signed memorandum of understanding that specified how they would coordinate to ensure the full and effective use of the Bureau of Mines' research capabilities and MSHA's resources and assistance to ensure that technology resulting from mine safety research would be used to the fullest extent.[26] The memorandum embodied many of the key practices we have identified in prior work that can help federal agencies enhance and sustain their collaborative efforts, such as defining roles and responsibilities and

developing joint strategies. For example, the memorandum stated that the Bureau of Mines would provide overall coordination for the mine safety and health research programs, and MSHA would provide advice and assistance on issues such as health and safety standards and participate through the life cycle of research projects. In addition, the two agencies would develop a joint research strategy for short, intermediate, and long-term objectives, as well as hold regular meetings between staff designated as coordinators for both agencies. The agreement was developed following the move of MSHA from the Bureau of Mines into the Department of Labor. However, the memorandum is no longer used, and MSHA officials were unaware of a plan to update the document. (See table 2 for key coordination practices GAO has identified.)

**Table 1. MSHA’s and NIOSH’s Complementary Roles**

MSHA’s key activities	NIOSH’s key activities
Inspect mines and investigate mine accidents and complaints	
Develop mandatory safety and health standards	Enumerate hazards in the workplace
	Identify the causes of work-related diseases and injuries
	Create ways to control hazards
	Recommend occupational safety and health standards
Assess and collect penalties for violations of mine safety and health standards	
Review for approval mine operators’ health and safety training plans	
Maintain Mine Academy to train MSHA personnel, including inspectors, and others	Train safety and health professionals
Approve and certify certain products for use in underground coal mines to ensure they do not cause a fire or explosion	Evaluate the hazards of new technologies and work practices
	Research, develop, and test new technologies and equipment designed to enhance mine safety and health
Provide technical assistance to mine operators to meet the requirements of the Mine Act	
Cooperate with states in the development of their mine safety and health programs	
Make grants to states in which mining takes place	
Oversee rescue and recovery operations	

Source: GAO analysis of agency documents.

In addition, MSHA and NIOSH do not regularly involve each other in their strategic planning efforts, including planning for research, as required by the Government Performance and Results Act.[27] NIOSH uses a comprehensive framework to gain input from more than 500 stakeholders on its research agenda, but MSHA officials contend that their agency should have a higher priority among NIOSH’s stakeholders for planning its research. While mine safety and enforcement is MSHA’s primary focus, mine research is only one part of NIOSH’s much broader worker safety agenda, which includes preventing and reducing occupational disease, injury, and death in a number of fields such as agriculture, health care, emergency response, and mining. An MSHA headquarters official told us that the agency does not know much about NIOSH’s research outside of the few partnerships in which the two agencies are engaged. A top NIOSH official told us that the agency generally does not involve MSHA in planning its research unless doing so could involve a change in regulations. Officials from

both agencies told us that when both agencies were under the Bureau of Mines, MSHA had a greater influence on NIOSH's research agenda.

**Table 2. Key Practices for Effective Coordination**

Define and articulate a common federal outcome or purpose they are seeking to achieve that is consistent with their respective agency goals and missions. Developing such a common outcome takes place over time and requires sustained resources and commitment.
Establish mutually reinforcing or joint strategies to achieve the outcome. Such strategies help align the agencies' activities, core processes, and resources to accomplish the common outcome.
Identify and address needs by leveraging resources (human, information technology, physical, and financial resources). Agencies can obtain additional benefits that would not be available if they were working separately.
Agree upon agency roles and responsibilities. In doing so, agencies can clarify who will do what, organize their joint and individual efforts, and facilitate decision making. Committed leadership from all levels of the organization is also important.
Establish compatible policies, procedures, and other means to operate across agency boundaries. Frequent communication is another means to facilitate working across agency boundaries and prevent misunderstanding.
Develop mechanisms to monitor, evaluate, and report the results of collaborative efforts. Doing so can help key decision makers within the agencies, as well as clients and stakeholders, obtain feedback for improving both policy and operational effectiveness.
Reinforce agency accountability for collaborative efforts through agency plans and reports. Federal programs contributing to the same or similar results should collaborate to ensure that goals expressed in strategic and annual performance plans are consistent and, as appropriate, program efforts are mutually reinforcing <sup>a</sup>
Reinforce individual accountability for collaborative efforts through agency performance management systems. Agencies can do so by, for example, holding agency senior executives accountable for collaboration and teamwork across organizational boundaries to help achieve goals.

<sup>a</sup> The purpose of the Government Performance and Results Act of 1993 (GPRA) is to establish strategic planning and performance measurements for federal agencies. Under GPRA, federal agencies are required to develop strategic plans, set program goals and measure performance against them, and publicly report on their progress to the President and Congress (Pub. L. 103-62).

Source: GAO.

For their part, NIOSH officials expressed a desire for more input into MSHA's rulemaking process. The head of one of NIOSH's research branches suggested that MSHA should allow NIOSH and other key stakeholders, such as the labor unions and the mining industry, to comment on a proposed rule before it is published for public comment in the *Federal Register*.<sup>[28]</sup> He noted that MSHA recently solicited NIOSH's input on the proposed personal dust monitor regulations. Another official expressed concern that MSHA sometimes issues new safety and health regulations or standards without fully considering the research that should be conducted before implementing them, requiring NIOSH to dedicate resources to unplanned research. For example, MSHA issued a stricter regulation for noise levels in the mines to prevent hearing loss in 1999, causing NIOSH to make changes in its staffing and funding to make research into technology to control noise and efforts to educate mine workers a higher priority.

A recent National Academy of Sciences review of NIOSH's hearing loss research program found that the mechanisms through which NIOSH anticipates the early research needs of MSHA and other regulatory partners are not sufficiently consistent and systematic and that there did not seem to be an effective joint planning process for regulatory activities. The academy recommended that the program establish regular means of conferring with its

partners to better anticipate their research needs relevant to regulatory decision making. Anticipating research needs is particularly important given that MSHA and NIOSH operate under different time frames.[29] MSHA must quickly respond to safety hazards identified in the mines, whereas NIOSH typically requires 3 to 5 years to conduct its research, according to officials from both agencies.[30] The 1978 memorandum between NIOSH's predecessor and MSHA provided for such consultation, requiring MSHA to advise the Bureau of Mines of its plan for developing and revising standards in order to allow sufficient opportunity for technical consultation prior to publishing proposed regulations. Similarly, the bureau would advise MSHA of research results that could affect existing or proposed regulations.

As a result of not having a formal agreement or policies to guide their activities, coordination between MSHA and NIOSH is primarily driven by informal relationships between staff at both agencies. Officials from both agencies and labor union representatives told us that coordination has been primarily at the initiative of individuals at both agencies and, as such has not always been consistent across the agencies. For example, some heads of research divisions at MSHA and NIOSH said that the staff from both agencies will contact each other on an informal basis if they have a question or need additional information on a current project. However, other division heads at MSHA reported less frequent communication and a NIOSH official confirmed that some divisions work together better than others.

Communication between MSHA and NIOSH has improved in recent years, in part due to several partnerships, but these efforts are temporary, limited to specific issues, and not part of either agency's standard operating procedures. Further, officials acknowledged that most of these partnerships were initiated by outside parties, such as the mining industry or the labor unions, rather than by the agencies themselves. For example, in 1999 an industry group asked NIOSH to work with MSHA, manufacturers, and a labor union to develop a personal dust monitor, a device miners can wear to monitor in real time the amount of coal dust or other irritants that they are being exposed to as they work. Final testing of the monitors has been completed, but MSHA has not yet proposed new changes to the rule requiring mines to use them. In response to the MINER Act, NIOSH and MSHA are involved in another partnership with states, industry and labor groups, and others to develop, evaluate, and implement technology to help workers in mines communicate with personnel on the surface after an accident. The MINER Act requires mine operators to have two-way emergency communications systems within 3 years after passage of the act,[31] but the harsh underground mine environment makes it difficult to adapt existing communications systems for this purpose. In 2006, Congress provided NIOSH with \$10 million in emergency supplemental funds to be used by the end of fiscal year 2007 to support research to develop mine safety technology, such as communication devices. The funds, which NIOSH is awarding competitively, are targeted to communications and other technologies that could be available for use in mines within 24 to 36 months. These partnerships, while good, have provided only a temporary and limited avenue for coordination between MSHA and NIOSH.

## Informal Coordination May Be Insufficient Given Impending Retirements and Other Challenges MSHA and NIOSH Face

NIOSH and MSHA face a potentially large workforce turnover in coming years, and informal coordination based on working relationships between staff members may not continue when the individuals leave. Like many federal agencies, a large proportion of engineers and scientists at MSHA and NIOSH are eligible to retire within the coming years. MSHA provided us with data showing that more than 50 percent of its 140 engineers and scientists will be eligible for retirement within the next 10 years, with 31 percent eligible within 5 years (see table 3).[32]

**Table 3. Proportion of MSHA Engineers and Scientists Eligible for Retirement over the Next 10 Years, as of March 2007**

Time of eligibility	Number of engineers	Number of scientists
Currently eligible	14	5
Eligible in 5 years	18	6
Eligible in 10 years	24	4
Total eligible within 10 years	56	15
Total workforce	114	26
Percentage eligible within 10 years	49%	58%

Source: MSHA.

Similarly, about half of NIOSH's employees—most of whom are scientists and engineers—are eligible to retire in the next 5 years. Although current informal coordination may provide researchers with the information they want, new staff replacing those who retire may not continue existing coordination practices without a formal agency policy guiding them to do so.

In addition, MSHA and NIOSH face other challenges that require them to work more closely together, particularly in developing and approving safety technologies. An influx of new and inexperienced miners brought on by the increased demand for coal and the aging of the workforce, rising dangers as miners go deeper underground to mine coal, and recent mine disasters have heightened interest in getting promising new safety technology into the mines quickly. The MINER Act addresses some of these issues, and underscores NIOSH's and MSHA's roles in developing and approving safety technologies. For example, the act requires NIOSH to establish a permanent Office of Mine Safety and Health in order to enhance the development of new mine safety technology and speed the use of such technology in the mines, some of which requires MSHA's approval. The act also requires NIOSH to study the use of refuge chambers for miners that are unable to escape a mine during a disaster and requires MSHA to review the results to determine what actions, such as making regulatory changes, are appropriate in light of NIOSH's findings. NIOSH and MSHA are now working together to fulfill their responsibilities within the time frame required by the act.[33] NIOSH also must establish an interagency working group made up of representatives of other federal agencies selected by NIOSH to share technology research and developments that could enhance mine safety and accident response. The group is to recommend technologies for further development to the Director of NIOSH and issue a report on safety technologies and equipment that have been studied, tested, and certified for use in the past year.

---

## **MOST PENALTIES ASSESSED BY MSHA ARE PAID WITHOUT OPPOSITION, BUT MANY OF THOSE APPEALED ARE REDUCED SUBSTANTIALLY**

Most of the penalties proposed by MSHA are paid by mine operators without opposition. However, a small percentage of more serious and higher-dollar penalties are appealed, and many of those appealed are reduced substantially. MSHA uses a standard formula to propose penalties, but the entities involved in the appeals process reported using more subjective methods to assess penalties. MSHA proposes penalties using a standard formula established in its regulations designed to assess higher penalties for more serious violations. However, the entities involved in the appeals process—Labor’s Office of the Solicitor, MSHA’s conference litigation representatives, [34] and the Commission’s administrative law judges—recognize that their methods for determining penalty amounts are more subjective than MSHA’s standard formula. As a result, while MSHA’s standard formula and the proposed penalties it calculates using the formula are transparent, it is sometimes more difficult to determine how final penalty amounts were determined through the appeals process.

### **MSHA Uses a Standard Formula to Calculate Penalties, and Recent Changes Are Expected to Increase Them**

Through the regulatory process, MSHA has developed a standard formula to calculate proposed civil penalties. In order to determine the amount of a proposed penalty, the agency uses a standard formula that assigns point values to each of the six broad factors outlined in the Mine Act.[35] Through this formula, two of the six factors—whether the operator was negligent and the gravity of the violation—carry the greatest weight in deciding the amount of the proposed penalty. MSHA inspectors are responsible for identifying the magnitude of these two elements during their inspections.[36] To determine negligence, the inspector must rate the operator’s failure to provide adequate care to ensure the safety of miners on a scale from “no negligence” to “reckless disregard.” To determine the gravity of the violation, the inspector must determine (1) the likelihood of harm that could come to miners, (2) the severity of any possible or actual injury or illness, and (3) the potential or actual number of miners that could be affected.

After an inspector issues a citation and makes an initial finding regarding the levels of gravity and negligence involved in the violation, MSHA’s Office of Assessments determines the magnitude of the remaining four factors and tallies the points for each of the six factors to determine the proposed penalty amount. Because MSHA’s standard formula assigns greater points to gravity and negligence than the other four statutory factors, the application of the formula generally results in larger penalties being proposed for violations involving higher levels of gravity and negligence. Between 1996 and 2006, MSHA proposed 506,707 penalties for safety and health violations, and the average penalty was \$234 per violation. Table 4 details the range of average penalties, by degree of gravity and negligence, proposed by MSHA from 1996 through 2006.

**Table 4. Average Proposed Penalty by Gravity and Negligence Indicators, 1996 to 2006**

Elements of gravity and negligence	Percentage of citations issued	Average proposed penalty
Gravity of violation <sup>a</sup>		
<i>Likelihood of accident</i>		
Accident occurred	0.2%	\$12,324
Highly likely to occur	0.9%	\$2,362
Reasonably likely to occur	38.6%	\$367
Unlikely to occur	55.5%	\$74
No likelihood	2.4%	\$168
Total	97.6% <sup>b</sup>	
<i>Potential injury or illness</i>		
Fatal	3.5%	\$1,185
Permanent injury	7.4%	\$569
Lost days	62.4%	\$202
No lost work days	24.4%	\$77
Total	97.7% <sup>b</sup>	
<i>Number of miners affected</i>		
0-1 miners	82%	c
2-5 miners	10.8%	c
6-9 miners	4.5%	c
10 or more miners	2.7%	c
Total	100.0%	
Negligence by mine operator		
Reckless	0.1%	\$8,458
High	3.5%	\$1,757
Moderate	84.3%	\$179
Low	9.4%	\$91
None	0.3%	\$454
Total	97.6% <sup>b</sup>	

Note: These data represent the points accumulated under the former assessment process. MSHA expects its new regulations to result in higher proposed penalty amounts for each of these categories.

<sup>a</sup> Each subelement of gravity is an exclusive category.

<sup>b</sup> Percentage does not add to 100 due to a small amount of missing data.

<sup>c</sup> We did not calculate the average proposed penalty for the number of miners, because most (75 percent) of the violations involved only one miner.

Source: GAO analysis of data MSHA penalty and violation data.

MSHA recently changed its regulations governing civil penalty assessments to update them and increase proposed penalty amounts, and to implement the new civil penalty requirement of the MINER Act. The new regulations increase the points for most of the six statutory factors, and MSHA officials predicted that the new penalty structure will increase total penalty assessments by 234 percent. For example, these changes will increase the maximum points allotted for gravity from 30 to 88 points. MSHA officials asserted that these changes will likely lead to greater rates of compliance and subsequently a safer working environment for the nation's miners. As required by the rule-making process, MSHA conducted an economic analysis to measure the costs and benefits of the new regulations. In its analysis, MSHA estimated that if these changes had been in effect in 2005, the total violations for all mine types would have declined by 20 percent, from 116,673 to 93,422 violations.[37] See table 5 for an example of how MSHA would determine the penalty for a



certain violation based on the six statutory factors under the previous and new penalty formulas.

**Table 5. Example of How a Proposed Penalty Amount Could Be Determined Based on the Previous and Revised Standard Penalty Formulas**

Statutory factor	Points under previous formula	Points under new formula
Operator's history of previous violations		
Mine had an average of about one violation per inspection day	8	10
Mine had 10 repeat violations in prior 15 months and averaged 0.04 repeat violations per inspection day	a	5
Operator's size		
Mine produced over 2 million tons of coal per year	10	15
Company owning mine produced over 10 million tons of coal per year	5	10
Negligence		
Moderate	15	20
Gravity		
<i>Likelihood of accident</i>		
Highly likely to occur	7	40
<i>Severity of injury or illness</i>		
Lost work days	3	5
<i>Number of miners affected</i>		
2 miners	2	2
Total points under previous and new formula	50	107
Total penalty under previous and new formula	\$878	\$4,810

Note: This example assumes that the penalty will not affect the operator's ability to remain in business, and therefore does not account for a reduction for this factor. In addition, this example assumes the mine operator does not get a good faith reduction in the penalty.

<sup>a</sup> MSHA's new regulations added this as an additional element of the factor for the operator's history of previous violations.

Source: GAO analysis of MSHA data.

**Many Contested Penalties Are Reduced Substantially Regardless of the Gravity of the Violation and the Degree of the Operator's Negligence**

Many of the proposed penalties contested by mine operators are reduced substantially through the appeals process, despite the initially determined gravity of the violation and the initially determined degree of the operator's negligence contributing to the violation. Between 1996 and 2006, approximately 6 percent (31,589) of the penalties proposed by MSHA for violations of underground coal mine safety and health standards were contested by mine operators. Our analysis of MSHA's penalty data showed that over the last 10 years, the amounts of the proposed penalties contested by mine operators were typically much larger than those not contested and involved more serious health and safety violations. For example, the average amount of a contested penalty was \$1,107, compared to an average of \$176 for a noncontested penalty, and more than half of all contested penalties were for the most serious violations.[38]

Almost half of all penalties contested by underground coal mine operators are reduced through the appeals process, even those involving the highest levels of gravity and negligence. From 1996 to 2006, 47 percent of all contested penalties (14,723 penalties) were decreased from the amount originally proposed by MSHA. On average, these penalties were reduced by about half of the amount initially proposed by MSHA using its standard formula. In addition, regardless of the levels of gravity and negligence found by MSHA's inspectors, penalties were reduced, on average, between 47 percent and 66 percent. Proposed penalties assessed by MSHA based on the highest and lowest levels of gravity and negligence found by MSHA inspectors were reduced by the greatest amounts (see table 6).

**Table 6. Contested Penalty Reductions by Gravity and Negligence Indicators, 1996 to 2006**

Elements of gravity and negligence <sup>a</sup>	Percentage of contested penalties that were reduced	Average percentage reduction
Gravity of violation		
<i>Likelihood of accident<sup>b</sup></i>		
Accident occurred	63.5%	59%
Highly likely to occur	65.5%	49%
Reasonably likely to occur	51.3%	47%
Unlikely to occur	32.4%	54%
No likelihood	45.7%	66%
<i>Potential injury or illness<sup>b</sup></i>		
Fatal	59.4%	52%
Permanent injury	57.4%	47%
Lost days	46.5%	48%
No lost work days	31.2%	57%
<i>Number of miners affected<sup>b</sup></i>		
0-1 miners	c	c
2-9 miners	c	c
10 or more miners	c	c
Negligence by mine operator <sup>b</sup>		
Reckless	68.8%	55%
High	61.4%	50%
Moderate	43.6%	48%
Low	50.9%	49%
None	55.8%	57%

<sup>a</sup> Initial penalty proposals are based on the findings from mine inspections and are calculated using MSHA's standard formula. The entities involved in the appeals process may have altered the inspectors' findings, which could lead to a reduction in the penalty amount.

<sup>b</sup> Percentages may not add to 100 due to rounding or a small amount of missing data.

<sup>c</sup> We did not calculate the average proposed penalty for the number of miners, because most (75 percent) of the violations involved only one miner.

Source: GAO analysis of MSHA data.

---

## **Entities Involved in the Appeals Process Apply the Statutory Factors to Determine Penalty Amounts, but Exercise Considerable Discretion**

While all of the entities involved in the appeals process—Labor’s Solicitor’s Office, MSHA’s CLRs, and the Commission’s ALJs—are required by law to apply the six statutory factors specified in the Mine Act, they are not legally obligated to use any particular method to set a final penalty amount when they determine that a reduction from MSHA’s proposed penalty is appropriate. As a result, they have considerable discretion in deciding on the final penalty amount. Prior decisions by the Commission require ALJ decisions to be sufficiently explained.[39] However, in some cases we reviewed, while the reasons supporting a reduction from MSHA’s proposed penalty are clearly explained, the rationale for the final penalty amount is not always well documented.

Officials from all three of the entities involved in the appeals process told us that, in determining the size of a final penalty, they apply the six statutory factors on a case-by-case basis and use their professional judgment. For example, officials from the Solicitor’s Office and CLRs told us that, when appropriate, the Department of Labor generally views penalty settlements as being in the best interest of both the agency and the mine operators because settlements allow them to avoid costly litigation.[40] Attorneys from the Solicitor’s Office also told us that they analyze the evidence presented by MSHA inspectors and mine operators and assess their chances of winning the case in deciding whether to settle a penalty or go to trial. For example, one attorney told us that many of the penalty amounts contained in settlement agreements are generally the result of negotiations between the Solicitor’s Office and the mine operator. In commenting on a draft of this report, MSHA and the Solicitor’s Office said that CLRs and attorneys may concede somewhat on the penalty amount in some settlement cases as long as future compliance with the standard, or another valid enforcement objective, is agreed to by the mine operator.

Labor officials told us that, when the CLR program was created, CLRs were expected to handle approximately 30 percent of all contested cases. However, our analysis of the CLRs’ caseloads indicated that, as of January 2006, they were assigned only 14 percent of all open cases contested by mine operators. According to the CLRs, they generally take a similar approach to that taken by attorneys with the Labor Solicitor’s Office in negotiating settlements. Both CLRs and Solicitor’s Office staff told us that they are encouraged to use MSHA’s standard formula to assess penalty amounts but using the formula is not required and is not standard practice. When the Solicitor’s Office or a CLR is unable to negotiate a settlement or determines that it would not be appropriate to settle, the case goes to trial and an ALJ determines the final penalty amount. Several ALJs told us that they review the evidence provided by MSHA but the process for determining the final penalty amount relies greatly on their experience and expertise.

In general, while the reasons supporting a reduction from MSHA’s proposed penalty are clearly explained in ALJ decisions, the rationale for the final penalty amount is not always well documented. For example, in one case decided in October 2005, the ALJ reduced MSHA’s proposed penalty from \$50,000 to \$10,000.[41] Although the judge concluded that the gravity of the violation was less than MSHA had originally found, thereby supporting a penalty reduction, he appeared to agree with MSHA’s assessment regarding the other five statutory factors, including MSHA’s finding that the operator’s degree of negligence was high.[42]

---

## CONCLUSIONS

The risky conditions in underground coal mines were brought to the nation's attention early in 2006, and the sad consequences have become a reality for many Americans. As MSHA embarks on the reforms outlined in the MINER Act and other internal efforts to improve the safety of mines, it faces hurdles that will need to be overcome in order to assist the mining industry as it bears the daily responsibility for the safety and health of America's miners. The mining industry is changing: production continues to increase, technologies are evolving, and new workers are entering the mines to replace their experienced colleagues who are retiring. These changes call for a greater attention to safety from all entities involved—federal and state officials, mine operators, miners, and their representatives. Without adequate training, including practice using safety devices in simulated emergency conditions, miners may be unable to safely and confidently escape a mine. Further, absent adequate monitoring of instructors who provide this training, MSHA cannot determine whether all of its instructors are properly qualified or whether it has enough instructors to meet its needs. Perhaps most important, MSHA is unable to determine whether miners receive timely and appropriate training.

The social, economic, and technological changes in the mining industry present challenges that will be difficult, if not impossible, for MSHA to address alone. MSHA and NIOSH have complementary roles, particularly in developing and approving technologies to help improve mine safety, and face similar challenges such as high rates of retirements. Yet, without having a more structured method of coordination, their shared knowledge base and research cannot be used to effectively speed the implementation of new safety technology in mines.

Finally, given the trends over the past 10 years for penalties contested by mine operators, the higher proposed penalties under MSHA's new penalty structure will likely lead more operators to appeal. This reaction is also likely to increase the number of cases that are settled by Labor's Solicitor's Office, MSHA's CLRs, and the ALJs at the Commission using methods to determine final penalty amounts that are more subjective than penalties proposed using MSHA's standard formula. As a result, it is important that penalty decisions are transparent and contain the necessary information to understand how final penalty amounts are set. Without such information, it will be difficult to monitor their decisions over time to ensure that all of the entities involved in the appeals process are appropriately and consistently applying the six statutory factors in altering penalty amounts and that the impact of penalties in protecting miners' safety through greater compliance by mine operators is not diminished.

## RECOMMENDATIONS FOR EXECUTIVE ACTION

To help mines train their workers under simulated emergency conditions, the Secretary of Labor should direct MSHA to publicize information and available tools for training mine workers under such conditions. In addition, MSHA should periodically review and update this information, as appropriate.

To help ensure that mine workers are adequately prepared for emergencies, MSHA should strengthen its monitoring of training. This monitoring should include

- reviewing and standardizing districts' procedures for approving new instructors;
- establishing continuing education requirements for instructors to help instructors maintain or improve their knowledge and skills;
- improving the data in its records on approved instructors; and
- developing a process for monitoring miner training that includes regularly evaluating training sessions, assessing how well learning objectives are being met, and providing feedback to instructors.

To improve the effectiveness of information sharing between MSHA and NIOSH, we recommend that the Secretaries of Labor and Health and Human Services direct their respective agencies to work together to establish a formal memorandum of understanding to guide their coordination. In addition, the agencies should periodically review and update the memorandum, as appropriate.

In order to ensure that there is transparency in penalty determinations, we recommend that the Department of Labor's Office of the Solicitor, MSHA, and the Commission take steps to ensure that the specific rationale for all final penalty amounts, including reductions from MSHA's proposed penalties, are adequately documented.

## AGENCY COMMENTS

We obtained comments on a draft of this report from MSHA, the Department of Labor's Office of the Solicitor, the Department of Health and Human Services, and the Federal Mine Safety and Health Review Commission. Their comments are reproduced in appendixes III, IV, and V. MSHA and the Solicitor also provided technical clarifications, which we incorporated as appropriate.

MSHA, the Office of the Solicitor, the Department of Health and Human Services, and the Federal Mine Safety and Health Review Commission agreed with the recommendations addressed to each of their organizations. In addition, MSHA noted actions it has either begun or plans to take in implementing the recommendations. We commend MSHA for starting work to improve its oversight of the safety of underground coal mines.

In response to our recommendation that MSHA publicize and periodically update information on training mine workers under simulated emergency conditions, MSHA agreed, and stated that it will develop a Web page for this purpose and will issue an information bulletin to mine operators about this Web-based resource. To provide mine operators with additional options, MSHA noted that it has asked NIOSH to examine methods of providing simulated emergency training and to consider the cost of these methods.

In response to our recommendation that MSHA strengthen its monitoring of miner training, MSHA generally agreed and indicated that it will develop and implement standardized procedures for approving new instructors. In addition, it will develop an instructor evaluation plan to use in determining the effectiveness of training provided to miners. Regarding establishing continuing education requirements for approved instructors,

MSHA indicated that it has asked NIOSH to review the effectiveness of such requirements. MSHA noted that this action may require regulatory changes. MSHA also explained that there are other avenues that instructors can use to stay current on mining issues, such as attending an annual conference dedicated to training resources for the industry. MSHA also recognized the need to improve the data it maintains on instructors and noted that it has plans to improve its tracking and dissemination of up-to-date information on approved instructors.

In response to our recommendation that MSHA and NIOSH develop a memorandum of understanding, both agencies concurred with the need for a formal agreement and stated that such an agreement will help strengthen their coordination activities. MSHA noted that both agencies started the process of developing a memorandum of understanding in 2002 and stated that it will work with NIOSH to revitalize this effort and complete the process.

MSHA, Labor's Office of the Solicitor, and the Commission agreed with our recommendation for improving the penalty appeals process. Each of them agreed that there needs to be transparency in penalty determinations and that the specific rationale need to be provided when penalties are reduced from the levels originally proposed. MSHA and the Solicitor agree that transparency is essential to ensure public confidence that the purposes of the Mine Act are fulfilled and that administration of the Mine Act is fair. They commented that they would formally remind CLR's and attorneys to ensure that the rationale for each civil penalty agreement is adequately documented in settlement agreements and case file notes. They also commented that internal audits of the CLR program have emphasized the need for adequate documentation to support settlement agreements.

In respect to our characterization of the Washbash Mine Holding Co. case, the Commission disagreed with GAO's conclusions. We agree with the Commission that the reasons supporting the reduction are clearly explained. However, we continue to believe that the rationale for the final penalty amount was not well documented. In our analysis, we could not discern the specific reasons why the judge determined that \$10,000 was the appropriate fine.

We are sending copies of this report to the Secretaries of Labor and Health and Human Services, the Chief Commissioner of the Federal Mine Safety and Health Review Commission, relevant congressional committees, and other interested parties. Copies will be made available to others upon request. In addition, the report will be available at no charge on GAO's Web site at <http://www.gao.gov>. Please contact me at (202) 512-7215 if you or your staff have any questions about this report. Other major contributors to this report are listed in appendix VI.



Daniel Bertoni Director, Education, Workforce, and Income Security Issues

*List of Congressional Requesters*

The Honorable Robert C. Byrd Chairman Committee on Appropriations U. S. Senate

The Honorable Edward M. Kennedy Chairman The Honorable Michael B. Enzi Ranking Member Committee on Health, Education, Labor, and Pensions U. S. Senate

The Honorable Tom Harkin Chairman The Honorable Arlen Specter Ranking Member Subcommittee on Labor, Health and Human Services, Education and Related Agencies Committee on Appropriations U. S. Senate

The Honorable Patty Murray Chair The Honorable Johnny Isakson Ranking Member Subcommittee on Employment and Workplace Safety Committee on Health, Education, Labor, and Pensions U. S. Senate

The Honorable George Miller Chairman Committee on Education and Labor House of Representatives

The Honorable John D. Rockefeller IV U. S. Senate

The Honorable Shelley Moore Capito House of Representatives

The Honorable Alan B. Mollohan House of Representatives

The Honorable Nick Rahall House of Representatives

## **APPENDIX I: SCOPE AND METHODOLOGY**

To conduct this work, we reviewed relevant statutes, regulations, policy documents, decisions issued by the Commission and its administrative law judges (ALJ), and other materials. We spoke with Mine Safety and Health Administration (MSHA) officials in 6 of the 11 districts, including inspectors, conference litigation representatives (CLR), and district managers; and officials from the headquarters office, the National Mine Health and Safety Academy, Educational Policy and Development, the Educational Field Services, and certified trainers. We met with representatives from the Office of the Solicitor, including officials in the headquarters and regional offices, and interviewed the Chairman of the Federal Mine Safety and Health Review Commission, its Chief ALJ, and other Commission officials. Finally, we spoke with officials from universities, a technology manufacturer, the United Mine Workers of America, the National Mining Association, and the Joseph A. Holmes Safety Association.

We visited three states to obtain more detailed and qualitative information regarding the experiences of state mine safety agencies, mine operators, and MSHA district offices in our research objectives. We conducted visits in Kentucky, Virginia, and West Virginia. In Kentucky, we met with state and MSHA district officials. In addition, we observed a mine rescue competition where we conducted interviews with mine rescue team members. In Virginia and West Virginia, we met with state and MSHA district officials. In addition, we visited three underground coal mines to observe mining operations and to talk with mine managers, mine rescue team members, and mine workers. We also spoke with state officials in Pennsylvania. These four states contain almost 90 percent of all underground coal mines in the United States. Finally, we met with researchers and other officials at the technical research centers operated by MSHA and the National Institute of Occupational Safety and Health (NIOSH).

---

## **SURVEY OF UNDERGROUND COAL MINES**

### **Study Population and Sampling Design**

To determine the current state of underground coal mines' operations and challenges in preparing for and responding to mine emergencies, we surveyed a stratified random probability sample of 342 underground coal mines from a study population of 665 underground coal mines identified by MSHA as being active at the end of calendar year 2005. We selected our sample by five strata defined by the number of mine employees and the number of mines under the responsibility of a single contact. We included the last stratum in an attempt to ease the burden on the survey respondents. Close to 40 percent of the mines selected in the sample were out of scope for analysis due to closure by the time our survey fieldwork ended. Information on the coal mine population, the sample selected, out-of-scope mines, and the respondents across the five strata can be found in table 7. Ultimately, we received 146 completed, in-scope surveys, for an adjusted response rate of 69 percent.

### **Survey Development**

To inform the design of the survey questions, we consulted with mine officials, industry and labor organizations, and federal and state officials. In addition, we used documents and research about miner training and mine rescue. Finally, we referred to the recent mine evacuation regulations developed by MSHA and the Mine Improvement and New Emergency Response Act of 2006 to ensure we were collecting timely information on the operations at underground coal mines. A copy of the survey questionnaire can be found in appendix II.

To verify the clarity, length of time of administration, and suitability of the questions, we pretested the questionnaire with mine safety officials at three mines. We revised the instrument based on the results of the pretests and the feedback we received.

### **Administration of the Survey**

We used a self-administered mail-out questionnaire that was in the field between November 2006 and February 2007. We conducted several follow-up efforts to encourage a higher response rate: a reminder letter, a second mailing that included another copy of the questionnaire, and two efforts to contact nonrespondents by telephone. We ended data collection in February 2007.

### **Nonsampling Error and Data Quality**

The practical difficulties of conducting any survey may introduce errors, commonly referred to as nonsampling errors. For example, difficulties such as how a particular question was interpreted or in the sources of information that are available to respondents can introduce unwanted variability into the survey results. We took steps in the development of the questionnaire, the data collection, and the data analysis to minimize these nonsampling errors.



**Table 7. Sample Disposition for Survey of Underground Coal Mines**

Stratum number	Stratum description	Total population size	Total sample size	Number in sample that were out of scope	Number of respondents	Adjusted response rate for in-scope mines (percent)
1	Mine employs between 1 and 16 workers	180	88	48	26	65
2	Mine employs between 17 and 36 workers	152	82	38	30	68
3	Mine employs between 37 and 199 workers	147	78	25	36	68
4	Mine employs 200 or more workers	49	49	6	34	79
5	Mine shares contact point with at least four other mines	137	45	16	20	69
Total		665	342	133	146	69a

<sup>a</sup>Total adjusted response rate is an average based on each stratum's response rate weighted by its in-scope population.

Source: GAO analysis of MSHA data.

In addition to pretesting the questionnaire with relevant individuals to ensure questions were interpreted in a consistent manner, we edited all the surveys for consistency before they were sent for keypunching. All questionnaire responses were entered into our database and a random sample of the questionnaires was further verified for completeness and accuracy. In addition to the steps taken during the development of the survey and its administration, we performed computer analyses to identify inconsistencies and other indicators of errors. We established parameters for addressing inconsistent responses that included calling the respondent for clarification or treating the data as missing. In addition, all the computer syntax was peer-reviewed and verified by separate programmers to ensure that it was written and executed correctly.

## **Estimates**

Estimates in this report are for the population of underground coal mines in the United States that were in operation at the end of 2005 and remained open during the course of the survey. Due to mine closure, some mines are not represented in these results. We found that smaller mines were more likely to have ceased operation than larger mines. Therefore, it is possible that different safety practices and challenges may exist for mines that closed.

## **Sampling Errors**

The results of random samples like ours are subject to sampling errors that reflect the differences between the results obtained from the samples and the results that would have been obtained from a survey of the entire population under consideration. Because we surveyed a sample of underground coal mines, our results are estimates of the characteristics of this population and thus are subject to the sampling errors associated with samples of this size and type.


Measurements of sampling errors are stated at a certain level of statistical confidence. GAO used the weighted results to make estimates about the entire population of underground coal mines. Our confidence in the precision of the results from this sample is expressed in 95 percent confidence intervals, which are intervals that are expected to contain the actual population values for 95 percent of the samples we could have drawn. As a result, we are 95 percent confident that each of the confidence intervals in this report will include the true values in the in-scope population. All percentage estimates for our sample have margins of error—widths of confidence intervals—of plus or minus 8 percentage points or less, at the 95 percent confidence level.

## **CITATION AND PENALTY DATA**

To determine the average of proposed penalty amounts, the number of penalties contested, and the amount of the final penalties assessed on mine operators, as well as other violation information, we obtained data from the Mine Safety and Health Administration. We used data maintained in the MSHA Standardized Information System (MSIS). The data represent violations issued to mine operators and the associated actions taken on those violations (such as the proposed penalty, if the operator contested the violation, and if the final penalty was reduced) between January 1996 and October 2006.

To assess the reliability of the data, we (1) performed electronic testing of the relevant data elements, (2) reviewed related documentation, and (3) interviewed and worked closely with officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of this report.

## APPENDIX II: SURVEY OF UNDERGROUND COAL MINES

	<p style="text-align: center; margin: 0;"><b>United States Government Accountability Office</b></p> <p style="text-align: center; margin: 0;"><b>Survey of Underground Coal Mines</b></p>
<p><b>Introduction</b></p> <p>The U.S. Government Accountability Office (GAO)—the research arm of Congress—is conducting a survey of underground coal mines. Your responses will provide GAO with the necessary information to inform Congress about the current state of mines’ operations and the challenges mines face in preparing for and responding to mine emergencies. In addition, we will report to Congress on mines’ abilities to respond to new requirements set out in the <i>Emergency Temporary Standard</i> issued by the Mine Safety and Health Administration (MSHA) and the <i>Mine Improvement and New Emergency Response Act of 2006</i> (MINER Act).</p> <p style="padding-left: 40px;">This survey is <u>not affiliated</u> with requests for information from MSHA or any other efforts MSHA is conducting to implement the MINER Act or other regulatory changes.</p> <p><b>We ask that you provide responses for the mine identified by the MSHA Mine ID # below.</b> This mine was selected as part of a random sample of underground coal mines in the U.S.</p> <p>Responses will be reported in the aggregate only and will not be attributed to any specific mine in our report. To assist us, we ask that you complete and return the survey within <u>one week</u> of the date you receive it. When responding, you may wish to consult with others who are familiar with these topics, such as mine rescue team coordinators.</p> <p>In the event the envelope is misplaced, the return address is: U.S. Government Accountability Office, P.O. Box 50654, Washington, DC 20077-0075; Attention: Delores Hemsley. If you have any questions about this questionnaire, please call or e-mail Joel Green at (415) 904-2148 (<a href="mailto:GreenJ@gao.gov">GreenJ@gao.gov</a>) or Sara Schibanoff at (202) 512-4176 (<a href="mailto:SchibanoffS@gao.gov">SchibanoffS@gao.gov</a>).</p> <p>Thank you for your assistance.</p> <p><b>Contact Information</b></p> <p>Please provide the following information for the individual coordinating the completion of this survey so that we may contact him/her to clarify any responses, or obtain additional information, if necessary.</p> <p>Name: _____</p> <p>Title: _____</p> <p>Mine Name: _____</p> <p>Telephone Number: (        )        - _____</p> <p>Email address: _____ @ _____</p> <p>MSHA Mine ID # _____</p>	
1	

**Mine Workers**

- 1. How many employees and contractors are currently employed at your mine? Include full- and part-time workers in your counts.**

\_\_\_\_\_ Employees

\_\_\_\_\_ Contractors

- 2. Typically, how many mine workers are underground per shift?**

\_\_\_\_\_ workers per shift

- 3. Does your mine currently use the practice of “hot seating” at the change of shifts when mine workers from overlapping shifts are underground at the same time?**

Yes.....

No .....

**4. A. In calendar year 2006, has your mine conducted mine emergency evacuation drills with your mine workers?**

Yes.....  →

No.....  *(please skip to question 10)*

**B. If yes, how many emergency evacuation drills have you conducted?**

\_\_\_\_\_ Emergency evacuation drills

**C. When was the most recent evacuation drill conducted?**

\_\_\_\_\_/\_\_\_\_\_(Month/day)

**D. Was an MSHA representative present at any of the emergency evacuation drills conducted in calendar year 2006?**

Yes .....

No.....

Do not know.....

**5. How was the most recent evacuation drill conducted?**

*Please select one*

Mine workers exited the mine riding on the man trip.....

Mine workers exited the mine on foot .....

Mine workers used a combination of riding on the man trip and walking to exit the mine on foot .....

Other, please describe below: .....

**6. During the evacuation drills conducted in calendar year 2006, how many mine workers practiced donning their self contained self rescuers (SCSRs)?**

- None of them.....       **→ Please skip to question 10**
- Some of the them .....
- Most of the them .....
- All of the them .....

**7. In calendar year 2006, how many mine workers performed the following activities during exercises with SCSRs?**

	None of them ▼	Some of them ▼	Most of them ▼	All of them ▼
a. Opening the unit.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Donning nose clips.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Inserting the mouthpiece.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Starting the device .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Operating the device .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Other, please describe below: .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



11. In calendar year 2006, has your mine conducted an exercise in which your mine workers practiced taking off one SCSR and donning another SCSR of the same model?

Yes .....   
No .....

—————> If yes, please describe how this training was conducted:

12. In calendar year 2006, has your mine conducted an exercise in which your mine workers practiced taking off one SCSR and donning another SCSR of a different model?

Yes .....   
No .....

—————> If yes, please describe how this training was conducted:

13. Does your mine have directional lifelines installed for emergency evacuation?

Yes .....   
No .....

—————> If yes, are the directional lifelines fire resistant?

Yes .....   
No .....

—————> If no, please explain why directional lifelines have not been installed:



**14. Some mines have conducted drills in environments that simulate actual emergency situations. In calendar year 2006, have you conducted any emergency drills in simulated environments?**

Yes.....

No .....  *If no, please skip to question 16*

**15. If you have you conducted emergency drills in simulated environments, please provide examples of the types of activities included in these exercises for the following scenarios: (Attach additional pages if necessary)**

**Fire**

**Explosion**

**Gas inundation**

**Water inundation**

**Other, please describe:**

**16. During calendar year 2006, did your mine conduct the following activities to assess mine workers knowledge or skills after they participated in mine worker emergency training?**

*Please answer "yes" or "no" to each item*

	Yes ▼	No ▼
a. Mine worker completes evaluation form eliciting feedback about instructor/instruction .....	<input type="checkbox"/>	<input type="checkbox"/>
b. Mine worker completes written test.....	<input type="checkbox"/>	<input type="checkbox"/>
c. Mine worker completes oral test.....	<input type="checkbox"/>	<input type="checkbox"/>
d. Mine worker demonstrates ability to instructor .....	<input type="checkbox"/>	<input type="checkbox"/>
e. Obtain feedback from mine worker's supervisor on knowledge or skills gained.....	<input type="checkbox"/>	<input type="checkbox"/>
f. Other, please describe:.....	<input type="checkbox"/>	<input type="checkbox"/>

**17. To what extent do the following areas related to mine workers currently pose a challenge to your mine in preparing for and responding to mine emergencies, if at all?**

	Not a challenge ▼	A minor challenge ▼	A moderate challenge ▼	A major challenge ▼	Not applicable ▼
a. Preparing mine workers to use SCSRs for escape .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Familiarizing mine workers with escape routes.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Training mine workers in first responder-type activities, such as fire fighting techniques.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. The loss of experienced mine workers due to retirements .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. The amount of time needed to train new mine workers.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. The availability of training centers that can simulate an emergency situation .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. The availability of training in a simulated mine emergency situation ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. The availability of certified instructors who can conduct simulated mine emergency training.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. The cost associated with simulated mine emergency training .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Other, please describe:.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9

**Mine Rescue Teams**

**18. How many mine rescue teams do you currently have available to you?**

\_\_\_\_\_ Teams

**19. What are the names of your current mine rescue teams? Please refer to the two primary teams that you use (i.e. the two that you report to MSHA).**

a) Team #1 \_\_\_\_\_

b) Team #2 \_\_\_\_\_

*Note: For the remainder of the survey, you will be asked to answer questions about these two teams (e.g. "Team 1", "Team 2"). Please refer to the teams as you have identified them in Question 19 when answering these questions.*

**20. A. Which of the following best describes the composition of your *current* mine rescue Team #1?**

*Please check one*

- a. Comprised of mine workers from your mine whose primary responsibilities are to serve only your mine .....
- b. Comprised of state employees.....
- c. Comprised of mine workers from multiple mines owned by *different* operators (may or may not be state-sponsored/designated) .....
- d. Comprised of mine workers from multiple mines owned by the *same* operator (may or may not be state-sponsored/designated).....
- e. Comprised of members with underground coal mine experience and organized through a third-party vendor .....
- f. Other, please describe: .....

**B. For question 20A above, if you selected “c” or “d,” is Team #1 state-sponsored/designated or not?**

- Yes, it is state-sponsored or designated.....
- No, it is not state-sponsored or designated.....
- Do not know .....
- Not applicable .....

**21. A. Which of the following best describes the composition of your *current* mine rescue Team #2?**

*Please check one*

- a. Comprised of mine workers from your mine whose primary responsibilities are to serve only your mine .....
- b. Comprised of state employees .....
- c. Comprised of mine workers from multiple mines owned by *different* operators (may or may not be state-sponsored/designated).....
- d. Comprised of mine workers from multiple mines owned by the *same* operator (may or may not be state-sponsored/designated) .....
- e. Comprised of members with underground coal mine experience and organized through a third-party vendor .....
- f. Other, please describe: .....

**B. For question 21A above, if you selected “c” or “d,” is Team #2 state-sponsored/designated or not?**

- Yes, it is state-sponsored or designated.....
- No, it is not state-sponsored or designated.....
- Do not know .....
- Not applicable .....

**22. During calendar year 2006, on average, how many hours will each mine rescue team member have participated in training** (include any training planned for the remainder of the year)? *Please make an estimate if you do not have an exact number, and include classroom and participation in training exercises in your estimate.*

*Please check one*

- a) Team #1? 12 to 23 hours .....   
 24 to 47 hours .....   
 48 to 63 hours .....   
 Over 64 hours .....   
 Do not know .....

*Please check one*

- b) Team #2? 12 to 23 hours .....   
 24 to 47 hours .....   
 48 to 63 hours .....   
 Over 64 hours .....   
 Do not know .....

**23. In calendar year 2006, has the amount of training your mine rescue teams participated in or planned increased, decreased, or stayed the same in comparison to calendar year 2005?**

a) Team #1? Stayed the same.....  Please explain why any changes occurred:  
 Increased.....  →  
 Decreased .....  →

b) Team #2? Stayed the same.....  Please explain why any changes occurred:  
 Increased.....  →  
 Decreased .....  →

24.

A. In calendar year 2006, did either of your mine rescue teams participate in mine rescue competitions?	B. How much time, on average, did the team spend preparing for these competitions?	C. Is preparation for mine rescue competitions part of fulfilling the annual training requirements for your teams or is it additional training?
<p>a) Team #1 <span style="float: right;"><i>Please check one</i></span></p>		
Yes .....	<input type="checkbox"/> → 8 hours or less .....	<input type="checkbox"/>
No.....	<input type="checkbox"/> → Between 9 to 16 hours.....	<input type="checkbox"/>
Do not know....	<input type="checkbox"/> → Between 17 and 24 hours...	<input type="checkbox"/>
	<input type="checkbox"/> → Between 25 and 40 hours...	<input type="checkbox"/>
	<input type="checkbox"/> → Between 41 and 80 hours...	<input type="checkbox"/>
	<input type="checkbox"/> → More than 80 hours .....	<input type="checkbox"/>
	<input type="checkbox"/> → Do not know .....	<input type="checkbox"/>
<p>b) Team #2 <span style="float: right;"><i>Please check one</i></span></p>		
Yes .....	<input type="checkbox"/> → 8 hours or less .....	<input type="checkbox"/>
No.....	<input type="checkbox"/> → Between 9 to 16 hours.....	<input type="checkbox"/>
Do not know....	<input type="checkbox"/> → Between 17 and 24 hours...	<input type="checkbox"/>
	<input type="checkbox"/> → Between 25 and 40 hours...	<input type="checkbox"/>
	<input type="checkbox"/> → Between 41 and 80 hours...	<input type="checkbox"/>
	<input type="checkbox"/> → More than 80 hours .....	<input type="checkbox"/>
	<input type="checkbox"/> → Do not know .....	<input type="checkbox"/>



**25. To what extent is each of the following factors a challenge, if at all, in your rescue teams' ability to prepare for and respond to mine emergencies?**

	Not a challenge ▼	A minor challenge ▼	A moderate challenge ▼	A major challenge ▼	Not applicable ▼
a. The number of mine rescue teams available to assist in the event of a mine emergency..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. The number of mine workers available to participate on mine rescue teams .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Loss of experienced team members due to retirements .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Amount of time needed to train and prepare new team members.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Access to practice facilities.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. The opportunity to participate in mine rescue competitions that simulate a real emergency situation .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. The opportunity to participate in training exercises that simulate a real emergency situation .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. The opportunity to conduct simulated activities that include all stakeholders that would be involved in an emergency (MSHA, state, union, and mine officials; rescue team; miners) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. The legal liability associated with assisting mines other than your own during emergencies.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. The funding required to train mine rescue teams .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. The funding required to equip mine rescue teams .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. The availability of up-to-date mine rescue technology and equipment .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Other, please describe: .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15

MSHA Assistance	
<b>26. Has your mine received any assistance from the Mine Safety and Health Administration (MSHA) on preparing for a mine emergency?</b>	
Yes .....	<input type="checkbox"/>
No.....	<input type="checkbox"/> <i>If no, please skip to question 28</i>
<b>27. If yes, please provide examples of the type of assistance you have received from MSHA on preparing for a mine emergency.</b>	
<div style="border: 1px solid black; height: 100px; width: 100%;"></div>	
<b>28. What do you think of the amount of assistance that MSHA provided your mine in preparing for a mine emergency?</b>	
They provided too much .....	<input type="checkbox"/>
The amount they provided is just right.....	<input type="checkbox"/>
They do not provided enough .....	<input type="checkbox"/>
	↓
<b>28 A. What additional assistance would you like to receive from MSHA to help your mine prepare for a mine emergency?</b>	
<div style="border: 1px solid black; height: 80px; width: 100%;"></div>	

MINER Act Provisions					
<p>The following questions ask about anticipated changes resulting from the MINER Act. Recognizing that guidance about specific provisions from the Act may not be available yet, please answer these questions to the best of your ability based on your current thinking. In addition, please answer only for anticipated changes resulting from the MINER Act as opposed to anticipated changes for other reasons.</p>					
<p><b>29. Which of the following provisions of the MINER Act will require changes, if any, to current practices at your mine?</b></p>					
	No change ▼	A minor change ▼	A moderate change ▼	A major change ▼	Not applicable ▼
a.					
<p>That mine rescue teams be available at the mine within one hour ground travel time from the mine rescue station .....</p>					
b.					
<p>That mine rescue teams participate at least annually in two local mine rescue contests .....</p>					
c.					
<p>That mine rescue teams train on a regular basis in the mines they are responsible for covering.....</p>					
d.					
<p>That the mine rescue team is knowledgeable about the operations and ventilation of the covered mines .....</p>					
e.					
<p>That certain mine rescue teams are comprised of individuals with a minimum of 3 years underground coal mine experience that occurred within the 10 years preceding their employment on the mine rescue team .....</p>					
g.					
<p>Other, please describe: .....</p>					

**30. A. Do you anticipate making changes to the composition of your mine rescue Team #1 as a result of provisions in the MINER Act? Please select the option that best describes your new team.**

*Please check one*

- a. New team will be comprised of mine workers from your mine whose primary responsibilities are to serve only your mine .....
- b. New team will be comprised of state employees .....
- c. New team will be comprised of mine workers from multiple mines owned by *different* operators (may or may not be state-sponsored/designated) .....
- d. New team will be comprised of mine workers from multiple mines owned by the *same* operator (may or may not be state-sponsored/designated) .....
- e. New team will be comprised of members with underground coal mine experience and organized through a third-party vendor .....
- f. No change.....
- g. Other, please describe: .....

**B. For question 30A above, if you selected “c” or “d,” do you anticipate Team #1 being state-sponsored/ designated or not?**

- Yes, it will be state-sponsored or designated .....
- No, it will not be state-sponsored or designated .....
- Not applicable.....

**31. A. Do you anticipate making changes to the composition of your mine rescue Team #2 as a result of provisions in the MINER Act? Please select the option that best describes your new team.**

*Please check one*

- a. New team will be comprised of mine workers from your mine whose primary responsibilities are to serve only your mine .....
- b. New team will be comprised of state employees .....
- c. New team will be comprised of mine workers from multiple mines owned by *different* operators (may or may not be state-sponsored/designated).....
- d. New team will be comprised of mine workers from multiple mines owned by the *same* operator (may or may not be state-sponsored/designated).....
- e. New team will be comprised of members with underground coal mine experience and organized through a third-party vendor.....
- f. No change.....
- g. Other, please describe: .....

**B. For question 31A above, if you selected “e” or “d,” do you anticipate Team #2 being state-sponsored/ designated or not?**

- Yes, it will be state-sponsored or designated .....
- No, it will not be state-sponsored or designated .....
- Not applicable.....

**32. In your opinion, in the event of an emergency, what should the requirement be for ground travel time between the mine rescue station and the mine?**

\_\_\_\_\_Hours

**32a. Please explain the factors you considered in selecting this amount of time:**

**Additional Comments**

**33. Do you have any other comments that you would like to share?**

**APPENDIX III :**  
**COMMENTS FROM THE DEPARTMENT OF LABOR**

**U.S. Department of Labor**

Mine Safety and Health Administration  
1100 Wilson Boulevard  
Arlington, Virginia 22209-3939



**MAY 01 2007**

Mr. Daniel Bertoni  
Director  
Education, Workforce, and  
Income Security Issues  
General Accounting Office  
441 G. Street, NW  
Washington, DC 20548

Dear Mr. Bertoni:

Thank you for the opportunity to comment on your draft report titled "Better Oversight and Coordination by MSHA and Other Federal Agencies Could Improve Safety for Underground Coal Miners" (GAO-07-622). We concur with the intent of your recommendations and our response is enclosed. Also included is an additional commentary which highlights sections of your report we believe require correction or clarification.

We look forward to continued dialogue with your staff regarding any additional corrective actions which may be required to resolve your recommendations. If you have any questions, please contact Brent Carpenter (MSHA) at (202) 693-9782 or Heidi Strassler (SOL) at (202) 693-9366.

Sincerely,

Richard E. Stickler  
Assistant Secretary of Labor for  
Mine Safety and Health

Jonathan L. Snare  
Acting Solicitor of Labor

GAO Recommendation

**To help [mine operators] train their workers under simulated emergency conditions, the Secretary of Labor should direct MSHA to publicize information and available tools for training mine workers under such conditions. In addition, MSHA should periodically review and update this information, as appropriate.**

MSHA Response

Through our website, MSHA will establish a "single-source" page identifying where operators may be able to obtain training facilities for simulated training (e. g. fire houses, simulated mines, military resources). This page will consolidate various information currently available on the MSHA web site, as well as incorporate subsequently released information. We will also issue a Program Information Bulletin (PIB) for mine operators to make them aware of the web site and the information available.

One example of MSHA publicizing useful information regarding emergency training involved the availability of self-contained, self-rescuer (SCSR) "expectation training models". By way of background, MSHA's Emergency Mine Evacuations Final Rule of December 8, 2006, included language requiring the donning of an SCSR in a simulated smoke filled environment. The Rule also provided for "expectations training" which requires breathing through a device that replicates the actual breathing experience of an SCSR. Likewise, in developing the Emergency Mine Evacuations Rule, MSHA asked the SCSR manufacturers to develop training models that would replicate the actual breathing experience of their live SCSR. The manufacturers complied with MSHA's request and on March 30, 2007, MSHA published in the *Federal Register* a notice alerting mine operators to the availability of realistic SCSR training units.

In an effort to provide mine operators additional training resources and options, MSHA's Office of Educational Policy and Development (EPD) recently requested that NIOSH conduct research to examine various methods of providing simulated mine emergency training. In particular, EPD asked NIOSH to identify practical approaches to this issue, recognizing that some simulated training may be somewhat cost prohibitive.



GAO Recommendation

**To help ensure that mine workers are adequately prepared for emergencies, MSHA should strengthen its monitoring of training. This monitoring should include:**

- **Reviewing and standardizing districts' procedures for certifying new instructors**

For clarification, MSHA *approves* instructors to conduct Part 48 training. Generally, MSHA reviews an instructor applicant's qualifications for "an ability to teach" and "subject knowledge." MSHA's Educational Policy and Development and Coal Mine Safety & Health will coordinate the development and implementation of standardized procedures to ensure consistency of this approval process.

- **Establishing continuing education requirements for instructors to help instructors maintain or improve their knowledge and skills;**

Through a variety of conferences and educational forums, MSHA approved instructors can enhance their health and safety knowledge and instructional skills. For example, the annual EPD-sponsored *Training Resources Applied to Mining Conference* is specifically designed for mine safety instructors and is attended by approximately 600 instructors from throughout the mining industry. In addition, MSHA partners with industry representatives in offering regional health and safety conferences. EPD sponsors an organization dedicated to the health and safety of our nation's miners and encourages participation by industry and labor in local and regional Association meetings. MSHA partners with this organization to provide materials/publications, such as Professional Miner newsletters and the Holmes Safety Association Bulletins.

Implementing a continuing education program for MSHA approved instructors may require a change in the existing regulatory standards. EPD has recently requested NIOSH to analyze the effectiveness of requiring a continuing education requirement for our approved instructors. MSHA will review options, including a potential regulatory revision, as we more fully consider this recommendation.

- **Improving the data in its records on certified instructors; and**

MSHA recognizes that the existing database of approved instructors needs to be updated. As a result, we have developed an initiative that involves MSHA's Educational Field Services Training Specialists and Small Mine Office Safety Specialists who have previous coal experience. The initiative includes a visit to each underground coal mine to determine that the mine safety and training staff (including contract and state grant trainers) are aware of mine specific training requirements. The visit will also include a review of the Part 48 and 75 training plans. This will help to determine that appropriate information and objectives are met and a sample survey of miners will be done to determine that the training is adequate and beneficial. The specialists have also been asked to inquire about the future training schedule so that follow up visits can be planned to further evaluate the training.

Additionally, we recognize the need for improvement in data collection. In the short-term, MSHA is developing a plan to create new electronic reports for tracking people who have been approved as instructors. MSHA is also working to improve instructor monitoring and tracking of instructor monitoring. The long-term process for creating the capability to update, maintain, and disseminate current instructor data includes the following sub-processes: development of business rules, completion of a cost-benefit analysis, creation of a funding request, identification of system requirements, identifying specifications, and developing code.

- **Developing a process for monitoring miner training that includes regularly evaluating training sessions, assessing how well learning objectives are being met, and providing feedback to certified instructors.**

MSHA intends to develop an instructor evaluation and feedback plan to determine the effectiveness of instruction. Through monitoring instructors, MSHA will assess the instructors' learning objectives and evaluation strategy to ensure that the training needs of the miners are met. As applicable, recommendations will be provided to the instructor after completion of the instructor monitoring. Finally, MSHA intends to explore the option of using individuals with requisite mine experience for the purpose of monitoring instructors.

GAO Recommendation

**To improve the effectiveness of information sharing between MSHA and NIOSH, we recommend that the Secretaries of Labor and Health and Human Services direct their respective agencies to work together to establish a formal memorandum of understanding to guide their coordination. In addition, the agencies should periodically review and update the memorandum, as appropriate.**

MSHA Response

We agree that a formal “memorandum of understanding” (MOU) between MSHA and NIOSH would serve to better guide coordination efforts and formalize working relationships. An effective MOU would set forth an understanding between MSHA and NIOSH on issues of coordination, communication, and cooperation, and would be periodically updated by the agencies when appropriate to revise procedures or update sections as needed. Starting in 2002, MSHA and NIOSH worked together to develop a draft MOU concerning the issues mentioned above, however, the document was never finalized and signed. MSHA plans to revitalize the MOU effort with NIOSH and bring it to closure.

GAO Recommendation

**In order to ensure that there is transparency in penalty determinations, we recommend that the Department of Labor’s Office of the Solicitor, MSHA, and the Commission take steps to ensure that the specific rationale for all final penalty amounts, including reductions from MSHA’s proposed penalties, are adequately documented.**

MSHA and Solicitor’s Office (SOL) Response

MSHA proposes penalty assessments in conformance with the procedures and tables listed in 30 C.F.R. part 100. That regulation sets out the factors to be considered and provides for notice of the proposed penalty assessment, which may be contested before the Federal Mine Safety and Health Review Commission (Commission). After the penalty is proposed, of course, MSHA and SOL sometimes decide to settle an alleged violation and its proposed penalty, based on several factors. Often, new factual information is found during the post-assessment discovery process, and the evidence necessary to support the violation is re-evaluated. Professional judgments are made regarding the strength of the evidence as applied to the cited standard and the likelihood of success at trial, including the likely amount of any final penalty which may be

imposed by the administrative law judge. MSHA and SOL agree that transparency in any resulting civil penalty settlement agreement is essential to ensure public confidence that the purposes of the Mine Act are fulfilled and that administration of the Mine Act is fair. Under the Mine Act, every time the parties reach a settlement agreement, it must be submitted to the Commission, which is independent, for approval. Because the Mine Act requires Commission approval of settlement agreements, and because the Commission will only approve a settlement agreement if it determines that it is in the best interest of the public, settlement agreements always contain supporting reasons for the positions adopted by the parties involved. Moreover, internal audits of the CLR program emphasize the need for adequate documentation to support settlement agreements. In addition, MSHA and SOL will formally remind CLR and attorneys to ensure that the rationale for all civil penalty agreements is adequately documented in settlement agreements and case file notes.

#### APPENDIX IV: COMMENTS FROM THE DEPARTMENT OF HEALTH AND HUMAN SERVICES



DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the Assistant Secretary  
for Legislation

Washington, D.C. 20201

APR 26 2007

Daniel Bertoni, Director  
Education, Workforce, and  
Income Security Issues  
U.S. Government Accountability Office  
Washington, DC 20548

Dear Mr. Bertoni:

The Department of Health and Human Services has reviewed the U.S. Government Accountability Office's (GAO) draft report entitled: Mine Safety: Better Oversight and Coordination by MSHA and Other Federal Agencies Could Improve Safety for Underground Coal Miners " (GAO 07-622).

The department concurs with the recommendation to establish an MOU between NIOSH and MSHA. We agree that this will help strengthen current coordination activities.

The department appreciates the opportunity to comment on this draft report before its publication.

Sincerely,  
*Rebecca Hemard*  
for Vincent J. Ventimiglia  
Assistant Secretary for Legislation

---

## APPENDIX V. COMMENTS FROM THE FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION



### FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION

OFFICE OF THE CHAIRMAN

April 19, 2007

Mr. Daniel Bertoni, Director  
Education, Workforce, and Income Security Issues  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, D.C. 20548

Dear Mr. Bertoni:

Re: Draft Report: Better Oversight and Coordination by MSHA and Other  
Federal Agencies Could Improve Safety for Underground  
Coal Miners

The Federal Mine Safety and Health Review Commission (the Commission) is pleased to comment on the above Draft Report. We commend the GAO on its thorough research and thoughtful recommendations regarding the current federal program governing the safety and health of our Nation's underground coal miners. Our comments are limited to those sections specifically addressing the Commission's role in the resolution of disputes arising from the enforcement of the Federal Mine Safety and Health Act of 1977, as amended (the Mine Act), but we find the report's research, conclusions, and recommendations regarding other aspects of the federal program enlightening and beneficial.

At the outset, the Commission agrees with the GAO that there needs to be transparency in penalty determinations and that specific rationales need to be provided when penalties are reduced from those levels originally proposed by MSHA. As the Draft Report indicates at page 38, it has long been the policy of the Commission that such reductions must be supported on the record:

When . . . it is determined that penalties are appropriate which substantially diverge from those originally proposed, it behooves the Commission and its judges to provide a sufficient explanation of the bases underlying the penalties assessed by the Commission. If a sufficient explanation for the divergence is not provided, the credibility of the administrative scheme providing for the increase or lowering of penalties after contest may be jeopardized by an appearance of arbitrariness.<sup>1</sup>

---

<sup>1</sup> *Jim Walter Resources, Inc.*, 28 FMSHRC 579, 606-07 (August 2006) (citing *Sellersburg Stone Co.*, 5 FMSHRC 287, 293 (March 1983)).

At the same time, it must be remembered that Congress adopted the split enforcement model, whereby MSHA enforces the Mine Act and the Commission adjudicates disputes arising under the Act, so as to provide for independent, *de novo* review of the circumstances surrounding an alleged violation of the Act and MSHA's rationale for seeking a civil sanction. Thus, it should be expected that among the 6 percent of penalties proposed to be assessed by MSHA that are appealed (Draft Report at 5), a significant share would end up being reduced once all issues are fully joined before a Commission judge. At that point and in a neutral forum, the operator is allowed to present evidence of mitigating circumstances or evidence that the MSHA inspector misinterpreted or misapplied the safety or health standard in question. Once that countervailing evidence has been presented to the judge, MSHA's preliminary characterizations as to the relative seriousness or operator culpability surrounding the citation might not prevail. Conversely, it can also be the case that the evidence adduced at a full hearing might demonstrate higher levels of seriousness or negligence than originally alleged by MSHA, thus warranting the assessment of a penalty by the judge that exceeds MSHA's proposed penalty. In either case, the Commission's guidance to its judges has been explicit:

While Commission judges are accorded broad discretion in assessing civil penalties under the Mine Act, such discretion is not unbounded and must reflect proper consideration of the penalty criteria set forth in section 110(i) and the deterrent purpose of the Act. *Westmoreland Coal Co.*, 8 FMSHRC 491, 492 (April 1986) (citing *Sellersburg Stone Co.*, 5 FMSHRC 287, 290-94 (Mar. 1983), *aff'd*, 736 F.2d 1147 (7th Cir. 1984)). In reviewing a judge's penalty assessment, the Commission determines whether the penalty is supported by substantial evidence and is consistent with the statutory penalty criteria. *Hubb Corp.*, 22 FMSHRC 606, 609 (May 2000). While "a judge's assessment of a penalty is an exercise of discretion, assessments lacking record support, infected by plain error, or otherwise constituting an abuse of discretion are not immune from reversal . . ." *U.S. Steel Corp.*, 6 FMSHRC 1423, 1432 (June 1984).<sup>2</sup>

In that connection, the Commission submits that the reduction in the civil penalty in *Wabash Mine Holding Co.*, 27 FMSHRC 672 (October 2005) (Draft Report at 39), comports with the Commission's policy set forth above and with the GAO's persuasive exhortation that final assessments of penalties be transparently determined and adequately documented. Accordingly, we respectfully but firmly disagree with the GAO's conclusion that the judge's rationale for reducing the penalty amount in that case was not well documented.

In *Wabash*, the judge reduced a \$50,000 proposed penalty to \$10,000 after explicitly finding, contrary to MSHA's arguments, that the subject violation did *not* contribute to the fatal accident at issue in the case. *Id.* at 684-85. The violation thus went from one alleged by MSHA to have contributed to a fatality to one found by the judge to have had nothing to do with the fatality, thereby greatly reducing its level of seriousness. Nevertheless, the resulting penalty of \$10,000, based largely upon the judge's agreement with MSHA that the violation resulted from the

---

<sup>2</sup> *Jim Walter Resources*, 28 FMSHRC at 606.

operator's high degree of negligence, is more than five times larger than the average penalty MSHA normally proposes for violations attributed to high negligence. (Draft Report at 33, Table 4). In short, we believe the judge in *Wabash* sufficiently articulated his reasons for reducing the penalty initially proposed by MSHA.

Other than our substantive comments set forth above, we have only two stylistic matters to bring to your attention. First, the citation to the *Jim Walters* decision in footnote 40 on page 39 of the Draft Report should read: *Jim Walter Resources, Inc.*, 28 FMSHRC 579, 606-07 (August 2006). Second, Figure 1 on page 10 does not provide for the circumstance where no civil penalty is ultimately assessed because the citation or order upon which it is based has been vacated by the Commission judge, the Commission, or the Circuit Court of Appeals.

The Commission once again commends the GAO on its informative and thoughtful Draft Report, and we thank you for the opportunity to provide comments on the report before it is released in final form. If you have any questions or require additional information from the Commission, please do not hesitate to contact us.

Sincerely,



Michael F. Duffy  
Chairman

## APPENDIX VI : GAO CONTACT AND ACKNOWLEDGMENTS

### GAO Contact

Daniel Bertoni, Director, (202) 512-7215, bertoniid@gao.gov

### Staff Acknowledgments

Reva E. Moran, Assistant Director, and Sara L. Schibanoff, Analyst-in-Charge, managed this assignment. Other staff who made key contributions throughout the assignment are Joel A. Green, Jeremie C. Greer, Gillian M. Martin, Mary Roy, and Rachael C. Valliere. Sheila R. McCoy provided legal assistance. Cindy K. Gilbert, Nancy A. Hess, Catherine M. Hurley, and Shana B. Wallace assisted with the methodology and statistical analysis.

### GAO's Mission

The Government Accountability Office, the audit, evaluation and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and

provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

### **Obtaining Copies of GAO Reports and Testimony**

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site ([www.gao.gov](http://www.gao.gov)). Each weekday, GAO posts newly released reports, testimony, and correspondence on its Web site. To have GAO e-mail you a list of newly posted products every afternoon, go to [www.gao.gov](http://www.gao.gov) and select "Subscribe to Updates."

### **Order by Mail or Phone**

The first copy of each printed report is free. Additional copies are \$2 each. A check or money order should be made out to the Superintendent of Documents. GAO also accepts VISA and Mastercard. Orders for 100 or more copies mailed to a single address are discounted 25 percent. Orders should be sent to:

U.S. Government Accountability Office 441 G Street NW, Room LM Washington, D.C. 20548

To order by Phone: Voice: (202) 512-6000 TDD: (202) 512-2537 Fax: (202) 512-6061

### **To Report Fraud, Waste, and Abuse in Federal Programs**

Contact:

Web site: [www.gao.gov/fraudnet/fraudnet.htm](http://www.gao.gov/fraudnet/fraudnet.htm) E-mail: [fraudnet@gao.gov](mailto:fraudnet@gao.gov) Automated answering system: (800) 424-5454 or (202) 512-7470

### **Congressional Relations**

Gloria Jarmon, Managing Director, [JarmonG@gao.gov](mailto:JarmonG@gao.gov) (202) 512-4400 U.S. Government Accountability Office, 441 G Street NW, Room 7125 Washington, D.C. 20548

### **Public Affairs**

Paul Anderson, Managing Director, [AndersonP1@gao.gov](mailto:AndersonP1@gao.gov) (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, D.C. 20548



---

## REFERENCES

- [1] Pub. L. 109-236.
- [2] The Mine Act gives MSHA the authority to issue an ETS when the agency determines that miners are exposed to grave danger from exposure to substances or agents determined to be toxic or physically harmful, or to other hazards, and that an emergency standard is needed to protect miners from such danger. The ETS becomes effective upon publication in the *Federal Register* and remains in effect until replaced by permanent rules that go through the regular rule-making process, but for no longer than 9 months.
- [3] 30 C.F.R. Parts 48, 50, and 75, Emergency Mine Evacuation; Final Rule, 71 Fed. Reg. 12,252 (March 9, 2006).
- [4] 30 C.F.R. Parts 3, 48, 50, and 75, Emergency Mine Evacuation; Final Rule, 71 Fed. Reg. 71,430 (December 8, 2006).
- [5] The MINER Act also imposes some new training requirements for mine rescue teams. MSHA is required to promulgate regulations implementing these requirements within 18 months of June 15, 2006. 30 U.S.C. § 825(e)(2).
- [6] If the penalty proposed by MSHA is not contested by the mine operator within the time allotted by law, it becomes a final order of the Commission.
- [7] Mines that are recognized as more dangerous, such as those containing high levels of methane gas, are inspected more frequently.
- [8] MSHA inspectors are authorized to issue either a citation or a withdrawal order when they observe a health and safety violation. All withdrawal orders compel the removal of miners from the affected work areas until the observed hazard is terminated. This, in essence, could halt production in a particular area of the mine.
- [9] Criteria and Procedures for Proposed Assessment of Civil Penalties; Final Rule, 72 Fed. Reg. 13,592 (March 22, 2007) (codified at 30 C.F.R. Part 100).
- [10] Under its prior regulations, MSHA also used a “single penalty assessment” for violations that were not reasonably likely to result in a reasonably serious injury or illness, and that were abated within the time set by the inspector. The penalty for these violations was \$60. However, the new regulations eliminate the single penalty assessment.
- [11] The MINER Act defines flagrant violations as those that involve “a reckless or repeated failure to make reasonable efforts to eliminate a known violation of a mandatory health or safety standard that substantially and proximately caused, or reasonably could have been expected to cause, death or serious bodily injury.” 30 U.S.C. § 820(b)(2).
- [12] A mine operator’s first conviction under these criminal provisions may carry a fine of up to \$250,000 and imprisonment for up to 1 year. Subsequent convictions are punishable by fines of up to \$500,000 and 5 years of imprisonment. 30 U.S.C. § 820(d).
- [13] Emergency breathing devices, also known as self-contained self-rescuers (SCSR), are closed-circuit devices containing or producing an independent supply of oxygen, enabling miners to breathe in the presence of hazardous or life-threatening contaminants in the atmosphere.
- [14] Percentage estimates are based on the sample and are subject to sampling error. We are 95 percent confident that the results we obtained are within plus or minus 8 percentage

- points of the true values of the in-scope population. Each sample element was subsequently weighted in the analysis to account for all members of the in-scope population, including those that were not selected.
- [15] MSHA made this change in the final rule because it was concerned that without actually physically inserting the mouthpiece, a miner may not gain the skills to effectively and properly perform this action.
- [16] Although ETS requirements initially were effective immediately, the final rule issued in December 2006 did not include a required compliance date for training with breathing devices because, according to MSHA, training devices that provided the sensation of airflow resistance and heat were not available for purchase at that time. In March 2007, MSHA published a notice in the *Federal Register* informing mine operators that they must have a purchase order for realistic SCSR training units by April 30, 2007, and that they must conduct training within 60 days of the receipt of the units. See Emergency Mine Evacuation, 72 Fed. Reg. 15,169 (March 30, 2007).
- [17] To ensure that four major scenarios—fire, explosion, gas, and water inundation—are covered each year, the final rule issued in December requires that a different scenario be used each quarter in conducting evacuation drills.
- [18] In 2006, 15 underground coal mines, mostly in West Virginia and Pennsylvania, used the West Virginia University Mining Extension Service’s mobile training facility to provide simulated emergency training to their workers.
- [19] For purposes of our survey, small mines are defined as those with 36 employees or fewer, whereas larger mines are those with more than 36 employees.
- [20] The packet contained a DVD on the protocol for how to transfer from one breathing device to another, training manuals on six types of breathing devices, an article on how to disinfect the devices, and other related information.
- [21] Bituminous Coal Operators’ Association and National Mining Association, *Mine Rescue Handbook: Emergency Response Procedures, Practices and Responsibilities*, January 2007.
- [22] MSHA’s Managerial Emergency Responsiveness Development Program (MERD) utilizes interview and survey feedback techniques, emergency situations and role playing, assessment center methods with feedback, tutorials, and knowledge tests to improve and develop emergency management capabilities. It was designed specifically for MSHA managers, but has been used by other organizations such as individual mines.
- [23] MSHA has not yet determined how the mine rescue team requirements in the MINER Act will be implemented. MSHA officials said they plan to hold public hearings on the requirements of the act before publishing final rules. The final rule is due December 2007.
- [24] According to a top NIOSH official, most of NIOSH’s mining program activities now fall under the Office of Mine Safety and Health, a new office established by the MINER Act. According to this official, the office primarily makes permanent a more informal structure that existed in NIOSH for mining research and expands NIOSH’s focus on safety technology development.
- [25] We have reported that agencies can strengthen their commitment to work collaboratively by articulating their agreements in formal documents, such as a memorandum of understanding, interagency guidance, or an interagency planning

- document, signed by senior officials in the respective agencies. See GAO, Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies, GAO-06-15, (Washington, D.C.: Oct. 21, 2005).
- [26] This agreement was originally executed between MSHA's predecessor in the Department of Interior, the Mining Enforcement and Safety Administration (MESA) and NIOSH's predecessor, the Division of Mining Research – Health and Safety in the Bureau of Mines in 1976. The agreement was updated in 1978 after MESA was transferred to the Department of Labor and renamed MSHA.
- [27] When developing strategic plans, GPRA requires agencies to, among other things, solicit and consider the views and suggestions of those entities potentially affected by or interested in such a plan. 5 U.S.C. § 306(d).
- [28] In commenting on our draft report, MSHA noted that it believes NIOSH provides input into MSHA's rule-making process through research, peer-reviewed studies, comments on rule-makings, and participation as a valued member in discussions on technical issues during MSHA rule-making panels.
- [29] In commenting on our draft report, MSHA noted that its rule-making priorities are published in the Department of Labor's semiannual Regulatory Agenda, which provides milestones for MSHA rule-making for the years ahead.
- [30] NIOSH officials told us they can complete a project in less time in the case of an emergency.
- [31] If, however, a mine operator is unable to comply with this requirement, its accident response plan must set forth the alternative means of compliance, which shall approximate, as closely as possible, the degree of functional utility and safety protection provided by a wireless two-way communications device.
- [32] MSHA faces similar shortages in its inspector workforce in coming years. See GAO, *MSHA's Revised Hiring Process Has Improved the Agency's Recruiting Efforts, But Its Human Capital Strategic Plan Does Not Adequately Project or Address Its Future Workforce Needs*, GAO-07-704R (Washington, D.C.: May 16, 2007).
- [33] NIOSH is required to report out on its work within 18 months after the enactment of the MINER Act. MSHA then has 180 days after receiving the report from NIOSH to determine what actions it intends to take.
- [34] CLRs are MSHA enforcement staff and are located in every MSHA coal district. They have been provided with specialized legal training and are authorized by the agency to negotiate settlements for penalties that are no higher than \$350 and are limited in legal complexity. The CLRs also oversee conferences requested by mine operators following the issuance of citations to attempt an informal resolution to the disputed violation.
- [35] Under regulations effective as of April 23, 2007, MSHA's penalties are assessed in two different penalty categories: regular and special. Prior to the recent regulatory changes, MSHA issued a third type of penalty called the single penalty. The single penalty was a flat \$60 penalty for violations that are unlikely to cause injury or illness. This type of penalty accounted for approximately 60 percent of the penalties issued between 1996 and 2006. MSHA's new regulations eliminate the single penalty. A regular assessment is the agency's general penalty and ranges from \$112 to \$60,000. Special assessments are reserved for violations in which MSHA elects to waive the regular assessment and set another penalty consistent with the six statutory factors. For example, special assessments may be used when an operator fails to correct certain violations or notify

MSHA of certain kinds of accidents. A special assessment can be as high as \$220,000, but this is for the new flagrant violation established under the MINER Act; the maximum for most special assessments is also \$60,000. Eligibility guidelines and assessment formulas for special and regular assessments are outlined in MSHA regulations and agency policies.

- [36] MSHA inspectors also determine whether mine operators have made good faith efforts to correct the violation, which results in a 10 percent reduction in the proposed penalty. Under regulations that were in effect through April 22, 2007, the good faith reduction was 30 percent.
- [37] Criteria and Procedures for Proposed Assessment of Civil Penalties; Final Rule, 72 Fed. Reg. 13,592, 13,629 (March 22, 2007) (codified at 30 C.F.R. Part 100).
- [38] Sixty-three percent of contested penalties are considered “significant and substantial,” or “S&S,” violations. An inspector designates violations as S&S if they are deemed at least reasonably likely to cause an injury that results in lost work days. This designation can trigger more serious sanctions, such as closing a portion of a mine or closing an entire mine.
- [39] In August 2006, the Commission reminded ALJs of the importance of adequately documenting penalty decisions. Specifically, the Commission wrote “When . . . it is determined that penalties are appropriate which substantially diverge from those originally proposed, it behooves the Commission and its judges to provide a sufficient explanation of the bases underlying the penalties assessed by the Commission. If a sufficient explanation for the divergence is not provided, the credibility of the administrative scheme providing for the increase or lowering of penalties after contest may be jeopardized by an appearance of arbitrariness.” *Jim Walter Resources, Inc.*, 28 FMSHRC 579, 606-07 (August 2006) (citing *Sellersburg Stone Co.*, 5 FMSHRC 287, 293 (March 1983)).
- [40] In addition to the general costs of litigation, in some cases, the Equal Access to Justice Act requires that the Department of Labor pay a mine operator’s fees and expenses, including reasonable attorneys’ fees, if the ALJ finds that the agency’s position was not substantially justified, such as when an MSHA-proposed penalty is lowered significantly in formal proceedings. 5 U.S.C. § 504 and 29 C.F.R. Part 2704.
- [41] *Wabash Mine Holding Co.*, 27 FMSHRC 672 (October 2005).
- [42] See also *Jim Walter Resources, Inc.*, 28 FMSHRC 1068 (December 2006) and *Jim Walter Resources, Inc.*, 28 FMSRC 579 (August 2006).

*Chapter 2*

**MINE SAFETY: ADDITIONAL GUIDANCE AND  
OVERSIGHT OF MINES' EMERGENCY RESPONSE  
PLANS WOULD IMPROVE THE SAFETY OF  
UNDERGROUND COAL MINERS\***

*GAO*

**ABBREVIATIONS**

MINER	Act Mine Improvement and New Emergency Response Act of 2006
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health

April 8, 2008

The Honorable George Miller  
Chairman  
Committee on Education and Labor  
House of Representatives

Dear Mr. Chairman:

In January 2006, at the Sago mine in West Virginia, 12 men lost their lives after an explosion prompted them to barricade themselves in the mine to await rescue, an effort that took almost 2 days to complete. They died hours after the explosion from the poisonous carbon monoxide gases produced by the explosion. In the wake of this and other fatal mine disasters in the United States, the Congress enacted the Mine Improvement and New Emergency Response Act of 2006 (MINER Act) in an effort to improve the safety of the nation's underground coal mines.[1] As part of this act, mine operators were required to

---

\* Excerpted from GAO Report GAO-08-424, dated April 2008.

develop emergency response plans that detail how they will ensure the safety of underground coal miners immediately following any future disasters, such as how they plan to communicate with trapped miners after an accident. The act required mine operators to submit their plans to the Department of Labor's Mine Safety and Health Administration (MSHA) for approval by August 14, 2006—2 months after the law was enacted. MSHA issued guidance to mine operators on plan development and assigned responsibility for reviewing and approving the plans to its 11 district offices. After approving the emergency response plans, MSHA inspectors in its district offices enforce mine operators' compliance with the requirements described in their plans as part of regular inspections of underground coal mines.

The plans must contain several components designed to help ensure the safety of miners trapped in a mine after an accident, such as providing breathable air—air that has not been contaminated by carbon monoxide or other deadly gases released during an explosion or fire. Generally, mine operators must implement each component of the plan as soon as the component is approved by MSHA, rather than waiting for approval of the entire plan. In addition, by June 2009, the plans must provide for wireless communications and electronic tracking systems or alternatives to these systems. The MINER Act also required the National Institute for Occupational Safety and Health (NIOSH), a research agency within the Department of Health and Human Services' Centers for Disease Control and Prevention, to study options for providing refuge to miners trapped underground after an accident.[2]

To learn about MSHA's efforts to approve and enforce implementation of the emergency response plans, you asked us to examine 1) the effectiveness of MSHA's process for approving mines' emergency response plans, 2) the status of implementation of underground coal mines' emergency response plans, and 3) the efforts MSHA has made to enforce implementation of the plans and oversee enforcement and plan quality.

To address these topics, we reviewed relevant federal laws, regulations, and agency guidance. We reviewed data provided by MSHA on the approval and implementation status of the emergency response plans for all underground coal mines categorized by MSHA as active, producing mines as of June 21, 2007. Using MSHA's data on the approval status of the plans, we selected a nonprobability sample of plans from each of MSHA's 11 district offices for review.[3] Our sample included both plans that had been fully approved and those that had only been partially approved. Because there were so few, we selected many of the partially approved plans to identify the factors delaying their approval. We also reviewed data on citations issued by MSHA's district offices to mine operators for noncompliance with their plans. To assess the reliability of the data obtained from MSHA, we reviewed related documentation to corroborate the data, including the sample of emergency response plans and completed citation forms, evaluated the data for obvious errors in accuracy and completeness, and interviewed agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of our review. In addition, we interviewed officials at MSHA's headquarters and 11 district offices to learn about the plan approval process, implementation of the plans, and MSHA's inspection efforts. We visited two of MSHA's district offices, located in West Virginia and Kentucky—the two states with the largest number of underground coal mines in the United States—and visited underground coal mines in those states to learn about the equipment and technologies they used to implement their emergency response plans. In addition, we consulted with individuals knowledgeable about the field of mine safety, mine company officials, and union and industry representatives. We

conducted this audit from April 2007 through April 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. See appendix I for further information on our scope and methodology.

## **RESULTS IN BRIEF**

The effectiveness of MSHA's process for approving underground coal mines' emergency response plans was hampered by several factors, including revisions and delays in developing the guidance and the lack of specificity of the guidance, which delayed approval of the plans. While MSHA headquarters issued initial guidance to its district offices and mine operators in July 2006, the agency continued to refine and revise the guidance for several months and did not issue guidance on one key component of the plans—providing postaccident breathable air to miners—until 6 months after the plans were due. These revisions and delays caused mine operators to revise and resubmit the plans and district officials to review the changes, delaying their approval, and ultimately, the preparedness of mine operators to respond in the event of an accident. MSHA headquarters officials attributed the revisions to not having enough time to interpret the law and obtain input from the mining community given the 2-month period between the enactment of the MINER Act and the deadline for submitting plans to MSHA. In addition, the lack of specificity in MSHA's guidance compelled headquarters and district staff to spend time resolving questions about the guidance after it was issued. Further, while the content of the plans may differ because of differences in the characteristics of each mine, we found that some of the plans did not specify the protections to be provided, and information about these protections varied. For example, some of the plans did not specify whether postaccident breathable air would be provided to miners working in certain areas of the mine, while other plans did. As a result, it is uncertain whether all miners will be adequately protected in the event of an accident.

As of January 2008, the operators of all active, producing underground coal mines had implemented most components of their emergency response plans, but many had not implemented two key components. Many mine operators could not implement one of the components—providing postaccident breathable air to trapped miners in the event of an accident—because all of the needed equipment was not yet available. For example, about one-fifth of the mines had not received breathing devices on order from manufacturers, and nearly three-quarters of the mines were waiting for refuge chambers—one of the methods operators may use to provide breathable air to trapped miners. In addition, mine operators have not yet begun to implement another key component of their plans—upgrading mines' communication systems to wireless or approved alternatives—because completely wireless systems are not available for underground mine use and MSHA has not determined what technologies it will allow mine operators to use to meet the June 2009 statutory requirement. The MINER Act provides that, where wireless systems are not available, alternatives to wireless communication systems are acceptable. Some companies have developed and begun marketing partially wireless systems that, according to NIOSH, could enhance

communications and the safety of miners. However, MSHA headquarters officials told us they had no immediate plans to issue guidance detailing what technologies will be acceptable in meeting the June 2009 requirement because they wanted to wait and see how new technologies develop by then. Given the delay, it is uncertain whether mine operators will be able to plan for and order the appropriate technology to meet the deadline, thereby missing opportunities to improve the chances of miners trapped in an underground coal mine after an accident to survive until they are able to be rescued.

MSHA's district offices have conducted inspections and issued citations to enforce implementation of mines' emergency response plans, but MSHA headquarters has provided limited oversight of the districts' enforcement efforts and the overall quality of the plans. MSHA's districts have inspected many mines for compliance with their plans and issued citations to ensure immediate implementation of all components of the plans. Since late 2006, inspectors have issued over 350 citations to mine operators who had not properly implemented the approved components of their plans. However, while its district offices have taken steps to enforce implementation of the plans, MSHA headquarters has not systematically evaluated the data on citations to identify potential problems with implementation or enforcement. We reviewed the citations issued by MSHA's 11 district offices for violations of mines' emergency response plans from August 15, 2006, through December 11, 2007, and found large differences in the number of citations issued across districts. For example, one district had cited one of its 18 mines for noncompliance, while three districts had each issued citations to over two-thirds of their mines. While there may be valid explanations for these differences, MSHA headquarters officials have not reviewed the data to identify why they occurred and, when asked about these differences, they said they were not aware of them. Similarly, MSHA headquarters has not analyzed whether inspectors are issuing citations under the statute or regulations when both apply, which could prevent MSHA from adequately tracking compliance and lead to inconsistent penalty assessments. In addition, MSHA has provided insufficient oversight to ensure the content of underground coal mines' emergency response plans meets a consistent agency-wide standard and determine whether corrective actions are needed.

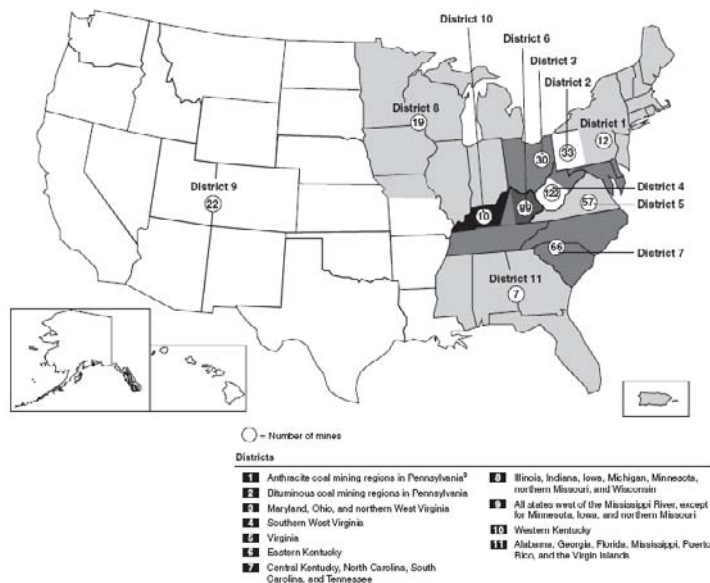
To help ensure that underground coal mines' emergency response plans and their implementation improve the safety of underground coal miners in the event of an accident, we are recommending that the Secretary of Labor direct MSHA to develop additional guidance to clarify what is required for key components of the emergency response plans, such as providing postaccident breathable air for the maintenance of trapped miners; work with NIOSH to develop guidance for mine operators on how to meet the June 2009 requirement to provide postaccident wireless communications systems; and take steps to ensure that district offices are consistently applying MSHA's guidance on approving and enforcing emergency response plans. In commenting on a draft of our report, the Department of Labor agreed with the recommendations and noted several actions that MSHA has begun or is planning to take to provide additional guidance and oversight for emergency response plans. In its comments, the Department of Health and Human Services concurred with our recommendation that NIOSH and MSHA work together to develop guidance on postaccident wireless communications systems.



## BACKGROUND

Under the Federal Mine Safety and Health Act of 1977 (the “Mine Act”), Congress created MSHA and gave it primary responsibility for ensuring the safety and health of mine workers. MSHA’s Coal Mine Safety and Health program office in headquarters is responsible for carrying out enforcement activities related to surface and underground coal mines, managing agency operations, and monitoring the activities of its 11 district offices. MSHA’s district offices have day-to-day responsibility for activities such as reviewing and approving mine plans, including emergency response plans, and for conducting inspections, issuing citations for violations of health and safety standards, and investigating mine accidents. As of December 2007, MSHA employed 460 underground coal mine inspectors in its 11 district offices.[4] MSHA’s principal enforcement responsibility for underground coal mines is fulfilled by conducting a minimum of four comprehensive inspections of every underground coal mine in the United States each year.[5] When MSHA inspectors observe violations of mandatory federal health and safety standards, they are required to issue citations, or in some cases withdrawal orders,[6] to mine operators. The mine operators generally are required by law to correct the hazardous situation on which the violation was based within the time frame set by the inspector, even if the mine operator contests the violation or penalty.

As of June 2007, there were approximately 470 U.S. underground coal mines categorized by MSHA as active, producing mines. As shown in figure 1, the number of active, producing mines varies among districts.



<sup>a</sup> We included all underground coal mines categorized by MSHA as active, producing mines as of June 2007. MSHA defines active mines as those that operate on a full-time basis to produce coal.

<sup>b</sup> While the map indicates that District 1 includes states north of Pennsylvania, there currently is no coal mining in those states.

Figure 1. MSHA’s Coal Mine Safety and Health District Offices and Number of Underground Coal Mines Located in Each District as of June 2007<sup>a</sup>.

The number of active, producing coal mines changes frequently as new mines open, active mines are temporarily idled, or mines are abandoned.[7] Some underground mines do not actively produce coal all year; some are only operated seasonally because of local weather conditions; and operations at smaller, less cost-effective mines are often suspended when the price of coal drops below a certain level.

Underground coal mining is a dangerous industry for several reasons. For example, the presence of methane gas, which is highly explosive and is often produced in large quantities when coal is extracted, contributes to the hazardous working conditions. Additional risks include geological conditions in many areas of the country that make the roofs of mines unstable, the danger posed by a fire in an underground mine, and flooding from nearby abandoned mines. The danger posed by these factors has increased in recent years as miners dig deeper to reach remaining coal reserves. Further, while the number of underground coal miners was on the decline in the last half of the 1990s, as shown in figure 2, this trend has reversed in recent years, exposing more workers to the dangers of underground coal mining.

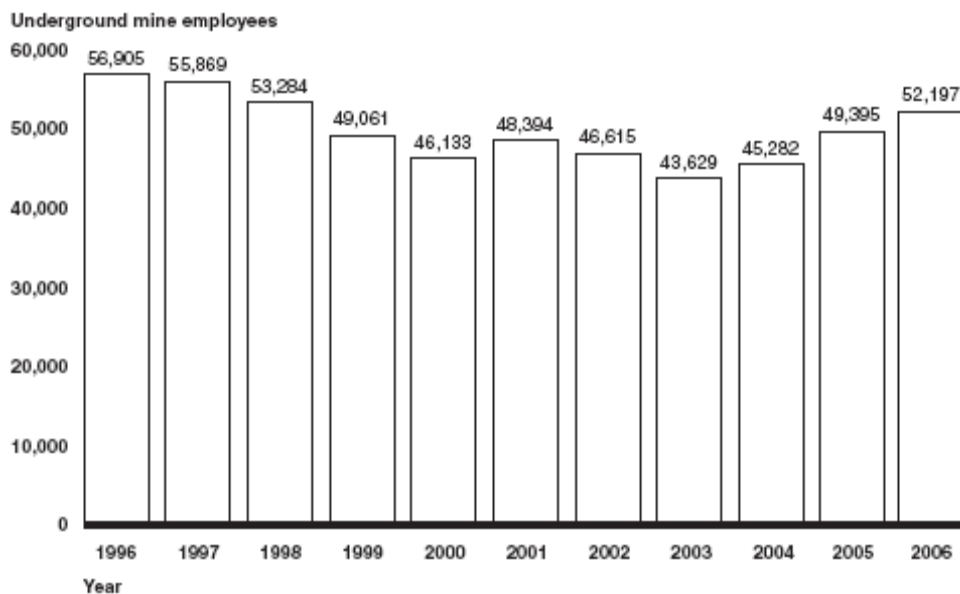
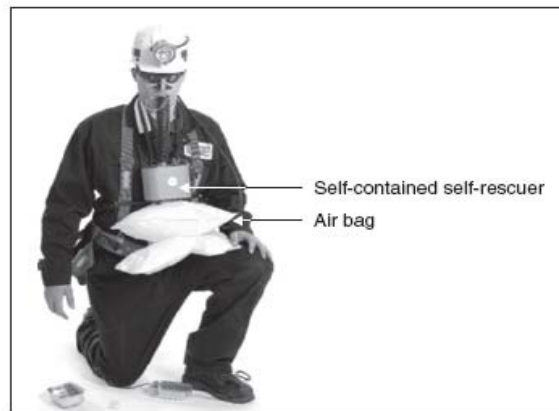


Figure 2. Number of Workers in U.S. Underground Coal Mines, 1996 to 2006.

In March 2006, a few months after the Sago mine accident, MSHA issued an Emergency Temporary Standard that required mine operators to immediately implement certain health and safety improvements designed to enhance protections for underground coal miners.[8] MSHA issued a final rule revising the standard in December 2006. In June 2006, the Congress passed the MINER Act, which required mine operators and MSHA to undertake reforms, including developing and adopting emergency response plans, enhancing mine rescue teams, and instituting higher penalties for the most serious violations.

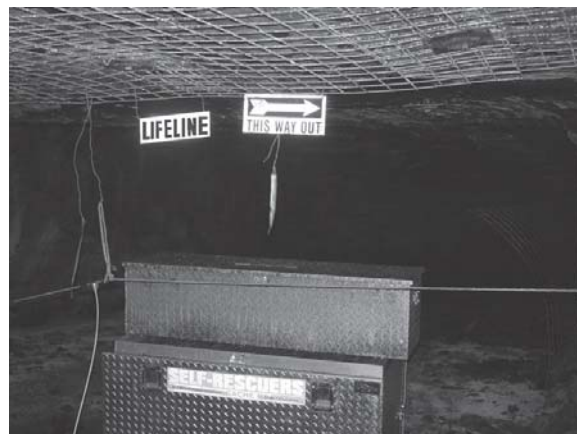
The MINER Act required that, within 60 days of enactment, underground mine operators develop and adopt written emergency response plans.[9] The act also required MSHA to review and approve emergency response plans. The agency implemented this requirement by issuing guidance for mine operators to use in developing their plans and by having its district

offices review the plans submitted by mines under their jurisdiction to ensure that they conformed with the guidance.[10] MSHA is also required to review approved plans at least every 6 months to ensure that they are updated to reflect changes in mine operations and advances in technology.[11] The MINER Act specified several components that mine operators must include in their emergency response plans, including providing uncontaminated or “breathable” air for miners after an accident.[12] The postaccident breathable air component includes two parts: (1) emergency supplies of air sufficient to maintain trapped miners for extended (long-term) periods and (2) caches of portable breathing devices—known as self-contained self-rescuers (see figure 3)—positioned along mine tunnels leading to the mine entrance to aid in the miners’ escape.[13] Another component required by the act is postaccident lifelines—ropes that miners can use after an accident to find their way out of the mine and to find the caches of portable breathing devices stored in the mine[14] (see figure 4).



Source: CSE Corporation.

Figure 3. Example of Self-Contained Self-Rescuer That Provides Supplemental Air in Case of an Emergency.



Source: MSHA.

Figure 4. Lifeline and Cache of Self-Contained Self-Rescuers in a Mine Tunnel.

**Table 1. Components of Emergency Response Plans Required by the MINER Act of 2006**

Component	Description of requirement
Postaccident communications	Redundant (backup) means of two-way communication with the surface for persons underground. Plans must require wireless two-way systems or alternatives by June 2009.
Postaccident tracking	System to enable above ground personnel to determine the current or immediately preaccident location of all underground personnel. Plans must require an electronic tracking system or alternative by June 2009.
Postaccident breathable air	Emergency supplies of breathable air sufficient to maintain trapped miners for a "sustained period of time." Caches of self-contained self-rescuers providing, in total, not less than 2 hours per miner to be kept in escapeways (tunnels that lead to the mine entrance) from the deepest work area to the surface at intervals no farther than a miner could walk in 30 minutes and a schedule for checking the reliability of self-rescuers to ensure that the units will function properly in an emergency.
Training	Training for proper donning of self-contained self-rescuers, switching from one self-contained self-rescuer to another, and ensuring proper fit of self-contained self-rescuers. Training program for emergency procedures described in the plan.
Postaccident lifelines	Directional lifelines (ropes with cones or other devices to indicate the direction of the mine entrance) used during an evacuation that are installed along mine tunnels leading from the areas where miners are extracting coal to the entrance of the mine (escapeways). Plans must require lifelines that meet MSHA's flame resistant standards by June 2009 or sooner, as existing lifelines are replaced.
Local coordination	Procedures for coordination and communication between the mine operator, mine rescue teams, and local emergency personnel; and provisions for familiarizing local rescue personnel with surface functions that may be required in the course of mine rescue work.

Source: GAO analysis of the MINER Act.

MSHA's headquarters allowed district offices to separately approve each component of a mine's emergency response plan so that the mine could begin implementing each component once it was approved, rather than waiting for approval of the entire plan. Most of the required components were to be implemented immediately upon approval or within the time frames set in the approved plan. However, the act gave operators additional time to implement certain components, including wireless communications and electronic tracking systems, or their alternatives, and flame-resistant lifelines, which generally are not required to be implemented until June 15, 2009.

In addition, the MINER Act required NIOSH to study the utility, practicality, survivability, and cost of providing various refuge alternatives in underground coal mines and to report its findings, which it did, by December 2007.[15] Under its Mining Safety and Health Research program, NIOSH conducts research on mine safety technology, including research on advancements in self-contained self-rescuers, communications equipment, and tracking devices. In 2006, the Congress provided NIOSH with \$10 million in emergency supplemental appropriations for research to develop mine safety technology.

MSHA and NIOSH are both responsible for getting new safety technology into the mines. For certain types of mining products, MSHA's technical experts conduct evaluations and tests to ensure that they will not cause a fire or an explosion in a mine before they approve the use of such products. NIOSH is responsible for developing and adapting new

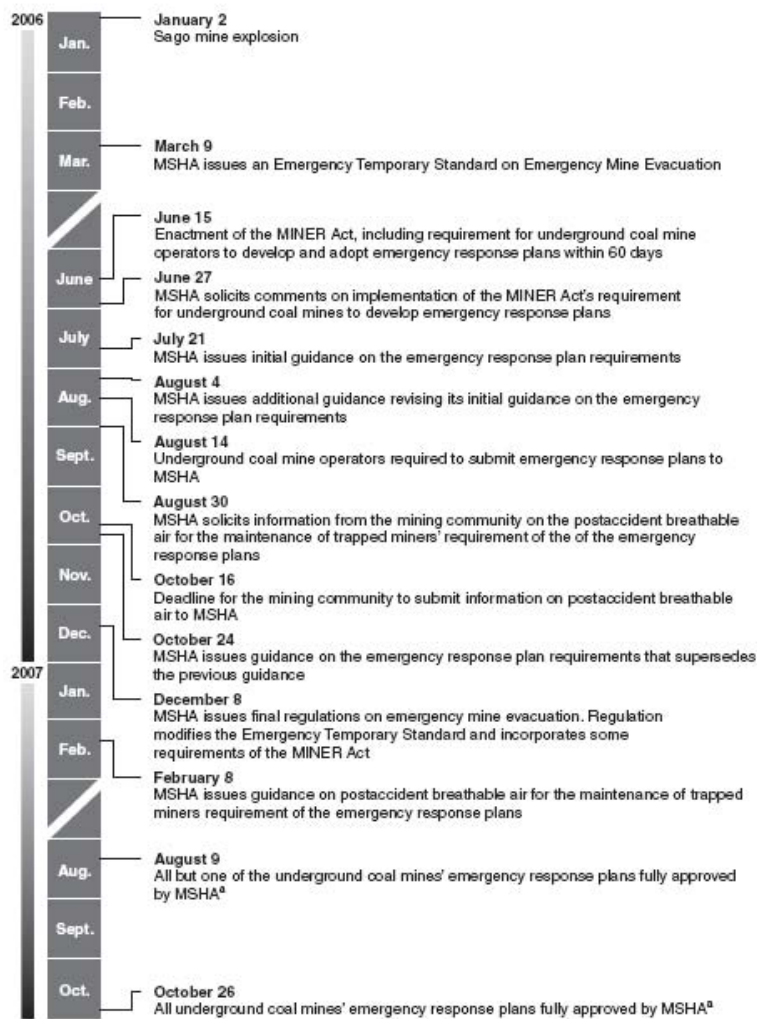
technologies for use in the mining industry. Based on research findings, NIOSH may recommend that MSHA issue new safety and health standards. However, NIOSH does not have the authority to compel MSHA to take action on its recommendations. In our 2007 report on MSHA, we stated that coordination between MSHA and NIOSH was primarily informal and inconsistent and recommended that they develop a formal memorandum of understanding to guide their agencywide coordination efforts.[16] However, at the time of our review, such a memorandum had not been finalized.

### **THE EFFECTIVENESS OF MSHA'S APPROVAL PROCESS WAS HAMPERED BY SEVERAL FACTORS THAT DELAYED APPROVAL AND RESULTED IN VARIATIONS IN THE PLANS**

The effectiveness of MSHA's approval process for underground coal mines' emergency response plans was hampered by several factors that delayed approval of the plans. Specifically, MSHA issued its guidance multiple times and did not issue guidance on one key requirement until 6 months after the initial plans were due. Once issued, MSHA's guidance lacked specificity and, as a result, MSHA district staff we interviewed said that they had to spend time resolving mine operators' questions about the guidance after it was issued. In addition, actions taken by some mine operators, such as their reluctance to submit adequate plans, further delayed the approval process. We also found that the plans we reviewed varied in content and did not always specify the protections to be provided for miners.

#### **MSHA's Revisions and Delays in Issuing Its Guidance Delayed Plan Approvals**

Both MSHA district staff and mine operators we interviewed stated that MSHA's revisions of its guidance and delays in issuing the guidance caused mine operators to revise their mines' plans several times, delaying plan approvals. The MINER Act required underground coal mine operators to develop and adopt written emergency response plans by August 14, 2006. (See figure 5 for a timeline of MSHA's guidance and key events related to the emergency response plans.) MSHA issued general guidance on the requirements for the emergency response plan components in July 2006 and revised it twice—in August and October of that year. According to district officials, by the time MSHA headquarters issued its revised guidance in October—2 months after mine operators were required to submit their plans for approval—the districts were in the process of reviewing and approving the plans. As a result, mine operators had to revise and resubmit their plans to reflect the revised guidance, and the districts had to review them to ensure that changes were incorporated.



<sup>a</sup> This includes only mines categorized by MSHA as active, producing as of June 2007.

Figure 5. Timeline of Guidance and Key Events Related to Emergency Response Plans.

In addition, in February 2007, 6 months after mines were required to submit their emergency response plans to MSHA for approval, the agency issued new guidance on the MINER Act's requirement that the plans provide long-term postaccident breathable air for miners trapped underground. MSHA sought input from the mining community on this requirement, requesting comments on methods for providing safe and reliable supplies of postaccident breathable air in the summer of 2006. However, while MSHA received 11 comments from mine operators or their representatives during the comment period that closed on October 16, 2006, it did little to act on these comments for several months. One senior level MSHA official told us that a working group established to develop this guidance did not begin to do so until January 2007 and that the agency did not finalize the guidance until February 2007, 4 months after the comment deadline and 6 months after the deadline for mine operators to submit their plans to MSHA for approval.

In the absence of written guidance, some district officials we interviewed said that they provided mine operators with verbal guidance that was inconsistent with written guidance later issued by MSHA headquarters. For example, officials in one district told us that they had informed mine operators, based on discussions with headquarters officials, that they would be required to provide 48 hours of long-term postaccident breathable air. However, when headquarters later issued written guidance requiring mine operators to provide 96 hours of postaccident breathable air, the district officials had to meet with mine operators to explain the new guidance and ask them to revise their plans, which delayed approval.

According to MSHA officials, some of the revisions and delays in developing guidance resulted from the tight time frames specified in the MINER Act for developing and adopting the plans. MSHA headquarters and district officials told us that, between the enactment of the MINER Act in mid-June 2006 and the deadline for submitting emergency response plans to MSHA for approval in mid-August, there was not enough time to develop complete guidance outlining what mine operators should include in their plans. At the same time, MSHA headquarters officials said that they were also trying to meet the December 2006 deadline for finalizing the Emergency Temporary Standard the agency issued in March. MSHA headquarters officials said they needed additional time to interpret the law, discuss it with key stakeholders from the mining community, and incorporate the results of these discussions in the guidance. Similarly, MSHA headquarters officials stated that they needed time to review and evaluate acceptable methods for meeting the MINER Act's requirement for postaccident breathable air before making decisions about the type, amount, and location of breathable air mines would be required to provide. However, because of the revisions and delays in issuing the guidance, mine operators' ability to provide the equipment and information needed to protect miners' safety in the event of an accident, as intended by the MINER Act, was also delayed.

### **The Lack of Specificity of MSHA's Guidance Also Hampered Approval of the Plans**

The effectiveness of the approval process was also hampered by the lack of specificity of MSHA's guidance on the emergency response plans' components, including its guidance on the postaccident tracking, lifelines, and postaccident breathable air requirements of the MINER Act. As a result, MSHA's district staff had to spend time resolving mine operators' questions about the guidance after it was issued, which further delayed approval of the plans and the preparedness of mine operators to respond to an accident. To resolve some of the questions posed by mine operators, some district officials told us that they asked headquarters staff for additional guidance but did not always receive a response, and sometimes the response was not timely. Staff in a few districts said that, if they did not receive a response from headquarters officials, they made their own decisions about how to interpret the guidance. In some instances, they said that headquarters officials later made decisions about the requirements of the plans that differed from those made by the districts. As a result, the districts had to ask mine operators to revise their plans to comply with headquarters' revised interpretations of the requirements, further delaying approval of the plans. The following examples illustrate the impact of MSHA's guidance:

- Although MSHA's guidance indicated that operators could satisfy the postaccident tracking requirement by using a dispatcher system, it did not specify certain aspects of what should be included in the plans. A few of the district officials we interviewed said that some mine operators stated in their plans that they intended to divide their mines into large zones to minimize the number of phones they had to provide and make it easier for miners to move around the mine without having to report their location to staff working above ground.[17] However, because MSHA's guidance did not specify the allowable sizes of the zones or provide criteria for determining their appropriate sizes, the district officials said they had to spend time negotiating with mine operators to establish smaller zone sizes, which would improve the chances of identifying the location of trapped miners after an accident.
- MSHA's guidance did not specify the materials mine operators needed to use to meet the requirement for postaccident lifelines. One district official told us some of the mine operators in his district wanted to use existing water lines as lifelines, rather than providing new, flame resistant lifelines. As a result, the official had to negotiate with them to resolve this issue. MSHA headquarters later specified in writing that some water lines were not a suitable option for meeting this requirement of the MINER Act.
- Further, MSHA's guidance did not specify what methods mine operators could use or what methods they were prohibited from using to provide oxygen to and remove hazardous gas from refuge areas. A few of the district officials we interviewed said that they had many discussions with mine operators and headquarters officials about whether MSHA would consider chemically-generated oxygen an acceptable method for supplying long-term breathable air. Similarly, some officials were seeking guidance from MSHA headquarters on acceptable methods of removing hazardous gas from refuge areas several months after the initial guidance was issued. MSHA's technical support division provided additional guidance after researching the technical issues involved. District officials then had to notify the mine operators who intended to use these methods that their plans had to be revised, which delayed their approval.

### **Approval of Plans Sometimes Delayed by Mine Operators' Actions**

In addition to the delays caused by issues related to MSHA's guidance, actions taken by some mine operators delayed plan approval. While district officials said that most mine operators were cooperative and responsive during the approval process, some district officials said some mine operators submitted initial plans that did not meet all of the requirements, which contributed to delays in the review process. For example, a few district officials said that some mine operators used vague language in their plans. In addition, a few district officials responsible for reviewing the plans told us that it was difficult to reach some of the mine operators to discuss deficiencies in their plans or ask them to resubmit their plans when revisions were needed, further delaying the approval process. One official added that, once MSHA gave mine operators deadlines for submitting revisions, the process for reviewing the revisions moved more quickly.



Some mine operators proposed methods for meeting the requirements of the MINER Act that took time for MSHA to evaluate because they were unfamiliar with these methods. For example, a company that owned nine mines in one district proposed an alternative method of meeting the postaccident tracking requirement: using telephone answering machines to track the locations of miners working underground. Since this method differed from the typical dispatcher system used by other mines, district staff sought input from headquarters on whether the proposed system was an acceptable method of complying with the postaccident tracking requirement for emergency response plans. MSHA's technical support division observed the system before making a decision and determined that it was not sufficient. The process of reviewing such alternative methods prolonged the approval of some mines' plans.

By June 2007, MSHA had resolved most of the issues with the mine operators and approved their plans, but the approval of a few plans was delayed for several months. After discussion with the mine operators, two districts reached an impasse with three mines on the postaccident breathable air component of their plans.[18] However, MSHA subsequently reached agreement with these mines on their emergency response plans. As of October 26, 2007, more than a year after the initial deadline for submitting plans, MSHA had approved all underground coal mines' emergency response plans that were part of our analysis.[19]

### **Mines' Approved Emergency Response Plans Vary in the Information Provided on Certain Plan Components, Raising Uncertainties about the Protections Provided to Miners**

The approved emergency response plans we reviewed varied in the information provided and, therefore, it is uncertain whether certain protections will be afforded to all miners. It is understandable that the content of the plans may differ because there are differences in the specific characteristics of mines. However, in our review of the plans we sampled, we found that some plans did not specify the protections to be provided and the amount of information about these protections varied from plan to plan. The following examples illustrate the variations in the plans we reviewed.

#### ***Postaccident Breathable Air***

Some of the plans we reviewed specified the materials that the mine needed to provide long-term postaccident breathable air for trapped miners, but other plans did not. For example, the plans we reviewed in three districts included worksheets for mine operators to complete that specified the quantity of oxygen, number of compressed air cylinders, and materials needed to remove contaminants from the air. An official in one of the districts said the district also required mines that chose refuge chambers as a method of providing long-term postaccident breathable air to trapped miners to indicate the size and type of refuge chambers they purchased. The official said they asked for this information to help ensure that the locations in the mines where the chambers would be placed were large enough to accommodate the inflated chambers without puncturing them. In contrast, some of the plans we reviewed in other districts only indicated the possible options or combinations of methods of providing breathable air that the mine might choose; the plans did not indicate the specific methods that the mines chose for meeting the breathable air requirement or specify the amount of oxygen, air, or materials needed to remove contaminants from the air. As a result,

it was unclear how the districts determined that the methods identified in the plans will be sufficient for those mines.

### ***Postaccident Breathable Air in Certain Locations of the Mine***

The plans we reviewed varied in whether they specified that the mine operator would provide long-term postaccident breathable air in locations between the working section of the mine where coal was being extracted and the entrance of the mine, known as outby locations.[20] For 6 of the 10 districts with approved plans,[21] all of the approved plans we reviewed either specified that postaccident breathable air would be provided in these locations and the method to be used to provide air, or they indicated that air was not required in these locations and explained why.[22] However, for 4 of the 10 districts with approved plans, some plans did not specify whether postaccident breathable air was required for miners working in outby locations or the methods for providing it. As a result, in some mines, miners working in these locations may not have access to postaccident breathable air if they become trapped in the mine after an accident.

### ***Postaccident Tracking***

We also found large differences in the information contained in the plans we reviewed for the postaccident tracking component. All of the plans we reviewed for one district detailed the responsibilities of surface and underground personnel for this component and described the underground areas or zones to be used in identifying the location of miners. In contrast, in another district, none of the plans we reviewed described the responsibilities of the mine personnel or the zones to be used to identify the location of miners. Without providing specific information about how to track miners, it was not clear how the districts determined that the methods identified in the plans will be sufficient for those mines and how mine operators will identify where trapped miners are located in the event of an accident.

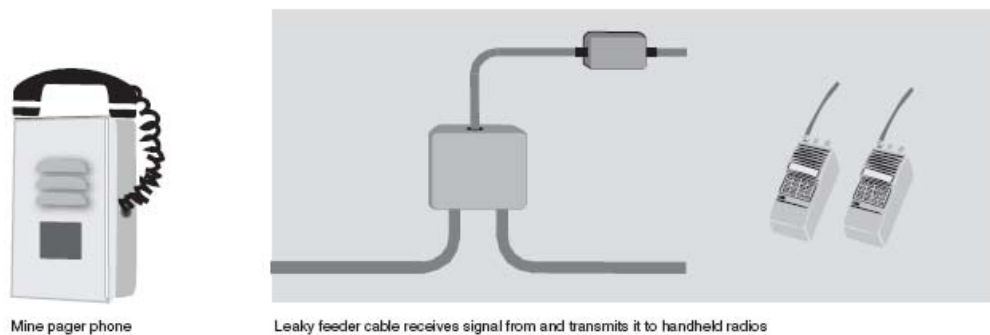
## **WHILE MOST PLAN COMPONENTS HAVE BEEN IMPLEMENTED, TWO KEY COMPONENTS HAVE NOT**

Most of the components of mines' emergency response plans have been implemented, but two key components remain. As of January 2008, all underground coal mines had implemented all or most components of their emergency response plans. However, few of the mines had implemented one key component—postaccident breathable air—because needed equipment was not available. In addition, mines had not begun to implement another component—wireless communications systems or a comparable alternative—because fully wireless technology is not available and MSHA had not determined what alternative technologies mine operators will be allowed to use to meet this requirement of the MINER Act, which mines must implement by June 2009.

## Mines Had Implemented All or Most Components of Their Emergency Response Plans

As of January 2008, all underground coal mines had implemented all or most of the components of their emergency response plans[23] that were required to be implemented immediately after approval. Twenty percent of all underground coal mines had fully implemented all components of their emergency response plans. The remaining mines had implemented all of the components, except the requirement for postaccident breathable air. Specifically, according to MSHA district officials, all mines had implemented the redundant communication and tracking systems required by their plans, had provided training on emergency procedures and the use of self-contained self-rescuers, and had developed procedures for coordinating and communicating with local emergency responders, as required. In addition, many mines had installed flame-resistant lifelines, although the MINER Act generally does not require their installation until June 2009.

Generally, as with most plan components, mines are using widely accepted methods to implement the current postaccident communications and tracking requirements of their emergency response plans and are moving toward using electronic tracking systems to meet the June 2009 requirement of the MINER Act. To meet the redundant communications requirement, according to NIOSH, most mines are using hardwired mine phones and leaky feeder cable systems with handheld radios[24] (see figure 6). To meet the postaccident tracking requirement, nearly 90 percent of the plans we reviewed specified that a dispatcher or equivalent system would be used to track miners.[25] At the time of our review, according to the manufacturers we interviewed, approximately 13 mines were installing electronic tracking systems.[26]



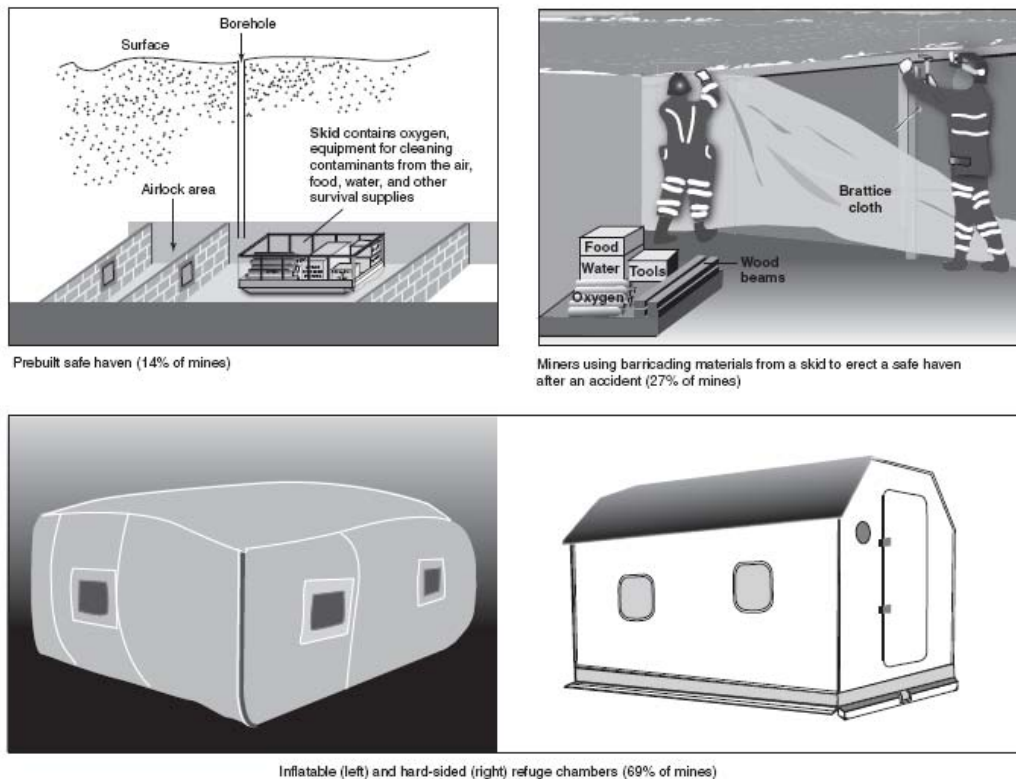
Sources: GAO presentation of miner's equipment used to summon help; images partially from Art Explosion.

Figure 6. Illustrations of Technologies Used to Meet the Current Requirement for Redundant Communication Systems.

## One Key Component Had Not Been Fully Implemented Because Equipment Was Not Available

As of January 2008, because needed equipment was not available, more than three-quarters of the mines had not been able to fully implement the requirement to provide long-

term postaccident breathable air for trapped miners, and one-fifth of the mines had not been able to provide all of the required self-contained self-rescuers to aid in miners' escape.[27] According to MSHA's guidance, mines can use several alternative methods to provide long-term postaccident breathable air for trapped miners. These methods include providing a premanufactured refuge chamber, either hard-sided or inflatable, that can be easily moved around the mine; building a protected room in the mine—called a prebuilt safe haven—where breathable air and survival supplies will be available; and providing a skid that contains materials for constructing an airtight barricade after an accident, equipment to provide breathable air, as well as water, food, and other supplies. As shown in figure 7, most mines planned to use at least one refuge chamber to provide long-term postaccident breathable air to trapped miners.



<sup>a</sup> Mines may use more than one method to provide breathable air to trapped miners. For example, a mine may choose to use a refuge chamber at the working section of the mine (i.e., where the coal is being removed) and a prebuilt safe haven at locations nearer the mine entrance along an exit route. Note: District officials reported that 7 percent of mines were using something other than the above alternatives to provide postaccident breathable air, such as forcing air into the mine through preinstalled pipes or through a borehole or shaft drilled from the surface into the mine.

Figure 7. Methods for Providing Long-Term Postaccident Breathable Air for Trapped Miners and Percentages of Mines Planning to Use Each Method<sup>a</sup>.

### ***Refuge Chambers***

Although, according to MSHA, 69 percent of all underground coal mines had ordered either inflatable or hard-sided refuge chambers, only 4 percent of these mines had received the chambers as of January 2008. Manufacturers had difficulty increasing production to meet the demand from mine operators prompted by enactment of the MINER Act, and they encountered shortages of needed materials and equipment. According to the MSHA officials and manufacturers we interviewed, manufacturing limitations may delay delivery of some refuge chambers until 2009. In light of these delays, senior MSHA headquarters officials told us that they were considering requiring mine operators who had not yet received refuge chambers to make interim arrangements, such as providing prebuilt safe havens or barricading materials to allow miners to construct safe havens. In addition, mine operators we interviewed said they were concerned that, based on NIOSH's evaluation of the chambers, MSHA might develop guidance that requires modification or replacement of the chambers they have ordered, which might further delay their delivery or increase the costs.[28]

Prebuilt safe havens and skids with barricading materials. Fourteen percent of the mines opted to build their own safe havens, and 27 percent opted to provide skids with supplies needed for breathable air, barricades, and other survival necessities. However, as of January 2008, only 12 percent of the mines using safe havens and 50 percent of the mines using skids had fully implemented these methods. Unavailable equipment prevented full implementation for many mines, often because manufacturers were not able to meet the increased demand for items such as oxygen tanks, airlock doors, and equipment needed to eliminate carbon dioxide from refuge areas.

Self-contained self-rescuers. At the time of our review, manufacturers of self-contained self-rescuers were beginning to catch up with the sudden increased demand created by the requirements of the MINER Act. However, as of January 2008, 20 percent of the mines were waiting for delivery of some of the self-contained self-rescuers required by their plans. The manufacturers we interviewed told us that they did not expect this large increase in demand to continue into the foreseeable future and, therefore, did not greatly increase their production capacity, which limited the number of units they could produce in the short term.

### **MSHA Has Not Determined what Technologies Will Be Acceptable in Meeting the MINER Act Requirement for Wireless Communications Systems**

Although the MINER Act requires mines to provide postaccident wireless two-way communications systems or approved alternatives by June 2009, MSHA has not determined what technology mine operators will be allowed to use to meet this requirement. The MINER Act does not define wireless communications systems, except to state that mines' emergency response plans must include provisions for postaccident communications between underground and surface personnel via a "wireless two-way medium." However, the act also states that, if such components cannot be adopted by mine operators, their plans may instead include alternative methods that "approximate, as closely as possible, the degree of functional utility and safety protection" that would be provided by a wireless system.[29] The Senate committee report on the act stated that the intent of this requirement is for mine operators to use the most advanced technology available that works best in their particular mine. The

report also noted that the intent is to avoid interpreting the law so narrowly as to stifle innovation and delay implementation of methods or equipment that would have significant safety benefits.[30]

According to NIOSH, the term “wireless,” as used by the global telecommunications industry, has come to mean that the end user device, such as a cell phone, is not connected locally by a wire. However, these systems require a hardwired infrastructure to support communications. In its research, NIOSH has found that infrastructure-free systems that can provide wireless two-way communications—which we refer to in this report as fully wireless systems—do not exist for most underground coal mines due to operational constraints. According to NIOSH officials, their research has demonstrated that, for wearable and portable two-way communications devices to work in most underground coal mines, infrastructure will be required to support any postaccident communications systems that will be available in the foreseeable future.

Although researchers and manufacturers have developed fully wireless communications systems, there are concerns about the viability and practicality of these systems, and there are significant limitations for their use in underground coal mines. For example, according to NIOSH, systems that use antennae placed underground and on the surface above the mine (referred to as through-the-earth systems) have a very limited range and most provide only one-way text communication from individuals on the surface to miners underground. Individuals we interviewed who were knowledgeable about the mine industry—including representatives of NIOSH, MSHA’s technical support division, and companies that develop new technology for use in underground coal mines—and the research we reviewed indicated that fully wireless two-way communications systems may not be available for many years because the conditions in the mines make it extremely difficult for communication signals to cover significant distances.

According to NIOSH, MSHA’s technical support division staff, and manufacturers, some partially wireless systems in which the coal miner is not tethered to the infrastructure are available now, and other alternatives that could enhance communications and the safety of miners in underground coal mines are nearly ready for use. The use of these partially wireless communications systems—such as leaky feeder or fiber optic cable systems—is becoming more widespread in mines. In addition, NIOSH and manufacturers are developing other options for providing partially wireless communications in mines, including ethernet networks and wireless mesh networks. Examples of some of these systems are shown in table 2.

Although some of these systems are currently available, others are still being developed, and some components have not yet been approved by MSHA as being safe for use in underground coal mines.[31] In early 2008, MSHA approved the first wireless mesh network for tracking miners and is reviewing the manufacturer’s application for approval of a modification that would enable two-way text messaging using this network. An MSHA official responsible for approving equipment for use in underground coal mines told us that the agency is working with a number of other manufacturers seeking MSHA’s approval of wireless mesh systems that would allow two-way voice communications.

**Table 2. Examples of Partially Wireless Communications Systems for Use in Underground Coal Mines**

Type of system	Description
Leaky feeder	Signal "leaks" to and from a feeder cable, radiating a signal that allows communication throughout much of the mine.
Ethernet	Ethernet local area network that uses a special data communications protocol transmitted over coaxial cable or twisted-pair wires to permit voice communications in mines.
Wireless mesh	Wireless mesh networks use wireless modems (called nodes) placed throughout a mine. The signal "hops" from node to node, permitting two-way voice, data and video to be sent and received. If some nodes fail in a mine accident, the network can reconfigure itself and create a new path for communication signals using nodes that are still functional.
Parasitic signal propagation	A signal is transmitted along existing mine infrastructure, such as wires, rails, and cabling, and can "jump" from one medium to another, such as traveling from a wire to a rail. In some instances, the signal can bypass a damaged section of cable by traveling along an alternate medium until it is past the damaged section.

Source: NIOSH.

NIOSH has developed plans for ensuring that advanced and survivable communications systems are provided in the mines. Given the progress that has been made in developing alternatives to fully wireless technology, NIOSH has developed a phased approach in which underground coal mines would install systems using partially wireless technology. Mines could install these improved communications systems alongside traditional systems, such as mine pager phones, or combine systems that use one type of technology, such as leaky feeder cable, with those that use other technologies, such as wireless mesh, to create communications systems more likely to survive a mine accident. NIOSH officials told us that their approach is focused on ensuring that mine operators can make use of existing technologies as they upgrade to more survivable communications systems.

Similar to NIOSH's approach, West Virginia requires mines to use wireless communications systems but defines them as systems that allow individual communications by a miner through a mine communication and tracking system without a physical connection. West Virginia allows mines to use leaky feeder cable and WiFi communications systems to meet this requirement, both of which are partially, rather than fully, wireless systems. West Virginia's state mining office has approved communications and tracking technologies developed by several manufacturers, but not all of them have been approved by MSHA for use in underground coal mines. West Virginia officials said that they expect their mines to have operational systems to meet this requirement by late 2008.

Despite these advances in partially wireless technology, MSHA had not yet determined what types of technology will be acceptable for mines to use to meet the June 2009 requirement for wireless communications. In its guidance on emergency response plans issued in October 2006, MSHA defined the term wireless to mean systems with no underground wires that might be damaged by fire or explosion. As previously noted, according to NIOSH, such infrastructure-free systems will not be possible for most mines. MSHA's guidance noted that specific conditions in each mine would be taken into account in determining whether the system was likely to withstand an accident intact. At the time of our review, MSHA officials told us they had no immediate plans to issue guidance detailing what technology will be acceptable in meeting the June 2009 requirement for wireless

communications because they wanted to wait and see what technology is available closer to the deadline. As a result, it is uncertain whether mine operators will be able to plan for and order enhanced communications systems to meet the deadline. In justifying the delay, one official expressed concern that manufacturers would stop trying to develop fully wireless technology if MSHA announced that partially wireless technology is acceptable. However, some manufacturers told us that, because MSHA has not determined what technology will be acceptable, they are concerned that they are investing time and money in developing technology that may not ultimately be acceptable to MSHA.

### **WHILE MSHA'S DISTRICT OFFICES HAVE ENFORCED MINES' IMPLEMENTATION OF EMERGENCY RESPONSE PLANS, MSHA HEADQUARTERS HAS PROVIDED LIMITED OVERSIGHT OF ENFORCEMENT AND PLAN QUALITY**

MSHA's district offices have conducted inspections and issued citations to enforce implementation of mines' emergency response plans, but MSHA headquarters has provided limited oversight of the districts' enforcement efforts and the overall quality of the plans. MSHA's districts have inspected many mines for compliance and issued citations to enforce implementation of their emergency response plans, but MSHA headquarters officials have not systematically evaluated the data on citations related to emergency response plans to identify potential problems with implementation or enforcement. In addition, MSHA headquarters has provided insufficient oversight to ensure the quality of underground coal mines' emergency response plans or to identify whether corrective actions might be needed.

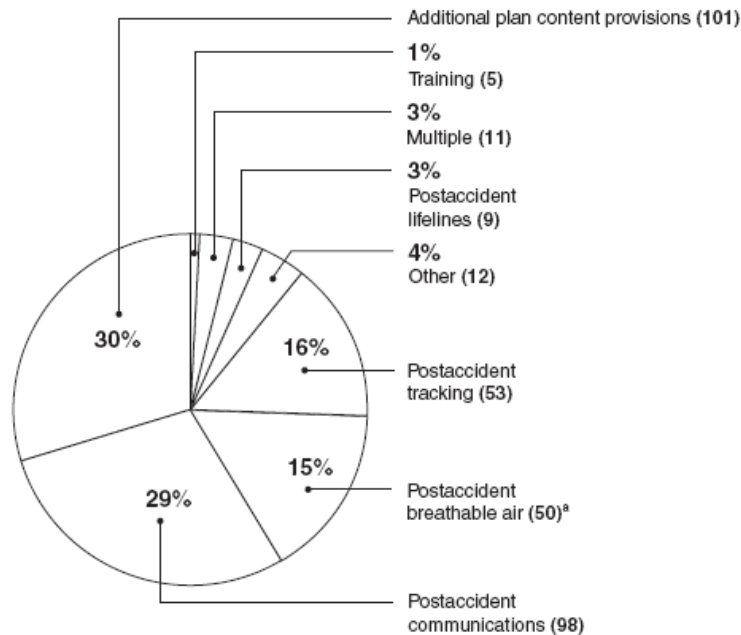
#### **District Offices Have Used Inspections and Citations to Enforce Implementation of Plans**

In October 2006, MSHA headquarters provided the districts with guidance stating that inspectors should begin checking for compliance with approved emergency response plan components during the regular inspection process. If an inspector finds a mine operator has not implemented a component of its approved plan, MSHA can cite the mine for noncompliance with its plan. According to district officials, all of MSHA's districts began incorporating individual components of mines' plans into their regular inspections as soon as the components were approved. Inspectors were notified of the approval of individual components of the mines' plans through updates of the mines' uniform mine files, which contain all of the mines' plans and must be reviewed by inspectors prior to each inspection.[32]

As of December 2007, inspectors had issued over 350 citations to mine operators who had not properly implemented the approved components of their emergency response plans. MSHA inspectors began issuing citations for noncompliance in November 2006, shortly after MSHA headquarters issued its guidance.[33] Prior to November 2006, MSHA district offices only issued citations to mines that had failed to submit or revise their emergency response plans for approval. From November 2006 through mid-December 2007, the most frequently



issued citations were related to postaccident communications, postaccident tracking, postaccident breathable air, and additional plan content.[34] The citations for noncompliance with the postaccident breathable air component of mines' plans included violations for not having the required self-contained self-rescuers and supplies for providing oxygen to miners trapped underground for a long period of time. Figure 8 indicates the percentage and number of citations issued for noncompliance with each component of the mines' emergency response plans.



<sup>a</sup> The 50 citations for noncompliance with the postaccident breathable air component include 42 violations of plans' provisions for the long-term maintenance of miners trapped underground, 7 violations of plans' provisions for self-contained self-rescuers, and 1 violation of both provisions for both.

Figure 8. Citations MSHA Issued to Mines under the MINER Act for Noncompliance with Each Emergency Response Plan Component, by Component, August 15, 2006, to December 11, 2007.

The reasons for the citations varied; instances of noncompliance cited included, among other things, mines not installing required equipment or equipment not functioning properly. Table 3 includes examples of the conditions cited by inspectors.

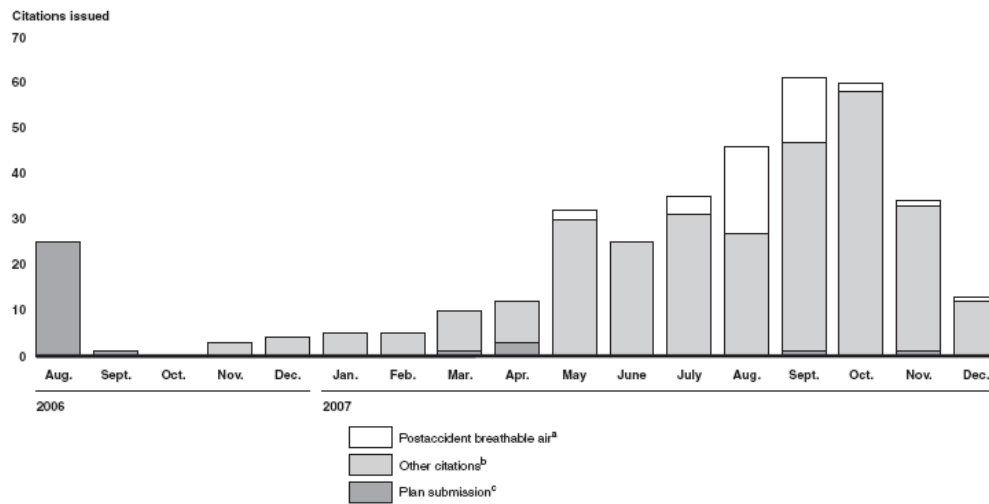
MSHA issued more citations to mines beginning in May 2007 when more plans had been fully approved. Citations issued for failure to submit or revise a plan were generally issued earlier in light of the August 2006 deadline, and citations issued for long-term postaccident breathable air for miners trapped underground tended to be issued later, since MSHA did not provide guidance on this issue until February 2007. Excluding these two categories, the number of monthly citations increased from 9 in April 2007 to 30 in May 2007 and had increased to nearly 60 by October 2007 (see figure 9). According to MSHA's Administrator for Coal Mine Safety and Health, the number of citations increased as more approved plans

became eligible for inspection, and will likely decrease as more mines successfully implement their plans and properly maintain their equipment.

**Table 3. Examples of Conditions Cited by Inspectors for Noncompliance with Mines' Emergency Response Plans**

Emergency response plan component	Summary of violation
Postaccident communications	The plan stated that a second and separate communications system would be installed in the primary escapeway. The plan also stated that the second system would be a telephone line that would extend with the lifeline as mining progressed. This second line was to be installed within 30 days of the approval of the plan. No secondary communications system had been installed.
Postaccident tracking	The mine operator failed to comply with the tracking plan in the mine's emergency response plan. The tracking plan was not effective in that one miner was recorded as being in two different working sections of the mine at the same time and two miners were recorded as being underground when they were actually both on the surface.
Postaccident breathable air: long-term maintenance of miners trapped underground	The operator's emergency response plan required that arrangements be made to provide breathable air for the active section of the mine within 60 days after the plan was approved. The plan had been approved and 60 days had elapsed, but the operator had not made arrangements to provide breathable air.
Postaccident breathable air: self-contained self-rescuers	A self-contained self-rescuer storage container was not being maintained. The container had been damaged; the lids were badly bent and hanging; and the self-contained self-rescuers were exposed to dirt, dust, and water.
Training	Discussions with seven miners indicated that they were not adequately trained in transferring from one self-contained self-rescuer to another, as required by the approved emergency response plan.
Postaccident lifelines	The lifeline installed in the alternate escapeway along the conveyor belt was broken in several locations. A section of the lifeline was wrapped around other equipment.
Additional plan content	The following items were not available on the working section: claw hammer, protective gloves, eight roof jacks, four brattice boards, nails, and food and water in sufficient amounts.
Multiple	The operator had not installed a lifeline in the primary escapeway from the surface to the working section. Also, the mine operator had not installed an additional means of communication from the surface to the working section of the mine.
	The mine operator was not keeping a written record of the location of miners underground, as required by the mine's emergency response plan. In addition, the items listed in the plan's section for additional plan contents were not provided on the working section for the maintenance of miners trapped underground.

Source: GAO summary of MSHA data.



- <sup>a</sup> “Postaccident breathable air” includes citations issued for not providing supplies for the long-term maintenance of miners trapped underground. These citations were related to MSHA’s February 2007 guidance on providing postaccident breathable air for the maintenance of miners trapped underground. Citations issued for failure to comply with the requirement for providing caches of self-contained self-rescuers, which MSHA addressed in its general guidance in the summer and fall of 2006, are included in “other citations.” We categorized the citations this way to demonstrate the increase in citations related to postaccident breathable air that occurred after MSHA issued the guidance on this component. One citation that was issued for both the maintenance of trapped miners and for self-contained self-rescuers is included in this category.
- <sup>b</sup> “Other citations” includes citations issued for multiple components, including one from August 2007 that cited a mine for, among other things, not providing postaccident breathable air for the long-term maintenance of miners trapped underground. The category also includes citations issued regarding self-contained self-rescuers, which were addressed in MSHA’s general guidance on emergency response plans issued in the summer and fall of 2006.
- <sup>c</sup> “Plan submission” includes failure to submit a plan or revise a plan. For example, after MSHA released its February 2007 guidance on postaccident breathable air for the long-term maintenance of trapped miners, MSHA required mine operators to resubmit their plans to show how the mine would address this component.

Figure 9. Number of Citations Issued under the MINER Act Each Month, August 15, 2006, to December 11, 2007.

Most citations MSHA issued for violations of mines’ emergency response plans were promptly addressed by the mine operators. Upon issuing a citation, the MSHA inspector is required to establish a deadline for correction of the safety or health hazard identified in the citation. More than half of the hazards identified in citations issued to underground coal mines through December 11, 2007, were corrected within a week of being issued, and one-quarter were corrected on the same day that the citations were issued (see table 4). About 7 percent of the citations reviewed were still outstanding at the end of 2007 and pertained to mines’ failure to comply with their plans’ requirement to provide long-term postaccident breathable air to trapped miners. Half of these outstanding citations have not been terminated because the equipment the mine operators planned to use to meet the requirement was unavailable.

**Table 4. Correction Time Frames for Citations Issued under the MINER Act to Mines for Failing to Submit or for Not Complying with Their Emergency Response Plans**

Correction time frame	Number of violations	Percent of total violations
Same day	94	25.3%
Within 1 week	134	36.1
Within 2 weeks	39	10.5
Within 3 weeks	39	10.5
Within 4 weeks	18	4.9
Greater than 4 weeks	20	5.4
Not corrected <sup>a</sup>	27	7.3
Total	371	100%

<sup>a</sup> These citations were still outstanding, as of January 1, 2008.

Source: GAO analysis of MSHA data.

In a November 2007 report, the Department of Labor's Office of Inspector General indicated that decreasing inspection resources has made it difficult for MSHA to complete all required inspections of underground coal mines.[35] Management officials we interviewed in 4 of the 11 district offices indicated that they did not have an adequate number of inspectors to complete the required emergency response plan inspections. However, several managers also said that this situation will be remedied when newly hired inspectors become fully qualified to conduct inspections. One former district manager said that inspectors were able to complete the required inspections of mines' emergency response plans but may not have had time to proactively recommend improved safety practices to mine operators during these inspections.

### **MSHA Has Not Systematically Evaluated Citation Data to Identify Potential Problems with Implementation or Enforcement**

MSHA headquarters has not examined the available data on citations to assess the extent to which each emergency response plan component has been violated or whether enforcement of the plans may differ across districts. Senior officials at MSHA headquarters told us that they had not analyzed the citations related to emergency response plans, apart from totaling the number of citations issued under the MINER Act. The MSHA specialist responsible for reviewing the citation data said that MSHA headquarters analyzes the citation data more to oversee the compliance of individual mine operators and mines, rather than to oversee districts' enforcement efforts. As a result, MSHA headquarters officials were not aware that the number of citations related to emergency response plans varies across districts. We reviewed the citations issued by MSHA's 11 district offices for violations of mines' emergency response plans from August 15, 2006, through December 11, 2007, and found large differences in the number of citations issued across districts. For example, as of December 11, 2007, one district had cited one of its 18 mines for failing to comply with its emergency response plan; in contrast, three districts had cited over two-thirds of their mines for noncompliance with their plans. (See app. II for details on the number of citations issued and the number of mines cited per district.) When we informed a senior MSHA official of these differences, he said he was not aware of them or the reasons for these differences. While

some differences can be expected, MSHA has not identified the causes of these differences or whether they are the result of inconsistent enforcement, which may warrant corrective actions.

MSHA headquarters also has not analyzed and compared citations issued under the MINER Act with citations issued under related agency regulations.[36] Some of the emergency response plan requirements of the MINER Act are also contained in MSHA's regulations. For example, both the MINER Act and MSHA regulations require mines to have lifelines or equivalent devices.[37] MSHA has not established a clear policy for when inspectors should cite the emergency response plan requirement of the MINER Act or the regulations when both apply. We found that both types of citations have been issued for the same requirement, indicating that it would not be possible to assess mines' compliance with a requirement by evaluating either type of citation in isolation. Specifically, based on our analysis of MSHA's citation data, we found that, while inspectors issued only 14 citations for noncompliance with the lifeline requirements of the MINER Act, they issued over 150 citations for noncompliance with regulations regarding lifelines over the same period.[38] One assistant district manager said that inspectors use the regulations as the basis for citations because they are more specific than the language of the MINER Act; therefore, the regulations allow the inspector to better specify the nature of the violation and defend the citation if it is contested.[39] While data on citations for noncompliance with the MINER Act and the regulations are available, MSHA headquarters does not review both data sources and, as a result, may not have accurate information to reflect the full extent of operator compliance with emergency response plan requirements.

The option to cite either the emergency response plan requirement of the MINER Act or regulations for certain kinds of violations could also prevent MSHA from appropriately considering one of the statutory factors that is used to calculate penalty assessments. Specifically, MSHA is required to consider the mine operator's history of previous violations in assessing penalties. The formula it uses to assess penalties results in a higher penalty if the mine has been cited previously five or more times for violating the same statutory provision or regulation in the preceding 15 months. However, if citations for repeat violations by the same mine are not issued consistently under the same provision—either the applicable statute or the regulations—MSHA's penalty assessment system will not identify them as repeat violations, even though the nature of the violation is the same. Therefore, if an inspector issued five citations to a mine operator for failing to maintain the mine's lifelines under the emergency response plan requirement of the MINER Act and subsequently issued a sixth citation under the regulations, rather than the MINER Act, MSHA's penalty assessment system would not flag the violation as a repeat violation, and the higher penalty assessment would not apply. For example, MSHA issued two citations to one mine under the MINER Act and assessed the minimum penalty amount. Between the dates that these two citations were issued, however, the mine received at least four citations for violations of regulations that overlapped with the requirements of the MINER Act. Had these four citations been issued under the MINER Act per MSHA headquarters' guidance to its districts, rather than under MSHA's regulations, the penalties assessed would have been higher to reflect the mine's repeated violations of the emergency response plan requirements of the MINER Act.

## **MSHA Has Not Provided Sufficient Oversight to Ensure Plan Quality**

Although MSHA headquarters has reviewed some of the mines' emergency response plans, it has not provided sufficient oversight of the district offices to ensure that the levels of safety protection required by the plans are adequate across all of its district offices. Internal control standards for the federal government advise that internal controls should be designed so that monitoring is ongoing and ingrained in agency operations.[40] During mine inspections, inspectors must ensure that the mines are adhering to the requirements described in the content of their emergency response plans. However, as discussed earlier in this report, the plans we reviewed varied in the information provided for certain plan components, such as postaccident breathable air and postaccident tracking, raising uncertainties about the protections provided to miners. One senior MSHA headquarters official said that the district offices have submitted samples of mines' approved plans to headquarters but the review of such plans has not been systematic or comprehensive. He further indicated that such a review would be time-consuming and resource intensive. MSHA headquarters officials said they plan to review the emergency response plans as part of the agency's peer review process, but each district office only undergoes a peer review once every 2 years. Without monitoring the quality of the plans across all districts, it is unclear how MSHA headquarters can ensure that its guidance and the requirements of the MINER Act are applied consistently and that mines are held to the same standards.

## **CONCLUSIONS**

At the Sago mine, 12 miners died hours after an explosion in the mine after being exposed to the carbon monoxide that accumulated in the mine. The MINER Act now requires underground coal mines to develop emergency response plans to ensure that miners have the tools and technology needed to protect them in the event of future mine accidents. However, because of differences in the mines' emergency response plans, it is not clear that all mines are being held to the same standards for providing these tools to trapped miners and, ultimately, for providing the protections needed to ensure the safety of miners. We understand that not all of the mines' emergency response plans will be exactly the same because they must take into account the specific characteristics of each mine. However, the differences in the plans we reviewed seemed to reflect a lack of specific guidance, rather than the unique characteristics of each mine. MSHA's current guidance will continue to be a problem as districts approve emergency response plans for new mines and review compliance with emergency response plans as part of their inspections of all mines. In addition, despite advances in technology, MSHA has not developed guidance indicating what technologies it will allow mine operators to use to meet the June 2009 wireless communications requirement of the MINER Act because they want to wait and see what will be available. However, if MSHA does not act soon to determine what will be acceptable, it is not clear that manufacturers and mine operators will be able to plan and prepare for the implementation of new technologies before the deadline, thereby missing opportunities to improve trapped miners' chances of survival after an accident. Finally, by not monitoring district offices to

determine the quality of the emergency response plans and district enforcement efforts, MSHA headquarters officials will not be aware that the district offices may be holding mines to different standards. As a result, all mines may not be prepared to adequately protect their miners in the event of an accident.

## **RECOMMENDATIONS FOR EXECUTIVE ACTION**

To ensure that new and existing mines are held to the same agencywide standards in preparing for future accidents, we recommend that the Secretary of Labor direct the Assistant Secretary for Mine Safety and Health to develop and issue additional guidance to district offices to clarify what is required for key components of the emergency response plans, such as providing postaccident breathable air for the maintenance of trapped miners.

To improve trapped miners' chances of survival after future accidents through the use of advanced technology, we recommend that the Secretary of Labor direct the Assistant Secretary for Mine Safety and Health to work with NIOSH to develop guidance for mine operators on how to meet the June 2009 requirement to provide postaccident wireless communications systems.

To improve oversight of the enforcement and approval of emergency response plans, we recommend that the Secretary of Labor direct the Assistant Secretary for Mine Safety and Health to take steps to ensure that district offices are consistently applying MSHA's guidance on approving and enforcing emergency response plans, such as:

- analyzing its citation data by district offices and using the information to clarify policies across districts if these analyses reveal discrepancies in policies;
- analyzing violations of the MINER Act and related regulations to identify trends and ensure that the appropriate penalties are being assessed, particularly for repeat violations; and
- reviewing a sample of plans across districts to ensure that the content of the plans meets a consistent agencywide standard and, if not, take corrective action by clarifying the guidance.

## **AGENCY COMMENTS AND OUR EVALUATION**

We obtained written comments on a draft of this report from the Departments of Labor and Health and Human Services, which are reproduced in their entirety in appendixes III and IV. Both agencies concurred with our recommendations and the Department of Health and Human Services provided technical comments and clarification, which we incorporated in the report as appropriate.

In response to our recommendation that MSHA issue additional guidance to its district offices clarifying the requirements for key components of emergency response plans, the Department of Labor agreed and stated that MSHA will issue more detailed guidance to district managers, including checklists that clarify what must be included in reviewing new emergency response plans and 6-month reviews of the plans. The agency also noted that, in

developing guidance on the breathable air component of the plans, MSHA needed time to evaluate all available technology to ensure that breathable air was provided safely in an underground mine environment. We understand that the safety issues involved warranted careful consideration and that MSHA needed to obtain input from the mining community as it developed the guidance. However, as stated in our report, MSHA, for several months, did little to act on the comments it received on the draft guidance which made it difficult for its district offices and mine operators to move forward in providing miners with the protections intended by the MINER Act.

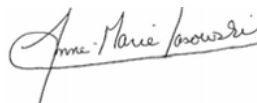
In response to our recommendation that MSHA work with NIOSH to develop guidance for mine operators on meeting the June 2009 requirement to provide postaccident wireless communications systems, both the Departments of Labor and Health and Human Services agreed with the recommendation. The Department of Labor stated that it expects MSHA to develop guidelines at least 6 months prior to the June 2009 deadline. In its comments, the Department of Health and Human Services emphasized the need for MSHA to issue its guidance in time for mine operators to respond quickly, indicating that at least 10 months would be needed for them to develop plans, order equipment, and install the new systems. Given the upcoming June 2009 deadline and steps mine operators and manufacturers must take, the Departments of Labor and Health and Human Services should work quickly to develop the needed guidance. The Department of Labor also indicated that our report omitted the fact that MSHA maintains up-to-date lists of approved equipment on its website. However, while these lists indicate which equipment has been approved as safe for use in underground coal mines, they do not address what equipment will be sufficient to meet the postaccident wireless communications requirement in the MINER Act.

In response to our recommendation that MSHA provide additional oversight to ensure that district offices are consistently applying the agency's guidance on approving and enforcing emergency response plans, the Department of Labor agreed. It stated that MSHA plans to review citations issued by its district offices; provide inspectors with guidance to help ensure that consistent methods are used in citing statutory provisions of the MINER Act or regulations violated by mine operators; and formalize headquarters' reviews of emergency response plans to ensure consistency in their content, implementation, and enforcement.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies of this report to the Secretaries of Labor and Health and Human Services, interested congressional committees, and other interested parties. We will also make copies available to others on request. In addition, the report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-7215 or [lasowskia@gao.gov](mailto:lasowskia@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix V.

Sincerely yours,



Anne-Marie Lasowski  
Acting Director, Education, Workforce, and Income Security Issues



## APPENDIX I: SCOPE AND METHODOLOGY

To conduct this work, we interviewed officials at the Mine Safety and Health Administration's (MSHA) Coal Mine Safety and Health headquarters and its 11 district offices to learn about MSHA's guidance for approving the emergency response plans, the status of implementation of the plans, and MSHA's inspection efforts. In each district, we interviewed the district manager or assistant district manager,[41] the specialist responsible for reviewing and approving emergency response plans, and an underground coal mine inspector. We visited two of MSHA's district offices located in West Virginia and Kentucky—the two states with the largest number of underground coal mines in the United States. We selected District 3 in West Virginia because of the state's stringent mine safety laws. During this visit, we accompanied MSHA officials to observe conditions in an underground coal mine. We selected District 7 in Kentucky because of the unique and hazardous conditions in some of its mines, such as mines that release high amounts of methane. During this site visit, we accompanied an MSHA inspector to observe a system used by one mine that incorporated relatively new technology to meet the requirement for a postaccident tracking system. We also interviewed officials from the National Institute for Occupational Safety and Health (NIOSH); MSHA's Approval and Certification Center; and manufacturers of refuge chambers, breathing devices, and communications and tracking technologies to learn about the status of mine safety technology research and development. In addition, we interviewed the director of MSHA's penalty assessment office to determine how citations for violations related to mines' emergency response plans are processed.

We examined relevant federal laws and regulations that govern MSHA, the Federal Mine Safety and Health Review Commission, and NIOSH, as they applied to our research. Further, we reviewed the decisions that resolved the cases in which MSHA reached an impasse with mine operators on the requirements of their emergency response plans mentioned in our report. Finally, we consulted with outside individuals knowledgeable about the field of mine safety; mine company officials; and other representatives of the mining community, including the United Mine Workers of America, the National Mining Association, and the Bituminous Coal Operators' Association to obtain their views on mine safety efforts and the new requirements of the Mine Improvement and New Emergency Response Act of 2006 (MINER Act) for emergency response plans.

We also obtained and analyzed data provided by MSHA on the approval, implementation, and enforcement of the emergency response plans that all underground coal mines were required to submit to MSHA as part of the MINER Act. Our review included all mines that MSHA categorized as active, producing mines, which MSHA defines as those mines that operate on a full-time basis to produce coal.

### **Data on the Approval Status of Mines' Emergency Response Plans**

To determine the approval status of mines' emergency response plans, we obtained copies of the tracking reports from each district office used by MSHA headquarters officials to track the approval status of each component of the mines' plans. The reports indicate which components of each mine's plan had been approved, as of June 21, 2007. MSHA's district

offices updated these tracking reports weekly and provided them to MSHA headquarters. To assess the accuracy and reliability of the data recorded on the tracking reports, we (1) reviewed a nonprobability sample of emergency response plans and the supporting approval and deficiency letters sent by MSHA's district offices to mine operators that corroborated the reports provided to us by MSHA's district offices; (2) ensured that the data included all mines that became active, producing mines prior to June 21, 2007; and (3) interviewed agency officials knowledgeable about the data. We worked with district officials to correct any discrepancies we found before conducting our analyses. MSHA's tracking reports contained data for 462 of 467 mines; for the 5 mines that were omitted, we obtained the mines' emergency response plans and supplemented MSHA's tracking reports with information for these mines. We verified our assessment of the approval status of these plans with MSHA. After completing these steps, we determined that the data were sufficiently reliable for the purposes of our review.

We selected the nonprobability sample of mines' emergency response plans from mines that were included in the data provided by MSHA. Our sample included 77 of the plans submitted to MSHA by the 462 mines for which MSHA was tracking the approval status of their plans as of June 21, 2007. As of June 21, 2007, with the exception of District 1, all of MSHA's district offices had fully approved most of their mines' emergency response plans.<sup>[42]</sup> Districts 2 through 11 had fewer than five plans that had only been partially approved. Therefore, we included all of the partially approved plans from these districts in our sample to determine why they had not been fully approved and what factors were delaying their approval. We also randomly selected a minimum of five fully approved plans for the mines in these districts and 10 percent of the plans in the four districts with over 50 mines. Because none of the emergency response plans for the 12 mines in District 1 had been fully approved as of that date, we randomly selected a sample of 5 of these 12 partially approved plans for review. As shown in Table 5, our sample included 63 of the 441 plans that had been fully approved and 14 of the 21 plans that had been partially approved as of June 21, 2007.

**Table 5. Number of Emergency Response Plans, by District**

District office	1	2	3	4	5	6	7	8	9	10	11	Total
Underground coal mines' emergency response plans tracked for approval, as of June 21, 2007	12	33	29	120	57	89	64	19	22	10	7	462
Partially approved plans, as of June 21, 2007	12	2	0	0	2	0	0	4	1	0	0	21
Partially approved plans selected for review	5	2	0	0	2	0	0	4	1	0	0	14
Fully approved plans, as of June 21, 2007	0	31	29	120	55	89	64	15	21	10	7	441
Fully approved plans selected for review	0	5	5	12	6	9	6	5	5	5	5	63
Total number of plans selected for review	5	7	5	12	8	9	6	9	6	5	5	77

Source: GAO analysis of MSHA data.

We also used the 77 plans that we sampled to review the content of the plans and analyze the differences in the plans. We developed a data collection instrument to record information on each component contained in the plans. We used this data collection instrument to analyze and compare differences across the plans we reviewed.

Because, at the time of our review, MSHA had only recently approved most of the mines' emergency response plans, we did not include in the scope of our work the 6-month reviews of approved plans that the MINER Act requires MSHA to conduct.

### **Data on the Implementation Status of Mines' Emergency Response Plans**

To determine the status of mines' implementation of the components of their emergency response plans, we obtained data as of September 2007 from MSHA headquarters detailing whether the mines' plans had been partially or fully implemented and what supplies mines had on order. We obtained these data for 439 of the 449 mines categorized by MSHA as active, producing mines as of October 30, 2007. We used this more recent date, rather than the June 2007 date, because it better reflected the implementation status of the emergency response plans of mines categorized as active, producing mines.[43] We could not obtain information on the implementation status of 10 mines' emergency response plans because MSHA did not track the status of their plans.

The September 2007 data on the implementation status of the mines' emergency response plans were compiled by MSHA's district offices as part of a one-time request from MSHA headquarters for this information. In January 2008, we asked the district offices to provide updated information on the implementation status of the emergency response plans for each of the 449 mines that were still active, producing mines. We used the January 2008 data to assess the extent to which mines had implemented their emergency response plans and the extent to which they were using certain methods to implement the requirements of their plans, such as whether they were using refuge chambers to meet the requirement to provide postaccident breathable air to trapped miners.

We did not independently verify the information provided by MSHA on the implementation status of each mine's emergency response plan, but we assessed its reliability. To assess the reliability of the data provided by MSHA on the implementation status of each mine's emergency response plan, we (1) reviewed MSHA's citation data to corroborate the data on implementation of the mines' emergency response plans and (2) interviewed agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of our review.

### **Data on MSHA's Citations**

To analyze MSHA's enforcement efforts, we obtained data from MSHA's headquarters office on citations issued by its inspectors for violations of the emergency response plan section of the MINER Act. The data represent citations issued from August 15, 2006, through December 11, 2007. We analyzed citations issued to underground coal mines that were among the 449 categorized by MSHA as active, producing mines as of October 30, 2007. Many mines may have changed status during that time frame; therefore, we used the data on

the status of each mine as of October 30, 2007 that we obtained in conjunction with the data on the status of the implementation of the mines' plans because obtaining data on the status of each mine on the date that it received a citation would have been too cumbersome. We also obtained data on citations issued for violations of 30 C.F.R. Part 75 during this same general period because some of the provisions it contains overlap with requirements of the MINER Act. We reviewed these citations, as well as those issued for violations of the of the emergency response plan section of the MINER Act, to obtain a complete picture of MSHA's enforcement efforts. We also analyzed whether some of these overlapping requirements posed a problem for inspectors in deciding how to issue the citations and for MSHA in assessing accurate penalties. We did not, however, review the extent to which mine operators contested citations issued by MSHA.

To assess the reliability of MSHA's citation data, we (1) reviewed a sample of completed citation forms to corroborate the data provided by MSHA, (2) performed electronic testing for obvious errors in accuracy and completeness, and (3) interviewed agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of our review.

We conducted this audit from April 2007 through April 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

## **APPENDIX II: CITATIONS ISSUED BY MSHA RELATED TO THE REQUIREMENTS OF MINES' EMERGENCY RESPONSE PLANS**

The following tables summarize MSHA's citations of the MINER Act, by district, from August 15, 2006, through December 11, 2007. Table 6 shows the number of citations issued by each district for each component of mines' emergency response plans. Table 7 provides additional detail on citations issued for violations of multiple components of the mines' plans. Table 8 indicates the number of mines per district that have been issued citations under the MINER Act.

**Table 6. Number of Citations Issued under the MINER Act to Active Mines for Violating Components of Emergency Response Plans, August 15, 2006, to December 11, 2007**

Violation	District											Totals
	1	2	3	4	5	6	7	8	9	10	11	
Failure to submit	2	2	5	3	-	-	17	-	-	-	3	32
Failure to comply												
Postaccident communications	3	7	10	24	23	3	14	1	3	1	9	98
Postaccident tracking	-	9	8	8	20	-	4	-	1	3	-	53
Postaccident breathable air												
Maintenance of miners trapped underground	-	2	-	-	26	8	4	-	2	-	-	42
Self-contained self-rescuers	-	-	5	-	-	2	-	-	-	-	-	7
Maintenance of miners trapped underground and self-contained self-rescuers	-	-	-	-	1	-	-	-	-	-	-	1
Training	-	-	1	2	-	-	-	-	-	-	2	5
Postaccident lifelines	-	-	-	1	1	-	6	-	1	-	-	9
Local coordination	-	-	-	-	-	-	-	-	-	-	-	-
Additional plan content provisions	3	4	3	44	15	3	25	-	-	-	4	101
Multiple <sup>a</sup>	-	-	3	3	1	-	4	-	-	-	-	11
Other	-	-	2	7	1	-	1	-	-	-	1	12
Total number of citations issued	8	24	37	92	88	16	75	1	7	4	19	371
Number of active, producing mines, as of October 30, 2007	11	33	30	119	54	85	61	18	21	10	7	449

Source: GAO analysis of MSHA data.

<sup>a</sup> See table 7 for a breakdown of citations issued for multiple violations.

**Table 7. Citations Issued under the MINER Act for Violations of Multiple Components of Mines' Emergency Response Plans as of December 11, 2007**

Emergency response plan components violated	Number of instances in which a mine in a district was issued one citation for violating multiple components
District 3	
Additional plan content provisions, postaccident communications, postaccident lifelines, postaccident tracking, training	1
Postaccident communications, postaccident lifelines	1
Postaccident communications, postaccident tracking	1
District 4	
Additional plan content provisions, postaccident communications	2
Additional plan content provisions, postaccident lifelines	1
District 5	
Additional plan content provisions, postaccident tracking	1
District 7	
Additional plan content provisions, postaccident tracking	1
Postaccident communications, postaccident lifelines	2
Additional plan content provisions, postaccident breathable air: maintenance of miners trapped underground	1

Source: GAO analysis of MSHA data.

**Table 8. Number and Percentage of Mines Cited per District under the MINER Act as of December 11, 2007**

District	Number of mines in district	Number of mines cited	Percentage of mines cited by district
District 1	11	5	36%
District 2	33	15	45
District 3	30	17	57
District 4	119	50	42
District 5	54	39	72
District 6	85	11	13
District 7	61	41	67
District 8	18	1	6
District 9	21	5	24
District 10	10	3	30
District 11	7	6	86

Source: GAO analysis of MSHA data.

**APPENDIX III: COMMENTS FROM THE DEPARTMENT OF LABOR****U.S. Department of Labor**Mine Safety and Health Administration  
1100 Wilson Boulevard  
Arlington, Virginia 22209-3939**MAR 31 2008**Ms. Anne-Marie Lasowski  
Acting Director  
Education, Workforce, and  
Income Security Issues  
Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Ms. Lasowski:

Thank you for the opportunity to comment on your draft report titled *"Additional Guidance and Oversight of Mines' Emergency Response Plans Would Improve the Safety of Underground Coal Miners"* (GAO-08-424). As you note in your report, MSHA has been diligent in taking actions to enhance mine safety since passage of the MINER Act in June 2006. As of March 17, 2008, 552 Emergency Response Plans (ERPs) for all active producing underground coal mines have been fully approved and implemented except where technology or products are not yet available.

MSHA continues to improve mine safety and values GAO's input in its efforts. A more detailed response to each of your agency's recommendation is enclosed. Also included is a summary of the MSHA actions taken to date to improve coal miner health and safety following enactment of the MINER Act.

We look forward to continued dialogue with your staff regarding any additional improvements that will benefit our nation's miners.

If you have any questions, please contact Ken Bullock at (202) 693-9778.

Sincerely,

A handwritten signature in cursive script that reads "Richard E. Stickler".  
Richard E. Stickler  
Acting Assistant Secretary for  
Mine Safety and Health

Enclosures

You can now file your MSHA forms online at [www.MSHA.gov](http://www.MSHA.gov). It's easy, it's fast, and it saves you money!



## Mine Safety and Health Administration (MSHA) Responses to GAO Report

### GAO Recommendation

**To ensure that new and existing mines are held to the same agency-wide standards in preparing for future accidents, we recommend that the Secretary of Labor direct the Assistant Secretary for Mine Safety and Health to develop and issue additional guidance to district offices to clarify what is required for key components of the emergency response plans, such as providing post-accident breathable air for the maintenance of trapped miners.**

### MSHA Response

MSHA continually reviews Emergency Response Plans (ERPs) every six months to ensure consistency and constant improvement. MSHA is pleased that GAO determined that MSHA has successfully implemented all technologically feasible Emergency Response Plan (ERP) requirements of the MINER Act in all active, producing underground coal mines. We also appreciate that GAO acknowledged that the two exceptions to full implementation are outside the control of MSHA and the coal mining industry due to supply constraints and technological feasibility.

To address the specific GAO recommendation, MSHA will issue updated guidance from the Administrator for Coal Mine Safety and Health (CMS&H) to the District Managers with more detailed information on the content and reviews of ERPs. This will include a national checklist and guidance on what must be included in a new emergency response plan review and a 6-month review. Each ERP will be different because of the unique conditions of the mine; however, as mine specific ERP implementation experience is gained and additional knowledge is learned, providing further guidance on the specific protections required will help to ensure that operators "(i) provide for the evacuation of all individuals endangered by an emergency; and (ii) provide for the maintenance of individuals trapped underground in the event that miners are not able to evacuate the mine."

One concern we have with the report, however, is GAO's criticism of MSHA's implementation schedule for the breathable air component of ERPs. The MINER Act required that ERPs must:

## 2

- a. Afford miners a level of safety protection at least consistent with the existing standards, including standards mandated by law and regulation;
- b. Reflect the most recent credible scientific research;
- c. Be technologically feasible, make use of current commercially available technology, and account for the specific physical characteristics of the mine; and
- d. Reflect the improvements in mine safety gained from experience under the [MINER] Act and other worker safety and health laws.

Stockpiling large amounts of oxygen for breathable air underground could create a significant safety issue. Thus, in requiring breathable air underground, MSHA had to evaluate all available technology to determine how breathable air could be most safely provided. Without careful consideration, premature implementation could have actually increased the danger to miners in the event of a mine accident, rather than improving their chances of survival, which is the overarching goal of MSHA.

#### GAO Recommendation

**To improve trapped miners' chance of survival after future accidents through the use of advanced technology, we recommend that the Secretary of Labor direct the Assistant Secretary for Mine Safety and Health to work with NIOSH to develop guidance for mine operators on how to meet the June 2009 requirement to provide post accident wireless communications systems.**

#### MSHA Response

MSHA concurs with the recommendation and has been working diligently with the National Institute for Occupational Safety and Health (NIOSH) to evaluate all communication and tracking technologies since the MINER Act was signed in June 2006. For example, NIOSH has a number of research and development contracts that have completion dates later this year that may develop new technology to meet the goals of the MINER Act. MSHA has also been working with NIOSH on guidance for mine operators on how to meet the June 2009 requirement to provide post accident wireless communications systems, and expects to implement guidelines well in advance of the required deadline -- at least six months prior to June 2009.

As GAO's report notes, currently available communication systems are not truly wireless. In the event of a significant accident underground, the infrastructure that these systems rely upon is almost certainly going to be damaged or destroyed – exactly when communications are needed most. Moreover, MSHA believes that mandating technologies that do not ensure communications in the event of an accident, could actually hinder the development of truly wireless technologies and thereby preclude an important safety improvement.

Should technology take longer to develop, the MINER Act allows for alternative means of compliance if the necessary, completely wireless technologies are not fully developed by June 2009. As noted, MSHA currently plans to provide guidance on a performance-based criteria for acceptable technological alternatives by January 2009, and later provide performance-based criteria for completely wireless solutions when such systems become commercially available.

Also, while we share GAO's concern that operators be given formal guidance as soon as possible, we believe GAO's report omits the important fact that MSHA maintains an up-to-date listing of MSHA-approved technologies and evaluation results of such technologies on its website at <http://www.msha.gov/techsupp/commoandtracking.asp>, which can be easily referenced by operators in evaluating systems for their mines.

#### GAO Recommendation

**To improve oversight of the enforcement and approval of emergency response plans, we recommend that the Secretary of Labor direct the Assistant Secretary for Mine Safety and Health to take steps to ensure that district offices are consistently applying MSHA's guidance on approving and enforcing emergency response plans, such as:**

- **analyzing its citation data by district offices and using the information to clarify policies across districts if these analyses reveal discrepancies in policies;**

#### MSHA Response

MSHA is pleased that GAO found that MSHA's diligent enforcement of ERP requirements has resulted in mine operators promptly improving safety – the majority “within a week” when cited – and that any ongoing problems with ERP implementation are due to manufacturing back orders of breathable air components and technological limitations, which are outside the control of mine operators and MSHA. As noted above, MSHA is constantly seeking to improve

the ERP review process for the benefit of miners in the course of its twice annual reviews of each ERP. To specifically address GAO's recommendation, the Administrator for CMS&H will issue a memo to District Managers requesting that all citations issued for ERP violations be scanned and transmitted to Headquarters for review and analysis. Internal guidance will be issued to underground coal mine inspectors to cite the statutory provision of the MINER Act applicable to emergency response plans when inspectors find a violation of the plan, unless there is a more specific regulation that applies to the violation. Headquarters staff will evaluate the issued violations and determine if any policy clarifications are necessary to improve consistency in issuances, and as MSHA does in all other areas, it will hold regular discussions with District Managers to receive input and develop best practices and improvements for ERPs.

- **analyzing violations of the MINER Act and related regulations to identify trends and ensure that the appropriate penalties are being assessed, particularly for repeat violations;**

#### MSHA Response

Penalties are an essential part of the Mine Act's enforcement scheme and deter mine operators from committing violations. When operators ignore their responsibilities, repeat violations rightfully incur a much higher penalty. Currently, there are only some specific safety regulations, such as those for lifelines, that apply to the components of the required ERPs; other requirements are covered by the statute and are more general. As GAO notes in its report, to ensure the fullest protection of miners, MSHA prefers to issue citations under the more protective regulations it has developed in cooperation with miners, operators and scientific experts through the rulemaking process, as opposed to more general statutory provisions. As a legal matter, we note that a violation of the regulations may not also violate the MINER Act and vice versa.

MSHA, however, appreciates the importance of requiring that repeat violations under either the statute or the regulation are deterred. Accordingly, MSHA will issue guidance to its inspectors to cite the statutory provision of the MINER Act where it is applicable unless there is a more protective regulation that applies to the violation. This policy will ensure that repeat violations are accurately captured in a mine's violation history and that the resulting assessment amount will reflect that history and ensure that the most protective standard for miners is met by operators.

- **reviewing a sample of plans across districts to ensure that the content of the plans meets a consistent agency-wide standard and, if not, take corrective action by clarifying the guidance.**

#### MSHA Response

As noted in GAO's report, MSHA headquarters personnel have been reviewing ERPs from mines throughout the country and working to ensure consistency of ERPs. In order to formalize that effort, MSHA will issue a memo to the Director, Office of Accountability (OA) and the Administrator, CMS&H, requiring the review of ERPs during any national OA review and CMS&H headquarters accountability review and district peer reviews to ensure consistency in plan provisions, operator implementation of the ERPs, and enforcement efforts.

CMS&H headquarters has already developed a list of mines, encompassing an appropriate cross-section of coal mine types and operators, for ERP review. The national ERP checklist and guidance, described previously, will be used to ensure that the content and approval of the ERPs meet the applicable agency-wide guidance. Based on a recurring review of sample ERPs from the districts, corrective action will be taken to update and clarify headquarters' guidance to address discrepancies and inconsistencies from established policy on the approval of these emergency response plans.

#### Conclusion

MSHA concurs with all of the GAO's recommendations for additional guidance and oversight of the approval and enforcement of mine operators' emergency response plans, and had already been working on improvements that address a number of GAO's recommendations. We will continue our efforts in that regard and expect these actions will further improve the consistency in ERPs approved and enforced nationwide for the benefit of our nation's miners.

## APPENDIX IV. COMMENTS FROM THE DEPARTMENT OF HEALTH AND HUMAN SERVICES



DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the Assistant Secretary  
for Legislation

Washington, D.C. 20201

APR 2 2008

Afne-Marie Lasowski  
Acting Director  
Education, Workforce, and  
Income Security Issues  
U.S. Government Accountability Office  
Washington, DC 20548

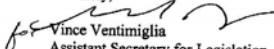
Dear Ms. Lasowski:

Enclosed are the Department's comments on the U.S. Government Accountability Office's (GAO) draft report entitled: Mine Safety: Additional Guidance and Oversight of Mines' Emergency Response Plans Would Improve the Safety of Underground Coal Miners (GAO 08-424).

The attached comments serve as the final comments for publication.

The Department appreciates the opportunity to review and comment on this report.

Sincerely,

  
for Vince Ventimiglia  
Assistant Secretary for Legislation

**GENERAL COMMENTS OF THE DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS) ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S (GAO) DRAFT REPORT ENTITLED: MINE SAFETY: ADDITIONAL GUIDANCE AND OVERSIGHT OF MINES' EMERGENCY RESPONSE PLANS (GAO 08-424)**

We have reviewed the report with particular attention to the issues, findings, and recommendations that relate to NIOSH's research activities. Overall we concur with those aspects of the report.

Below is an explanation/clarification of the timeline and excel spreadsheet sent with our earlier comments, which makes reference to the 10 month timeframe.

- We especially want to emphasize the importance of GAO's finding on page 28 that fully wireless systems may not be available for many years.
- As GAO correctly observed on page 27, the MINER Act itself does not define "wireless" communication, but as noted in the Senate HELP Committee Report on the Act, the intent is for mine operators to use the most advanced technology available for a particular mine, and to avoid interpretation of the law so narrowly as to stifle innovation and delay implementation of methods or equipment that would have significant safety benefits.
- These are critical points. NIOSH has informed MSHA that its policy statement on wireless communication is too narrowly defined.
- Moreover, we have estimated that it will take many operators at least 10 months after MSHA issues policy guidance to develop a post-accident communication plan, place equipment orders, and begin in-mine installation.
- Therefore, this guidance should be issued as soon as practicable, if the goal is to meet the June 2009 target established by the MINER Act.
- For this reason, we fully support GAO's recommendation that MSHA work with NIOSH to develop this guidance.
- It should be noted that MSHA has made a commitment to work with us on this issue.

---

## **APPENDIX V: GAO CONTACT AND STAFF ACKNOWLEDGMENTS**

### **GAO Contact**

Anne-Marie Lasowski, (202) 512-7215 or lasowskia@gao.gov .

### **STAFF ACKNOWLEDGMENTS**

Revae Moran, Assistant Director, and Cady Panetta, Analyst-in-Charge, managed this report. Other staff who made key contributions to the report include Alana Finley and Jill Yost. Sheila McCoy provided legal assistance. Cindy Gilbert and Shana Wallace assisted with the methodology and statistical analysis. Susanna Compton and Mimi Nguyen helped prepare the final report and the graphics.

### **GAO'S MISSION**

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

### **Obtaining Copies of GAO Reports and Testimony**

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site ([www.gao.gov](http://www.gao.gov) ). Each weekday, GAO posts newly released reports, testimony, and correspondence on its Web site. To have GAO e-mail you a list of newly posted products every afternoon, go to [www.gao.gov](http://www.gao.gov) and select "E-mail Updates."

### **Order by Mail or Phone**

The first copy of each printed report is free. Additional copies are \$2 each. A check or money order should be made out to the Superintendent of Documents. GAO also accepts VISA and Mastercard. Orders for 100 or more copies mailed to a single address are discounted 25 percent. Orders should be sent to:

U.S. Government Accountability Office 441 G Street NW, Room LM Washington, DC 20548

To order by Phone: Voice: (202) 512-6000 TDD: (202) 512-2537 Fax: (202) 512-6061

---

## To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Web site: [www.gao.gov/fraudnet/fraudnet.htm](http://www.gao.gov/fraudnet/fraudnet.htm) E-mail: [fraudnet@gao.gov](mailto:fraudnet@gao.gov) Automated answering system: (800) 424-5454 or (202) 512-7470

### Congressional Relations

Ralph Dawn, Managing Director, [dawnr@gao.gov](mailto:dawnr@gao.gov) , (202) 512-4400 U.S. Government Accountability Office, 441 G Street NW, Room 7125 Washington, DC 20548

### Public Affairs

Chuck Young, Managing Director, [youngc1@gao.gov](mailto:youngc1@gao.gov) , (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548

## REFERENCES

- [1] Pub. L. No. 109-236.
- [2] NIOSH is responsible for developing or adapting new technologies for use in the mining industry and may make recommendations to MSHA based on its research findings.
- [3] A nonprobability sample cannot be generalized to the population from which it was drawn.
- [4] These offices also employed approximately 76 inspectors who are authorized to inspect surface coal mines but not underground mines.
- [5] Mines that are recognized as being especially dangerous, such as those containing high levels of methane gas, are required to be inspected more frequently.
- [6] Withdrawal orders compel mine operators to remove miners from the affected work areas until the hazardous situation cited is corrected, which could halt production in those areas of the mine.
- [7] MSHA categorizes mines that have ceased production but anticipate reopening in the future as temporarily idled; mines that are closed for the foreseeable future as being abandoned; and mines that have been abandoned with their underground openings sealed as being abandoned and sealed.
- [8] MSHA has the authority to issue an Emergency Temporary Standard when it determines that miners are exposed to grave danger from exposure to substances or agents determined to be toxic or physically harmful, or to other hazards, and that an emergency standard is needed to protect miners from such danger. The standard becomes effective upon publication in the Federal Register and remains in effect until replaced by final regulations subject to the rulemaking process, but for no longer than 9 months.



- 
- [9] 30 U.S.C. § 876(b)(2)(A).
- [10] 30 U.S.C. § 876(b)(2)(C).
- [11] 30 U.S.C. § 876(b)(2)(D).
- [12] 30 U.S.C. § 876(b)(2)(E)(iii).
- [13] According to MSHA's guidance, self-contained self-rescuers are not an acceptable method of providing emergency supplies of air for the long-term maintenance of trapped miners.
- [14] 30 U.S.C. § 876(b)(2)(E)(iv).
- [15] NIOSH, *Research Report on Refuge Alternatives for Underground Coal Mines* (Washington, D.C., Dec. 2007).
- [16] GAO, *Mine Safety: Better Oversight and Coordination by MSHA and Other Federal Agencies Could Improve Safety for Underground Coal Miners*, GAO-07-622 (Washington, D.C.: May 16, 2007).
- [17] Generally, underground areas of the mine are divided into zones. Miners are required to contact mine staff working above ground when they move from one zone to another to let them know in which zone they are located in case of an accident.
- [18] Under the MINER Act, if MSHA and a mine operator reach an impasse on the approval of the mine's emergency response plan, MSHA must issue the mine a citation. Such a citation is immediately referred to the Federal Mine Safety and Health Review Commission, where an administrative law judge must render an expedited decision to resolve the dispute. That decision is reviewable by the Commission.
- [19] This included all underground coal mines that were categorized by MSHA as active, producing mines as of June 2007.
- [20] MSHA's guidance on long-term postaccident breathable air issued in February 2007 did not clearly specify whether the plans must require postaccident breathable air in these locations. It was later, in April 2007, in a questions and answers document, that MSHA headquarters clarified that the plans should require breathable air in outby locations.
- [21] One of MSHA's districts did not have any fully approved plans when we collected the sample of plans to be reviewed and, therefore, was not included in this analysis.
- [22] According to MSHA's guidance, some mines are not required to provide postaccident breathable air if the working section of the mine (the area where the coal is being removed) is less than 2,000 feet from the mine entrance.
- [23] This includes 449 mines characterized by MSHA as active, producing mines as of October 30, 2007.
- [24] These are systems that use feeder cables that allow radio signals to "leak" into and out of the cable, radiating a signal throughout most areas of a mine and allowing miners working underground and personnel above ground to communicate using these signals.
- [25] Miners report their changes in location to a dispatcher on the surface, who notes their new location on a map of the mine.
- [26] Identifying tags attached to miners' helmets or belts are read by electronic readers when the miners pass by the readers. The tags transmit each miner's location to electronic equipment on the surface. The system provides each miner's location on an electronic map of the mine.
- [27] The postaccident breathable air component includes two parts: (1) emergency supplies of air sufficient for the long-term maintenance of trapped miners and (2) caches of self-contained self-rescuers positioned along mine tunnels leading to the mine entrance to

- aid in the miners' escape. According to MSHA guidance, self-contained self-rescuers are not an acceptable method for providing emergency supplies of air sufficient for the long-term maintenance of trapped miners.
- [28] In April 2007, MSHA specified in a questions and answers document that state-approved refuge chambers were an acceptable alternative for providing postaccident breathable air for trapped miners. NIOSH released its research report on refuge alternatives in December 2007, which identified shortcomings in selected refuge chambers that must be corrected before they are installed in mines. As of February 2008, MSHA had not responded to the NIOSH report with specific guidance on the use of refuge alternatives. Its response is required by June 2008.
- [29] 30 U.S.C. § 876(b)(2)(F).
- [30] S. Rep. No. 109-365 (2006).
- [31] Equipment installed in an underground coal mine must have prior approval from MSHA as being either intrinsically safe for use in an underground coal mine or explosion-proof.
- [32] Each district office maintains all of the plans that each mine is required to have approved by MSHA, including its emergency response plan, in a uniform mine file for that mine. In addition to the emergency response plans, mines are required to have many other plans approved by MSHA, including ventilation plans and roof control plans.
- [33] Unless otherwise specified, the citations referred to in this report are citations written under the MINER Act, in which the inspector cites either § 316(b) or § 316 as the section of the act that was violated. We analyzed the citations MSHA issued from August 15, 2006, through December 11, 2007, to mines that were categorized by MSHA as active, producing mines, as of October 30, 2007.
- [34] The MINER Act does not specify the requirements for additional plan content; however, the requirements for this component of the plans are detailed in MSHA's guidance to underground coal mine operators on the content of emergency response plans. The guidance specifies provisions that the plan should include for the maintenance of miners trapped underground, including barricading materials, food and water, and emergency supplies.
- [35] U.S. Department of Labor, Office of Inspector General, *Underground Coal Mine Inspection Mandate Not Fulfilled Due to Resource Limitations and Lack of Management Emphasis*, 05-08-001-06-001 (Washington, D.C., Nov. 2007).
- [36] 30 C.F.R. Part 75 contains regulations relating to mandatory safety standards for underground coal mines.
- [37] See 30 U.S.C. § 876(b)(2)(E)(iv) and 30 C.F.R. § 75.380(d)(7) and § 75.381(c)(5).
- [38] Lifeline citations included in this analysis were those issued under 30 C.F.R. §75.380(d)(7)(i)-(ii) and 30 C.F.R. §75.381(c)(5)(i).
- [39] For example, MSHA's regulations contain more specific requirements regarding the spacing between directional indicators and the use of reflective material to mark the location of lifelines.
- [40] GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: Nov. 1999).
- [41] Due to changes in MSHA's staffing that occurred during our review, we interviewed the former managers of some of the district offices who oversaw the approval process,

rather than the current managers who were not knowledgeable about the process because they were not in the district at the time that the approval process was being developed.

- [42] None of the emergency response plans for the 12 underground coal mines in District 1 had been fully approved because, at the time, the mine operators were contesting the MINER Act's requirements for some components of their plans.
- [43] MSHA was in the process of collecting the implementation data throughout the month of September 2007 and provided it to us in late October 2007. In order to examine only active, producing mines, we requested mine status information, and MSHA was able to accommodate this request on October 30, 2007.



*Chapter 3*

**COAL MINE HEALTH AND SAFETY  
IN THE UNITED STATES**

*Dennis O'Dell*

United Workers of America, Testimony before the United States Senate,  
Committee on Health, Education, Labor, and Pensions,  
Subcommittee on Employment and Workplace Safety

Madam Chairman and members of this Subcommittee on Employment and Workplace Safety, I would like to thank you on behalf of all the members of the United Mine Workers of America (UMWA or Union) for holding this very important hearing. We are eager to share the UMWA's perspective regarding what has – and has not – occurred concerning coal mine health and safety since the MINER act passed some two years ago. We appreciate your interest in protecting the nation's miners and their families. We are also pleased that you appreciate the need for continued oversight of the federal agencies charged with the responsibility to protect the health and safety of all miners.

It is said that "Every coal mine health and safety law in this country is written in coal miners' blood." Despite the existing laws governing miners' health and safety, miners continue to die at alarming rates. Already this year, we have lost **14** coal miners. This is far too many. We need to further improve our laws and regulations so that no miner will be killed just because he goes to work at a coal operation.

It took the Jim Walters Resources disaster of September 2001, and the Sago, Aracoma and Darby disasters of 2006 to achieve the post-accident improvements contained in the Mine Improvement and New Emergency Response Act of 2006 (MINER Act). We hope that Congress will appreciate that lessons learned from the Crandall Canyon disaster demonstrate that it is imperative to enact further legislation to protect miners, such as the pending S-MINER Act.

We must learn from tragedies and near misses alike. We should take corrective action. However, as two recent investigative reports demonstrate, MSHA is not doing a good enough job protecting miners. The U.S. Senate Committee on Health, Education, Labor and Pensions (HELP) Report and the Department of Labor's (DOL) Office of Inspector General's (OIG) Report regarding MSHA's actions and inactions at the Crandall Canyon mine last August

both show internal problems at the Agency. I commend Senator Kennedy and the entire HELP Committee and the DOL's OIG on their Reports and would like to make both Reports a part of this record. From these reports it is evident that MSHA is incapable of policing itself.

When Congress passed the MINER Act, it constituted the first federal mining law enacted in almost 30 years. While it offers miners a better chance of surviving and escaping a fire, explosion, inundation or mine entrapment, in order for it to be most useful to miners it must be effectively codified in regulations by MSHA. As investigators outside of MSHA have discovered, MSHA continues to make dire mistakes, at the expense of miners' safety.

## **CRANDALL CANYON MINE DISASTER**

*Report Released by Health, Education, Labor and Pensions Committee  
Edward M. Kennedy, Chairman*

First, let me thank Chairman Kennedy on the record for the recent Report issued by the Health, Education, Labor and Pensions Committee regarding the Crandall Canyon mine disaster. That Report is insightful and factual.

It shows the extent to which some operators violate and ignore health and safety laws. The Report indicates that the operator at Crandall Canyon overlooked the needs of miners and coerced the federal Mine Safety and Health Administration into abdicating its responsibility to protect those workers. Indeed, it demonstrates that this operator systematically used its influence when it could to maximize profit.

As the Report illustrates, that operator made multiple attacks on a system designed in many cases to be slow and methodical. The disaster was partly attributable to the operator's deliberate intimidation of MSHA inspectors and supervisors, but also to a misguided desire on the part of some agents of MSHA to appease the operator by reducing enforcement in return for favors. The Company strategically challenged most citations, thereby overwhelming an already overtaxed program. Further, Bob Murray's words and tactics, and those of his surrogates, were well known and documented by the Agency and by the industry: his established way of doing business is to intimidate, threaten, peddle his influence when he can.

Regrettably, the disaster at Crandall Canyon was clearly preventable. We now know that Bob Murray had prior knowledge of problems that were being experienced at the mine – even though he later denied that to the press and families. Let me say on behalf of the UMWA that we concur with the Report that, "...miners were exposed to unnecessary and extreme risks. The mine operator and MSHA must be held accountable for their failures of diligence, care and oversight."

*Report of U.S. Department of Labor, Office of Inspector General - Office of Audit*

Just 25 days after Chairman Kennedy's Committee issued its report, the Office of Inspector General (OIG) of the U.S. Department of Labor issued its own Report on findings regarding MSHA's involvement in approving the roof control plan, and then assuring the

operator's compliance with the approved plan leading up to the Crandall Canyon disaster. The OIG investigation also considered some of the post-accident rescue and non-rescue activities. The OIG report found that:

“MSHA was negligent in carrying out its responsibilities to protect the safety of miners. Specifically, MSHA could not show that it made the right decision in approving the Crandall Canyon mine roof control plan or that the process was free from undue influence by the mine operator. MSHA did not have a rigorous, transparent review and approval process for roof control plans consisting of explicit criteria and plan evaluation factors, appropriate documentation, and active oversight and supervision by Headquarters and District 9 management. Further, MSHA did not ensure that subsequent inspections assessed compliance with, and the effectiveness of, approved plans in continuing to protect miners. MSHA and mine operator officials worked together to develop rescue plans related to the August 2007 tragedy with MSHA exercising final approval authority over all activities. MSHA, however, lacked guidance on appropriate non-rescue activities.”

The OIG found the Agency was complacent in enforcing the Mine Act. Moreover, it identified several instances where MSHA personnel ignored its established protocol and modified a federal regulation to allow the plan to be approved, and then remain in place even after learning about material facts that should have caused it to reconsider. An MSHA Supervisor, after meeting with company officials, was found to have ignored the assessment by an employee under his direction that the roof control plan proposed at Crandall Canyon was not safe and should be rejected.

The OIG Report not only reinforces the findings of the HELP Committee, but it also validates what the UMWA has been saying for quite some time: In recent years, the Mine Safety and Health Administration has ceased to be the enforcer of the nation's mining laws and the protector of miners. Instead it is more concerned with increasing operators' production and growing their bottom lines. This was never what Congress intended when it enacted our mining laws, whether in 1969, 1977 or in 2006. The Agency needs to return to its fundamental purpose: that is, to protect the health and safety of miners.

Like the HELP Committee Report, the OIG Report underscores the need to create an independent body to investigate mining accidents and disasters. The UMWA has been calling for an independent investigative body for decades. For the record: MSHA has clearly demonstrated time and time again its inability to police itself. The UMWA is once again recommending the establishment of an independent body to conduct post-accident investigations.

## ASSESSMENT OF CIVIL PENALTIES

On February 7, 2008, MSHA issued its *Criteria and Procedures for Proposed Assessment of Civil Penalties; Final Rule*, 30 CFR Part 100. The rule became effective March 10, 2008.

The intent of Congress was to have MSHA revise its penalty assessment program in such a way that it would force all mine operators to comply with the Mine Act and regulations. The Agency, contrary to this directive, has offered a plan that separates the assessment program

into several different and inequitably applied schemes. The Agency's proposal will permit small mine operators to avoid appropriate fines for violating the law, while holding large mine operators to much higher standards and penalties. The Agency also proposes tolerating a more relaxed set of criteria at metal/non-metal operations. This approach does not enhance the health and safety protections for the nation's miners and will not force large segments of the industry, that obviously need additional inducements, to take necessary action to comply with the law.

Rather than adopt an approach that forces across-the-board compliance, the Agency – while incrementally increasing the initial civil penalty – mitigates the overall effect of this increase by applying an outdated and failed litmus test to determine what operators are actually assessed. However, the criteria will in practice reduce the penalties to some of the most dangerous operations. These mitigating circumstances include:

- (1) The appropriateness of the penalty for the size of the business of the operator charged;
- (2) The operator's history of previous violations;
- (3) Whether the operator was negligent;
- (4) The gravity of the violation;
- (5) The demonstrated good faith of the operator charged in attempting to achieve rapid compliance after a notification of a violation; and
- (6) The effect of the penalty on the operator's ability to continue in business.

If a small mine operator is unable to financially comply with mandatory health and safety standards, then they should not be in business. Coal miners are exposed to enough inherent dangers without also tolerating an operator's non-compliance due to a financially precarious operating budget. We would hope that the Agency is not saying that miners employed at small mines should be afforded fewer health and safety protections than those afforded to miners at larger mines. If so, this essentially gives smaller operations the license to kill and maim.

Some of these standards should have been eliminated when MSHA drafted its new regulation. The Union believes the Agency's 30 years of experience in gathering information on mine operator violations and assessing penalties is sufficient to apply the mandate of Congress in a far more targeted manner.

MSHA should be able to determine what operations require special attention. The Agency is aware that small mine operators generally do not offer their miners the same level of protection as do larger operations. While MSHA has identified some of these areas of special concern, such as by initiating the tri-State initiative and the small-mine department, it should also use this knowledge to more effectively protect miners employed at small mines. Giving small mine operators a break in the penalty scheme is not the answer.

The Agency must consider if the potential for a penalty is sufficient to force an employer to correct an existing problem prior to the arrival of an inspector. In particular, at small operations – that do not usually receive frequent inspections – management simply will not be induced to take a proactive approach to health and safety based on this rule. In real terms, will this cause the small operator to replace a worn tire when it becomes hazardous without intervention by the Agency? Or will it permit them to continue to operate the hazardous equipment because the ultimate fine will be \$100 and a new tire costs \$20,000? The penalty



must fit the violation and in some instances that requires *greater* enforcement sanctions by MSHA.

The Union believes the *baseline* penalty for all citations of a similar nature should be identical without regard to any mitigating factors, especially mine size. After all, a miner is a miner. The Agency should therefore consider *increasing* the size of the penalty based on the immediate conditions of the violation. The appropriate criteria should include:

- a. The operator's previous violation history (over the past 24 months);
- b. The degree of operator negligence;
- c. The gravity of the violation; and
- d. The number of persons who were or would have been affected/injured by the condition had it been permitted to continue to exist.

There should be no circumstances or factors that are permitted to mitigate the amount of the assessment. This must include giving no consideration to the size of the penalty in reference to the size of the operator, any demonstration of good faith to correct a cited condition or the affect on the operator's ability to continue in business. Non-compliance at small mines is not a new problem. It has existed for well over 30 years. Miners are being injured and dying at these operations in disproportionate numbers, and MSHA needs to act accordingly.

Miners at *all* operations, no matter what the size, deserve the same protection under the law. There can be no special circumstances that would permit any violation to be viewed as less severe based on unrelated and outdated criteria. The Union would recommend that Congress direct the Agency to correct these flaws in the current regulation.

## **PATTERN OF VIOLATIONS**

The decision by MSHA to exercise its authority under 30 CFR Part 104, Pattern of Violations, represents an important step in achieving greater compliance. This regulation identifies mine operators who have, "established a pattern of significant and substantial (S&S) violations at the mine." Using this standard as a routine tool to induce compliance will have a beneficial impact on health and safety.

Whereas MSHA previously failed to use this power, it has begun to take advantage of this compliance tool to progressively increase pressure on operators and force them to address health and safety problems at their operations. The operators thus have significant control over the severity of their own regulatory penalty. Operators who move to correct hazardous conditions are removed from the pattern system. Operators who seek to continue the status quo or resist the Agency's attempt to force compliance will suffer increasing regulatory intervention by MSHA. Ultimately, operators who refuse to voluntarily follow the law will be issued orders to withdraw all miners from the affected area until the Agency is satisfied that the condition has been corrected. This type of enforcement, while rare, is necessary and appropriate in some cases.

The Union is pleased to see that MSHA has finally decided to use this available tool to increase pressure on mine operators who habitually violate the law.

## **FLAGRANT VIOLATIONS**

Section 8(b) of the MINER Act states that, “Violations under this section that are deemed flagrant may be assessed a civil penalty of not more than \$220,000.” The Act defines flagrant to mean, “...reckless or repeated failure to make reasonable efforts to eliminate a known violation of a mandatory health or safety standard that substantially or approximately caused, or reasonably could have been expected to cause death or serious bodily injury...”

The UMWA is pleased to see that MSHA has been exercising this new authority to apply enforcement leverage to uncooperative operators. We encourage MSHA to continue to use the “flagrant” power and to do so in a consistent and even-handed manner to effectively protect the health and safety of all miners.

We only wonder how it was that Crandall Canyon has escaped this enforcement tool!

## **CONFERENCING OF CITATIONS**

The Union previously expressed concerns about the ability of mine operators to abuse the conference system. Our concerns were validated insofar as many operators were overwhelming the process by requesting a conference for almost every citation issued by the Agency. Internal company documents obtained during the HELP Committee investigation of the Crandall Canyon disaster proved this to be a deliberate strategy of that mine operator. It is apparent that other operators employ this tactic, too.

This “plan of action” by operators created several problems within the Agency. The sheer volume of citations conferencing officers were approving for hearings limited the Agency’s ability to prepare and defend the citations. In most cases, the mine inspector who issued the citation was unable to attend the conference to explain the reason for the citation, leaving the conferencing officer with no first-hand knowledge of the conditions cited. As a result, most of the citations that went before the officer were reduced or abated. In reality, by overloading the system, the mine operator could reduce or eliminate its liability and therefore the amount of the civil penalty. This problem has existed for many years and should have been addressed previously.

We believe that MSHA has taken an important first step – albeit belatedly – in addressing this issue. On February 4, 2008, Kevin Stricklin, Administrator for Coal Mine Safety and Health, and Felix Quintana, Administrator for Metal and Non-metal Safety and Health, issued Procedural Instruction Letter (PIL) No. 108-III-1 to adjust the conferencing system. The PIL generally limits conferences to unwarrantable failure and high negligence violations, albeit with a window for other challenges when appropriate. This should prevent the operator abuse that previously plagued the system.

## **CLOSURE ORDERS**

MSHA needs to understand that greater compliance pressure must be placed on some operators in the industry. History has shown that as long as production continues, some mine operators do not feel compelled to comply with health and safety laws or correct outstanding

violations. The Union has long urged MSHA to require the cessation of all production work and the withdrawal of miners, except those needed to correct the hazardous condition(s). This approach will force rogue operators to comply with the law and encourage a culture more focused on health and safety.

The Union believes that the Agency has had this authority under Section 104 of the Act; we recently learned that MSHA plans to exercise this authority when needed to coerce compliance. While we feel this is long overdue, we nevertheless appreciate this new directions.

## **BELT AIR**

An outgrowth of the MINER Act, the Technical Study Panel on the Utilization of Belt Air and the Composition and Fire Retardant Properties of Belt Materials in Underground Coal Mining (Panel or TSP) began its work in January 2007. In the following 18 months, the TSP held various meetings around the country and toured several mining operations to gather relevant information. On December 18, 2007, after completing their analysis, the Panel issued 20 consensus recommendations to the Secretary for consideration.

The Union is generally pleased with the work of the Panel and would credit it with compiling extensive documentation and testimony on the subject and using that information to recommend important improvements in mine health and safety.

The Union still believes that use of belt air is generally unsafe for numerous reasons, many of which the Panel identified and noted as being unsafe. Though the Panel failed to recommend the banning of belt air, it determined that for certain operations, based on geology, depth of coal seam and methane gas liberation, the use of belt air can be justified *so long as* other protections are provided. Indeed, the Panel suggested that protections beyond those currently required by MSHA's belt air rule be added whenever belt air is approved.

The Panel indicated that the 2004 belt air rule that MSHA promulgated – over strong UMWA objection – is not sufficiently protective of miners. It also expressly noted that most current mining operations do not require the use of belt air and, absent a demonstrated enhancement of safety, should not be permitted to use it.

The Union believes that MSHA should begin the process of promulgating a new belt air rule. This rulemaking process should be expedited and follow the recommendations of the TSP. Also because of pressure from mine operators on MSHA District personnel, the Agency must take steps to see that the Headquarters staff oversees all requests for the use of belt air.

## **BELT FLAMMABILITY**

The question of belt flammability has been a concern of the UMWA and other health and safety organizations for at least a few decades. Attempts to promulgate a rule with regard to flame-resistant belts began in the early 1980s, but such a rule was never completed. Then in 2002, the Assistant Secretary for Mine Safety and Health, David Lauriski, a former coal mining executive, removed the “belt flammability rule” and 16 other then-pending regulations from further consideration. Failing to develop a protective rule on belt flammability was

costly when a belt fire at Massey Energy's Aracoma Alma No. 1 Mine claimed the lives of 2 miners on January 19, 2006.

The TSP that considered belt air also analyzed belt flammability and urged MSHA to immediately re-propose and implement the rule that was previously proposed but withdrawn in 2002 – Requirements for Approval of Flame-Resistant Conveyor Belts.

There was also consensus among the members of the Panel that all mines, regardless of whether they use belt air or not, should be required to install belts that meet the new flame-resistant requirements. The Panel also recommended that operators install additional fire detection hardware and software to current atmospheric monitoring systems (AMS) in order to use belt air. The Panel further recommended the use of smoke detectors in conjunction with CO sensors and suggested that MSHA consider other gas detection devices, too. Further, all AMS records in any mines using belt air should be reviewed by MSHA inspectors during regular inspections to determine the number and nature of all false alarms.

The Union is convinced that a belt flammability rule is long overdue. The Union urges MSHA to begin the process of promulgating a new belt flammability rule. This rulemaking process should be expedited and follow the recommendations of the TSP.

### **SEALING OF ABANDONED/WORKED-OUT AREAS**

In May 2007, MSHA issued the Final Rule: Sealing of Abandoned Areas, 30 CFR Part 75 § 335, § 336, § 337, § 338 and §371. The Union is generally pleased with most of the requirements in that rule and thanks MSHA personnel and support staff for their hard work on behalf of the nation's miners. The Union believes that some of its recommendations that MSHA failed to include in the rule are still necessary and should be pursued by the Agency.

In particular, we believe that all seals, no matter what the static or dynamic pressure rating, should be equipped with devices to monitor the atmosphere it is designed to separate from the active workings. This monitoring should be done through a combination of surface boreholes and seal sampling tubes (at least two sampling tubes should be placed in the highest seal in each bank of seals constructed). This approach would permit mine operators, miners and the regulatory agencies to be aware of the atmospheric conditions in the sealed area. We believe that this monitoring scheme would be more protective of miners.

The UMWA also believes that MSHA should re-consider whether to restrict some materials from being used to construct seals. The use of some materials, such as Omega Blocks and wood, have no place in seal construction at underground mining operations. They do not offer the necessary protections outlined in the Mine Act and should be prohibited for such applications. The ineffectiveness of Omega Block seals was witnessed firsthand at Sago.

### **COMMUNICATION/TRACKING DEVICES**

The UMWA is pleased that MSHA, with the assistance of the National Institute for Occupational Safety and Health (NIOSH), is in the process of evaluating and testing several communications systems for in-mine use. Likewise we are pleased that MSHA has agreed to expedite the approval process for all such devices. Based on the current status of these

devices, we agree with the Agencies' dedication of significant resources toward developing a two-way wireless communication system. We also agree with their assessment that development of the system is the most technically challenging, and that once it is completed a tracking system can easily "piggy-back" onto the existing communication system.

There has been some progress with respect to wireless technology for underground mining application. However, despite recent announcements that a wireless tracking system has been approved by MSHA's Approval and Certification Center (A&CC), it must be pointed out that the approved system is not entirely wireless. The Mine Tracer Miner Location Monitoring System made by Venture Design Services, Inc. uses infrared RIF readers placed at specific locations in mine entries to track miners who are wearing a transponder as they pass the reader. It is capable of transmitting this information wirelessly for several thousand feet, *provided* the readers are installed in a line-of-sight configuration. However, the information is transmitted to a distribution box that requires a hard wire connection from the underground to the surface.

While these advances are important, we need to continue to pursue truly wireless technology if we are to achieve the mandates of the MINER Act and offer miners the best chance of rescue in an emergency situation. To reach this goal, it is critical that Congress allocate sufficient dedicated funds to both MSHA and NIOSH to compete this important task.

## **MINE INSPECTORS/MINE INSPECTIONS**

Approximately 273 individuals were hired into inspector positions, and the first hires have nearly completed their initial training.

This does not solve MSHA's long-term problem. Like the entire mining community, much of the current inspectorate will reach retirement age in the next five years. The General Accounting Office recently estimated that approximately 41 percent of those eligible (154 inspectors) will leave the Agency by 2012. Thus, it is imperative for MSHA to regularly and continuously hire inspector trainees.

An additional benefit of planning for substantial retirements will result in the return of MSHA's ventilation, roof control, electrical and other specialists to their primary assignments – carefully reviewing and addressing mining plans submitted by the operators – rather than serving as fill-in inspectors.

## **REGULATIONS**

In addition to the issues already raised during my testimony, the UMWA also believes that MSHA must adopt an aggressive regulatory agenda to address these other important issues to enhance health and safety protections for miners:

1. Improve atmospheric monitoring systems (note the Technical Study Panel addressed this issue);
2. Develop a nationwide emergency communication system;
3. Reduce miners' occupational exposure to coal mine respirable dust;

4. Update air quality chemical substance and respiratory protection standards;
5. Promulgate a rule on confined spaces;
6. Promulgate a rule on surge and storage piles;
7. Reduce respirable crystalline silica exposures;
8. Provide for verification of surface coal mine dust standards; and
9. Promulgate a rule on requiring continuous monitoring of coal mine respirable dust in underground coal mines.

### **INDEPENDENT INVESTIGATIVE BODY**

The UMWA has been advocating the creation of an independent investigative body, much like the National Transportation Safety Board or Chemical Safety Board, to investigate post-accident mine tragedies. Recent events in the nation's coalfields have only reinforced the need for such a board.

For many years, we have realized that mine operators cannot be trusted to police themselves. In 1969, 1977, and again in 2006, Congress reached this inescapable conclusion. While MSHA was created to protect miners, in recent years we have witnessed the Agency cower to industry pressure. Too often it concerns itself about the potential cost of issuing new or improved regulations and enforcing existing laws, rather than focusing on protecting miners. The two Crandall Canyon reports cited earlier in my testimony demonstrate problems internal to the Agency.

MSHA must be required to return to its core mission and offer comprehensive and strict enforcement of the nation's mining laws. Further, the Agency does not possess the ability to conduct thorough and independent investigations into its *own* conduct and the role it plays in mine disasters and near misses. It can no more conduct an impartial investigation into its own contribution to a mining disaster than could the operator of the affected mine.

Therefore, it is extremely important for the long-term survival of the Agency and ultimately the health and safety of miners across the country that a truly independent body be assigned a key role in investigating MSHA's and the operators' role in such horrific events. Failure to do so will inevitably lead to more death and sorrow in the nation's coalfields.

### **PROGRAM FUNDING**

Based on the mandates of Congress, it is imperative that increased and sustained funding be available if we are to offer miners the greatest protection possible. The Union would, therefore, also urge Congress to adequately fund other agencies and programs that advance the health and safety of the nation's miners. These include:

- Pittsburgh Research Center
- Lake Lynn Experimental Mine and Facility
- Appalachian Laboratory for Occupational Health and Safety, Morgantown, WV
- MSHA's Approval and Certification Center
- Personal Dust Monitors (PDM)

- Colorado School of Mines

### **SUPPLEMENTAL MINER ACT (S-MINER)**

In 2006, having witnessed back-to-back tragedies at Sago, Aracoma and Darby, Congress determined that something was very wrong with coal mine health and safety. The passage of the MINER Act of 2006 helped re-direct MSHA to its core mission, at least concerning the post-accident events. However, as already provided in this testimony, and the HELP and OIG Reports very well articulate, we have much more to do before many of the identified problems are corrected and the many needs *not* addressed by the MINER Act are acted upon legislatively. The S-MINER Act, which your colleagues in the House passed last year, provides an excellent means for fixing remaining shortfalls in miners' health and safety.

At the time of the signing of the MINER Act, we hailed it as an important *first step* in addressing the hazards and dangerous conditions miners face daily. We still believe that once fully implemented as Congress intended, it will be very beneficial to miners who find themselves attempting to survive or escape a mine disaster. But that was not enough. Now is the time to move forward with additional legislation to help prevent such disasters from occurring in the first place.

The time has come to move forward with the S-MINER Act. This legislation that was passed out of the U.S. House of Representatives on January 16, 2008 is the first measure since the passage of the 1977 Mine Act aimed at *preventing* accidents and disasters. There can be no doubt that such a law is long overdue.

While we have discussed some of the health and safety enhancements still needed and which are contained in the S-MINER Act, it is important to review that proposed legislation as an integrated whole. If enacted, the S-MINER Act would offer greater protection to miners by:

- Requiring a communication system, at least as effective as a leaky feeder system, be installed in all mines within 120 days of enactment of the legislation; also mine operators would need to upgrade to better systems as the technology becomes available.
- Requiring mobile emergency shelters within 500 feet of the working face in all working sections within 60 days.
- Seals – all seals designed to withstand less than 240 psi would be monitored:
  1. Through at least one seal in each bank of seals.
  2. Through surface boreholes.
  3. Within one year, monitoring would be done by a continuous device.
  4. Applicable to metal/non-metal mines.
- Ventilation Controls – within 1 year all stoppings in sections other than pillar sections would:

- 
1. Be constructed of solid blocks, laid wet, sealed with bonding agent on at least the intake side.
  2. Pillar sections may use hollow blocks and bonding agent.
- Flame-Resistant Belts – by December 31, 2012 all belts would have to meet the flame-resistant requirements recommended by NIOSH. Shall apply to metal/non-metal mines.
  - Belt Air – by June 20, 2008 MSHA would have to revise its regulations and approve the use of belt-air only by the 101(c) petition process. Petitions would have to demonstrate significant safety
  - constraints requiring their use and the operator would have to agree to MSHA's requirements for such usage. Mines currently using belt air could continue for currently developed areas.
  - Communications – Pre-Shift Review of Conditions
1. Upon exiting the mine, the foreman, examiner or other agent of the operator would have to meet with their cross-shift and verbally communicate the conditions in the mine.
  2. The incoming foreman, examiners or other agents would have to communicate this information with all members of the crew.
- Atmospheric Monitoring – all areas where miners work or travel would have a continuous atmospheric monitoring system installed.
  - All miners working alone for any part of a shift would be equipped with a device to measure levels of methane, oxygen and carbon-monoxide.
  - The National Academy of Science would undertake a study of lightning and offer recommendations to the Secretary to better protect miners, with the study to be completed within 1 year.
  - Barrier Reduction and Pillar Recovery – Special internal plan review process for operations engaging in such work at depths greater than 1,500 feet or at a mine with a history of bumps.
    - --Operator would have to have an approved plan. --Operator would have to notify MSHA one week before beginning such mining. --MSHA would respond to notice in writing.
      - to ensure all miners engaged in such work are trained. --to witness such work to ensure it is done safely.
    - --could stop such mining at any time for safety reasons. --National Academy of Science – would study
    - the issue and make recommendations if necessary.
  - SCSR Random Testing Program --NIOSH would conduct annual random sampling of SCSRs in the field and determine the number to be sampled annually.
    - Operators would be responsible to purchase replacement units.



- MSHA Approval Center Priorities
  1. Next generation SCSR.
  2. Wireless communications.
- NIOSH Research Priorities for next 5 years
  1. Next generation SCSR.
  2. Battery technology for communication and Personal Dust Monitor.
  3. Advancing mine rescue team technology.
  4. Improved ventilation controls.
  5. Development of a mine-wide monitoring system.

#### MSHA's Inspection force

1. Creation of Master Inspector Position (increased responsibility and pay).
  2. Lifting the employment limits to train new inspectors before current ones retire; bar to be lifted for 5 years.
  3. If new inspectors cannot be hired in adequate numbers, retired inspectors could be employed on a contract basis.
- Creation of the Office of Ombudsman within Office of Inspector General.
    1. Appointed by the President.
    2. Approved by the Senate.
    3. Handles confidential complaints of miners, family members and others.
    4. Toll free phone number and internet site for contact.
    5. Tracks injuries, illness and violations.
    6. Monitors Secretary of Labor's efforts on behalf of miners.
  - Pattern Of Violations
    1. Clarifies how to determine a pattern of violation.
    2. Sets criteria for removal from pattern of violation status.
    3. Fines for pattern from \$50,000 to \$250,000.
    4. Withdrawal of miners from the entire mine when deemed necessary. No other work shall be performed during this time except to correct outstanding violations.
  - Failure to Pay Penalty in a Timely Manner
    1. If no notice of contest is filed in 30 days, the citation is considered final and not subject to appeal.
    2. MSHA may cease production at the operation for failure to pay fines.
  - Factors for Assessing Penalties

1. Assessment will be based on the size of the operator, not the size of the mine.
  2. The ability for the operator to stay in business will no longer be factored in.
- 105(c) discrimination penalties will be \$10,000 to \$100,000 for each occurrence.
  - 107(a) imminent danger citation requires immediate withdrawal of all miners until the condition is corrected.
  - Establishment of a new Emergency Call Center manned 24/7 by people with mining knowledge.
  - Creation of a Mine Map Repository at the DOL and a website for public access.

## CONCLUSION

Having dedicated the better part of my career to improving miners' health and safety, I have investigated many tragedies, visited many injured miners, and consoled many grieving family members. We can appreciate the improvements that have been made in the last two years, but so much more is needed.

Our job is not yet completed. The tendency to move down the path of least resistance, even at the expense of miners' lives, still surfaces at times. The mine operator mentality by MSHA's top officials can still be witnessed in the drafting of regulations. MSHA still allows mine operators to ventilate working sections with belt air, and non-flammable belts are still not required. Today there are no fully-reliable systems that would enable miners to communicate with the surface or vice versa in the event of an emergency. Many operators would not be able to locate their trapped miners. This is unacceptable.

It is time for bolder action and bigger steps. MSHA must be convinced or directed to implement *all* the provisions of the MINER Act, as Congress mandated. And the Senate should pass the S-MINER Act. These are the keys to protecting the nation's miners. As members of this Committee and of Congress are in the best position to insist that MSHA utilize all the tools you have given the Agency.

Madam Chairman and members of the Committee, we thank you for your help and interest in improving miners' health and safety.

*Chapter 4*

**“TWO YEARS AFTER THE MINER ACT:  
HOW SAFE IS MINING TODAY?”**

***Jeffery Kohler***

Associate Director for Mine Safety and Health  
Research National Institute for Occupational Safety and Health Centers for Disease  
Control and Prevention U.S. Department of Health and Human Services

**INTRODUCTION**

Good morning Madam Chair and other distinguished members of the Subcommittee. My name is Jeffery Kohler and I am the Associate Director for Mine Safety and Health Research at the National Institute for Occupational Safety and Health (NIOSH), which is part of the Centers for Disease Control and Prevention (CDC), within the Department of Health and Human Services.

I am pleased to be here today to report on NIOSH's progress under the Mine Improvement and New Emergency Response Act of 2006 (MINER Act) (P.L. 109-236) and the related supplemental appropriations that Congress provided to facilitate the development and diffusion of critical safety technologies in underground coal mines. In previous hearings and briefings we have discussed the challenges of bringing improved communications, tracking, oxygen supply, and other technologies to bear on improved mine safety. On March 14, 2008, I met with Richard Stickler, Acting Assistant Secretary for Mine Safety and Health, and we agreed to develop guidance that can be provided to the mining community by January 2009 on performance-based criteria for acceptable communications technological alternatives. Today, I would like to focus on our progress and the new technologies that NIOSH has developed to make mines safer, and better equip miners to safely escape from a fire, explosion, or other catastrophic event.

## **NIOSH MANDATES UNDER THE MINER ACT**

### **Office of Mine Safety and Health**

NIOSH has completed or implemented all of its mandates under the MINER Act. Specifically, we have established the Office of Mine Safety and Health Research as required by Section 6(A)(H). As authorized by the Act, the Office is strengthening NIOSH's focus on evaluating safety and health technologies, while maintaining a balanced research program to address overall mine safety and health issues.

### **Research Contracts**

We have established an on-going contracts and grants program to fund the development and adaptation of safety technologies for mining applications, as mandated in Section 6 of the Act. Under this program we have evaluated 62 proposals, and of those, 13 were of sufficient merit to warrant funding under the guidelines of this program, and we are excited about their prospects. Two examples are:

- the development of a spray-on liner to significantly strengthen mine seals, a process that is being adapted from a current military application;
- the development of a through-the-earth[1] two-way voice communications system, which is based on a technology developed by the military;

### **Interagency Working Group**

We established an on-going Interagency Working Group consisting of a broad range of federal agencies with an interest in technology, as directed by Section 6 (a)(h)(3)(C) of the MINER Act. Although no technologies have been identified for direct transfer to mining, several benefits of this collaboration among federal agencies are occurring. Notable examples included the following:

- NASA and the Naval Research Lab have provided valuable input into our work on refuge chambers;
- the U.S. Army Communications-Electronics Research, Development and Engineering Center (CERDEC) is working with us on adapting communications and tracking technologies; and
- we are working with the Department of Energy's geothermal research program at Sandia National Lab to examine the possible adaptation of rescue drilling technology.

---

## **Refuge Alternatives**

We completed research and testing on refuge alternatives, and submitted a report to the Senate Committee on Health, Education, Labor, and Pensions and the House Committee on Education and Labor addressing the utility, practicality, survivability and cost of refuge alternatives. We also conducted testing on refuge chambers at our Lake Lynn Experimental Mine. This report to the two committees provides a scientific basis for the Mine Safety and Health Administration (MSHA) on the use of refuge alternatives in underground coal mines. The report concluded that refuge alternatives have the potential for saving the lives of mine workers if they are part of a comprehensive escape and rescue plan, and if appropriate training is provided. Moreover, the report stated that the benefits of refuge alternatives and the specification of specific alternatives are sufficiently known to merit their commercialization and deployment in underground coal mines. We are continuing to work with MSHA, labor, industry, and manufacturers to facilitate the implementation of refuge alternatives in the underground coal industry.

## **EMERGENCY SUPPLEMENTAL APPROPRIATIONS**

The Emergency Supplemental Appropriations Act (ESA) for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (P.L.109-234) (\$10 million) and the Emergency Supplemental Appropriations Act for U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act, 2007 (P.L. 110-28) (\$13 million) provided a total of \$23 million to NIOSH to facilitate the development and diffusion of mine safety technology, including necessary repairs and improvements to leased laboratories, among other purposes. To fulfill the mandates of the ESAs and the MINER Act, we have designed research across several related but different tracks, and administered contracts and awarded funds to outside partners with resources and expertise that complement ours. We have moved ahead with a sense of urgency while doing everything we can to assure high-quality research. Moreover, to ensure success, we have applied our scientific know-how and our detailed knowledge of the underground mine environment, and persistence in working through the technical questions that always arise in scientific studies. Now, less than two years into this three-year effort, we are able to report significant progress, which will ensure that improved technologies will be available as intended by Congress. Notable accomplishments-to-date are summarized as follows.

### **Oxygen Supply**

NIOSH developed the conceptual design for the “next generation” self-contained self rescuer (SCSR), which was developed and tested under NIOSH’s research contracts program. The contractor is scheduled to deliver 125 units to NIOSH’s certification laboratory late this summer. The manufacturer is estimating commercial availability in the fourth quarter of 2008 or the first quarter of 2009, with a first year production capacity of between 2,000 and 4,000 units. This new SCSR represents the first significant advance in oxygen supply technology in

more than 30 years. Although this unit provides performance enhancements over current models, the significant advancement is that it is “dockable.” As such, fresh oxygen canisters can be easily exchanged without the need to don a new mouth piece and nose clip. This feature eliminates the dangerous act of attempting to don a fresh SCSR under very stressful conditions in a potentially poisonous environment.

## **Post-Accident Communications Technology**

Research results to date strongly indicate that the technological building blocks for achieving survivable post-accident communications systems for most mines will be available for implementation by June 2009, as required by the MINER Act. Although it is unlikely that any single system or technology will meet the requirements for most mines, a combination of technologies in any given mine should ensure adequate post-accident coverage and functionality. Moreover, this “building block” approach, as presented in the NIOSH communications roadmap, will serve as a platform on which future advancements in technology can be added.

NIOSH work to date indicates that the emergency communication plan for each mine will need to be tailored to that mine’s requirements, and it is likely that the plan will employ some combination of enhanced leaky feeder, mesh, and/or medium frequency wireless systems. The post-accident coverage and functionality provided by these systems could be further enhanced as technology permits with the addition of through-the-earth two-way voice systems, interoperability of systems for increased redundancy, and improved methods for protecting the communications infrastructure from damage. These enhancements are not currently available, but could become available over the next few years. However, significant progress is already being demonstrated in the area of post-accident communications, and much of this progress was facilitated by the funds provided through the supplemental appropriations. Three significant examples are provided below.

### **Leaky Feeder System**

Under contract to NIOSH, an enhanced leaky feeder system has been developed, which allows continued communications even in the event that a section of the system is damaged or destroyed. This system is compliant with MSHA permissibility requirements, and final approval is pending. A mine-wide demonstration system is being installed in the Loveridge mine in West Virginia. The system includes bi-directional redundancy in the main haulage areas and parallel leaky feeder systems in the working sections to ensure a very high level of survivability in the event of mine explosions. Backup battery power systems that can keep the system operational from 8 to 96 hours after a power failure are included in the design as well.

We have also evaluated methods to expand coverage throughout the mine, and to physically harden the system against explosive forces. Testing to date has shown that burying leaky feeder cable may be an effective way of preventing leaky feeder cable from being damaged. Such extreme measures of protection may be desired in potentially vulnerable locations such as those adjacent to sealed areas of the mine.

---

## Mesh System

Under another contract we are developing a survivable mesh-based system[2], and we are scheduled to evaluate a prototype system at the Sentinel mine at the end of this month. The system incorporates a variety of design features to provide a high level of survivability in an underground coal mining environment, and the initial system design has been submitted to MSHA for approval.

The survivability of a mesh system is highly dependent on the range of the mesh nodes and the ability of the system to reconfigure itself under the circumstances that might be required in a mine disaster. The NIOSH mesh development is intended to maximize the survivability of the system by ensuring that:

- the nodes have maximum range for a given amount of transmit power, thus minimizing the number of nodes, power supplies, and batteries required;
- the system can automatically support alternate communications paths;
- the handsets can support direct communications between them (known as “peer to peer” communications);
- the handsets can act as repeaters for communications to mesh nodes; and
- the system uses low bit rate voice communications for future interoperability with medium frequency or through-the-earth systems.

We are working with MSHA and other stakeholders to examine potential safety issues associated with battery backup supplies that will be required with post-accident communication systems.

## Medium Frequency System

NIOSH is working with the U.S. Army CERDEC to modify the Kutta medium frequency communications system for use in underground coal mines. Medium frequency systems have an enormous potential as emergency communications systems in a post-disaster scenario. We have demonstrated that medium frequency radios have a range in underground coal mines of over two miles through “parasitic propagation.” This is a characteristic of the radio energy that allows the energy to couple on to metallic structures in the mine, and be received anywhere along the path of the structure.

There are several advantages of the medium frequency systems. First, active radio elements (radio transmitters or amplifiers) can be spaced a mile or more apart, which means far fewer active elements than are required with leaky feeder or mesh systems thereby reducing potentially vulnerable infrastructure. Second, the parasitic radio propagation paths can be highly survivable, and do not require power. Power lines for instance may be damaged, but could still support medium frequency communications. Additionally, recent NIOSH tests have shown that a buried wire can provide an excellent propagation path with no observable degradation of the radio signal. Lastly, the medium frequency system is being designed to be interoperable with existing MSHA-approved UHF/VHF handsets that are used with leaky feeder systems; this will provide substantial flexibility in designing practical and cost-effective systems. Interoperability with future systems such as mesh systems and

through-the-earth systems will be considered as these products become available in the market place.

Initial pre-production models of the analog point-to-point medium frequency products will be received this month, and the delivery of the digital multi-hop products are expected in August. The system design has been submitted to MSHA for approval.

### **Technical Study Panel**

We participated in the Technical Study Panel on the Utilization of Belt Air and the Composition and Fire Retardant Properties of Belt Materials in Underground Coal Mining, as directed by Section 11(A) of the Act. This Panel was administered by MSHA, and NIOSH provided technical support. The Study Panel's report recommended additional research in the areas of development of guidelines for improved escapeway design in various ventilation situations, ways to reduce air leakage through ventilation controls and use of booster fans in underground coal mining operations. We have initiated a project to address these knowledge gaps identified by the Panel, and expect to have results over the next few years.

## **FY 2008 APPROPRIATIONS ACT ACTIVITIES**

NIOSH has been directed to conduct a study on the recovery of coal pillars through retreat room and pillar mining practices in underground coal mines at depths greater than 1500 feet, and to submit a report on the study findings to Congress within two years. We initiated this project in January, and are making progress. Two scoping meetings have been held with researchers from West Virginia University and the University of Utah. MSHA Tech Support is collaborating with us, and we have had technical meetings with them. Last month, NIOSH researchers made underground mine visits to collect information for use on this project.

Funding provided as part of the FY08 appropriation is also being used to restore projects focused on other critical mining safety and health problems, including respirable dust control, ground control, and explosion prevention. Methane and coal dust explosions are under investigation at our Lake Lynn Experimental Mine, as we seek improved methods and technologies to prevent or mitigate these potentially catastrophic events. Many of these projects are developing a range of interventions including engineering, training, and technology.

## **CONCLUSION**

In closing, NIOSH continues to work diligently to protect the safety and health of miners. The MINER Act and supplemental funding for mining research are enabling us to make significant improvements in the areas of communication and tracking, oxygen supply, and refuge alternatives. Moreover, our safety and health research program is addressing the critical areas identified by our customers and stakeholders, and through our



research, development, demonstration, and diffusion activities, we are enabling a shift to a prospective harm reduction culture in mining. I appreciate the opportunity to present our work to you and thank you for your continued support. I am pleased to answer any questions you may have.

## REFERENCES

- [1] A “through-the-earth” communications system is one with a signal that propagates through the layers of the earth between an underground transceiver and a transceiver on the surface.
- [2] A mesh-based system uses a network of wireless modems (called nodes) that are placed throughout a mine. The signal "hops" from node to node, permitting two-way communication to be sent and received. In the event of a mine accident, if one or more nodes fail the network can reconfigure itself and create a new path for communication signals using nodes that are still functional.



*Chapter 5*

**STATEMENT OF RICHARD E. STICKLER ACTING  
ASSISTANT SECRETARY OF LABOR MINE SAFETY  
AND HEALTH ADMINISTRATION BEFORE THE  
SUBCOMMITTEE ON EMPLOYMENT AND  
WORKFORCE SAFETY COMMITTEE ON HEALTH,  
EMPLOYMENT, LABOR AND PENSIONS UNITED  
STATES SENATE JUNE 19, 2008**

Chairwoman Murray, Senator Isakson, and other Members of the Subcommittee, thank you for the opportunity to share with you the many changes and enhancements we are making at the Mine Safety and Health Administration (MSHA) including nearing completion of our implementation of the Mine Improvement and New Emergency Response Act of 2006 (MINER Act or “the Act”).

Since I arrived at MSHA, I have been focused on improving the way MSHA approaches its core mission of protecting the safety and health of our nation’s miners.

The MINER Act was the first major change to the Federal Mine Safety and Health Act in 30 years. In the last two years since the MINER Act was signed into law, MSHA has worked diligently to implement the Act and to improve the overall safety and health of our nation’s miners.

For example, MSHA has:

- Published six final rules in the *Federal Register*;
- Issued an Emergency Temporary Standard;
- Proposed four additional rules.

MSHA also has implemented changes and policy clarifications for MSHA employees and mine operators through more than 75 Program Information Bulletins (PIBs), Program Policy Letters (PPLs), or Procedure Instruction Letters (PILs). Many of these changes are a result of the MINER Act, but we have also revised policies and procedures that are not covered by the MINER Act.

We have concluded three major accident investigations and related internal reviews. MSHA has made improvements to our inspection and training procedures by taking action on all 153 recommendations derived from these internal reviews. We are planning a follow-up meeting in November 2008 for all managers and supervisors in our Coal division to review progress and to update the training they received on these 153 items in July 2007.

We are also nearing completion of our accident investigation regarding Crandall Canyon and are awaiting the accident report, as well as the Independent Review team's report on MSHA's actions at Crandall Canyon.

We have improved our hiring practices to address staffing issues due to attrition and retirements. Since June 2006, we have hired 322 coal enforcement personnel, and the majority of the hires made in FYs 2006 and 2007 are on track to complete their training and receive their AR cards by the end of this fiscal year. While the net increase, due to attrition, is 163 additional inspectors, the overall number of coal enforcement personnel is at its highest level since 1994.

We have strengthened and updated our citation and penalty structure. While the amount of penalties is not a measure of our success as an agency, penalties are a critical enforcement tool in ensuring compliance with the law and regulations.

Nationwide, between FYs 2003 and 2007:

- The number of citations and orders issued to coal mine operators increased by 42%.
- The rate of citations and orders issued per coal mine inspection hour increased by 62%.
- Elevated enforcement at coal mines, including unwarrantable failures (high negligence) and imminent danger orders, increased by 98%.

The ultimate measure of MSHA's success is in how well we protect miners from harm. While we recognize more work needs to be done, the trends are encouraging. The coal all-injury rate, which is the reported injuries per 200,000 employee work hours, declined 24% between FYs 2003 and 2007.

Recently MSHA received a separate report from the Department of Labor's Office of Inspector General (OIG), as well as a report on conclusions made by the Senate Health, Education, Labor, and Pensions Committee, relating to the Crandall Canyon tragedy. We also received an unrelated report on the separate issue of Emergency Response Plans from the Government Accountability Office (GAO). Although it would be inappropriate to go into depth about the findings of the two reports on the Crandall Canyon accident before the official MSHA accident investigation team has made its report, I want to report to the Subcommittee that MSHA has already begun to implement reforms to address all of the recommendations, including some reforms that were already in progress before receiving the reports.

For example, MSHA has been working closely with the Department of the Interior's Bureau of Land Management (BLM) since September 2007 and developed a Memorandum of Understanding (MOU) with BLM to facilitate the communication of information on geological conditions or mining practices that impact the health and safety of miners. In response to the OIG and GAO reports, MSHA immediately began to create a more uniform and formal set of criteria for all Districts to use when approving roof control plans and emergency response plans.

---

## IMPLEMENTATION OF THE MINER ACT

Implementation of the MINER Act has been a top priority for MSHA since the Act was signed into law two years ago. We have made significant progress, which I outline below by section of the Act.

### Section 2 - Emergency Response

A major component of the MINER Act is the requirement for each underground coal mine operator to have an Emergency Response Plan (ERP). In March 2006, three months prior to the MINER Act being signed into law, MSHA issued an Emergency Temporary Standard (ETS) on emergency mine evacuation. We published subsequent guidance specifically addressing ERPs in October, and issued a final rule in December 2006. Highlights of the final rule include:

- *Self-Contained Self-Rescue (SCSR) Devices:* The rule requires coal mine operators to provide additional SCSRs for each miner in areas such as underground working places, on mantrips, in escapeways, and where outby crews work or travel. The rule also requires that SCSRs be readily accessible in the event of an emergency.
- *Multi-Gas Detectors:* The rule goes beyond the requirements of the MINER Act by requiring coal mine operators to provide multi-gas detectors to miners working alone and to each group of miners.
- *Lifelines:* The rule requires coal mine operators to install directional lifelines in all primary and alternate escape routes out of the mine. Lifelines help guide miners in poor visibility conditions toward evacuation routes and SCSR storage locations. In accordance with the MINER Act, lifelines must be fire-resistant by June 15, 2009.
- *Training:* The rule requires coal mine operators to conduct quarterly training for miners in how to don SCSRs and especially how to transfer from one SCSR to another at a cache location. SCSR training units for annual expectations training have now been developed. On March 30, 2007, MSHA published a notice in the *Federal Register* notifying mine operators that the units were available. Mine operators had to have a purchase order for these training units by April 30, 2007, and conduct training with them within 60 days of receipt of the units.
- *Accident Notification:* The rule requires all mine operators to “immediately contact” (i.e., at once without delay and within 15 minutes) MSHA after an accident.

I am pleased to announce that ERPs have been approved and are being implemented for all underground coal mines as specified in the Act, except where manufacturers of SCSRs and refuge chambers are unable to keep up with demand. As of June 9, 2008, there are 559 fully approved ERPs, and one partially approved ERP. The partially approved ERP was received within the last six months, and MSHA continues to work with mine operators to bring about full compliance. MSHA reviews each of these ERPs every six months and, where necessary, requires underground coal mine operators to implement improvements.

In February 2007, MSHA issued guidance to mine operators about acceptable options for providing breathable air in underground coal mines. Options included:

- Drilling boreholes within 2,000 feet of the working sections of mines;
- Having 48 hours of breathable air located within 2,000 feet of working sections coupled with contingency plans for drilling boreholes if miners are not rescued within 48 hours;
- Having 96 hours of breathable air within 2,000 feet of working sections or other options that provide equivalent protection.

We are also working on a Refuge Alternatives rule, which is discussed later, under SECTION 13 of the MINER Act.

In addition to post-accident breathable air, the ERPs must address post accident communications. The MINER Act requires mine operators to submit plans to install two-way wireless communications and electronic tracking systems by June 2009. In the meantime all mines have installed redundant communications systems as required by the MINER Act. As of May 28, 2008, MSHA has observed testing or demonstration of 49 communications and/or tracking systems at various mine sites. We have met with representatives from 62 communications and tracking system companies. To date, we have had discussions with various vendors regarding 168 different proposals for the development of mine communications and tracking systems.

MSHA is currently focusing resources on the evaluation of approval applications for communications and tracking technology. Since the beginning of 2006, we have issued 45 new or revised approvals for communications and tracking products. Last month, we issued a Program Policy Letter to establish approval guidelines for communications and tracking devices under the provisions of the MINER Act. We are currently investigating 48 approval applications for communications and tracking technology.

We are continuing to work with the Communications Partnership Working Group sponsored jointly by the National Mining Association and the Bituminous Coal Operators Association to arrange for demonstrations of additional systems. Should technology take longer to develop, the MINER Act allows for alternative means of compliance if the truly wireless technologies, meaning that no wired component of the system exists underground where it may be damaged by fire or explosion, are not fully developed by June 2009. MSHA is working with NIOSH and plans to provide guidance on performance-based criteria for acceptable technological alternatives by January 2009.

#### **Section 4 - Mine Rescue Teams**

On February 8, 2008, MSHA published a final rule that implements Section 4 of the MINER Act by addressing composition and certification of mine rescue teams and improving their availability and training. The final rule increases training, as well as improves overall mine rescue capability, mine emergency response time, and mine rescue team effectiveness. Components of the final rule include:

- Requires a person knowledgeable in mine emergency response to be present at each mine on each shift and receive annual emergency response training using an MSHA-prescribed course.
- Requires two certified mine rescue teams for each mine and includes criteria for certifying the qualifications of a mine rescue team.
- Requires mine rescue team members to be available at the mine within one hour from the mine rescue station.
- Requires team members to participate in training at each mine serviced by the team (a portion of which must be conducted underground), and be familiar with the operations and ventilation of the mine.
- Requires team members to participate annually in two local mine rescue contests.
- Provides for four types of mine rescue teams: mine-site, composite, contract and state-sponsored.
- Requires annual training in smoke, simulated smoke or an equivalent environment.
- Increases required training from 40 to 96 hours annually.

### **Section 5 - Prompt Incident Notification**

MSHA addressed prompt notification in the Emergency Mine Evacuation rule published on December 8, 2006 and in the civil penalty regulations published on March 22, 2007. The new rule established a National Call Center with a toll free phone number for use in reporting mine accidents to MSHA at once without delay and within 15 minutes after an operator knows or should know that an accident occurred.

### **Section 7 - Requirement Concerning Family Liaison**

On November 1, 2006, Secretary of Labor Elaine L. Chao signed Secretary's Order #17-2006 directing MSHA to develop the MSHA Family Liaison Program. MSHA issued PPL P06-V-11 on family liaison and primary communicator functions on December 22, 2006 implementing section 7 of the MINER Act. To date, MSHA has trained 21 family liaisons with the assistance of the National Transportation Safety Board and the American Red Cross.

MSHA has completed an exhaustive review and updated our Headquarters' Mine Emergency Response Procedures. Some new procedures are intended to improve coordination between the Family Liaison and Primary Communicator in addressing the needs of a miner's family following a mine accident. For example, all Districts are required to maintain Family Liaisons who are specifically trained to assist families in the event of an emergency. The Family Liaisons establish a 24-hour rotation schedule to ensure a continuing presence. They also coordinate with the Primary Communicator and interact with local officials. The Liaisons remain accessible to family members by telephone, cellular phone, e-mail, and conventional mail. Liaisons also maintain a log of all significant events.

Additionally, each MSHA District is required to maintain Primary Communicators to establish contact with and brief representatives of miners, the mine operator, media and state agencies. Primary Communicators also brief the Department of Labor's Office of Public Affairs and likewise maintain a log of all significant events. Another important improvement

involved the efforts of network personnel from our Program Evaluation and Information Resources (PEIR) division who have enhanced MSHA's mobile voice and data communication capabilities with new satellite phones and enhanced coverage.

### **Sections 5 and 8 - Penalties**

After passage of the MINER Act, MSHA immediately implemented increased penalties for late accident notification and "unwarrantable failure" violations which are characterized by a high degree of negligence. On October 26, 2006, MSHA issued Procedure Instruction Letter (PIL) NO. I06-III-4 to implement the "flagrant" violation provision of the MINER Act. On March 22, 2007, MSHA published a final rule to increase civil penalty amounts for all mine safety and health violations. This rule goes beyond the requirements of the MINER Act and demonstrates MSHA's commitment to strong enforcement. As of June 6, 2008, MSHA has already assessed 53 flagrant violations, seven of which were assessed fines at the \$220,000 maximum. These are the largest proposed penalties in the agency's history. These actions have resulted in a doubling of civil penalties issued from \$35 million in Calendar Year (CY) 2006, to \$75 million in CY 2007.

As prescribed by the MINER Act, the final rule:

- Establishes a maximum penalty of \$220,000 for "flagrant" violations, as proposed in the President's previous budgets.
- Sets minimum penalty amounts of \$2,000 and \$4,000 for "unwarrantable failure citations and orders."
- Imposes a minimum penalty of \$5,000 (up to a maximum of \$70,000) for failing to notify MSHA within 15 minutes of a death or an injury or entrapment with a reasonable potential to cause death.

Other major provisions of the final rule applicable to all mine operators and contractors include:

- Significantly increases civil penalties overall by an estimated 179% using 2005 violation data – targeting the most serious safety and health violations with escalating penalties.
- Adds a new provision to increase penalties – notwithstanding the severity – for operators who *repeatedly* violate MSHA standards.
- Replaces the \$60 single penalty with higher formula assessments for non-Significant and Substantial (non-S&S) violations.

### **Section 10 - Sealing of Abandoned Areas**

On April 18, 2008, MSHA published a final rule replacing the May 22, 2007 ETS that increased protections for miners who work in underground coal mines with sealed off abandoned areas. Although Section 10 of the MINER Act gave MSHA until December 2007 to issue a new standard on mine seals, MSHA concluded that an emergency temporary



standard was necessary in May 2007 to protect miners, based on MSHA's accident investigations of the Sago and Darby mine explosions, in-mine seal evaluations, and reports on explosion testing and modeling. The final rule and ETS went beyond the MINER Act – which requires that the standard for mine seals be greater than the 20 pounds per square inch (psi) requirement established in 1992 – to include requirements to strengthen the design, construction, maintenance and repair of seals, as well as requirements for sampling and controlling atmospheres behind seals.

The final rule has a number of protections that will improve miner safety, including:

- Air sampling behind seals that are built to withstand less than 120 psi and withdrawal of miners when the atmosphere behind a seal is explosive.
- Removal of potential ignition sources from sealed areas. If insulated cables cannot be removed safely, the seal must be constructed to withstand at least 120 psi.
- A three-tiered approach as in the ETS, which requires additional seal strength where sealed atmospheres are more dangerous.
- Operator certification and recordkeeping requirements for: (1) sampling; (2) construction and repair of seals; and (3) training.
- Increased training for those involved in seal sampling, construction and repair.
- Requirements for certification of seal designs.
- Enhanced recordkeeping to demonstrate compliance.

Seal manufacturers and mine operators have six months to submit revised seal applications and ventilation plans, respectively, to comply with the final rule.

## **Section 11 - Technical Study Panel**

Section 11 of the MINER Act requires that MSHA respond to a report by the Technical Study Panel (Panel), within 180 days, containing a description of the actions, including regulatory changes, on the recommendations of the Panel. The Secretary established the Panel in accordance with the MINER Act. The Panel conducted an independent scientific engineering review, and issued its report on December 20, 2007, on the Utilization of Belt Air and the Composition and Fire Retardant Properties of Belt Material in Underground Coal Mining. On June 19, 2008, MSHA will publish in the *Federal Register* a proposed rule that implements the recommendations of the Panel.

## **Section 13 - Research Concerning Refuge Alternatives**

Section 13 of the MINER Act requires that MSHA respond to a research report by the National Institute for Occupational Safety and Health (NIOSH), within 180 days, containing a description of the actions, including proposing regulatory changes, on refuge alternatives in underground coal mines. NIOSH published its "Research Report on Refuge Alternatives for Underground Coal Mines" in January 2008. MSHA had a follow-up meeting with NIOSH on March 14, 2008. On June 16, 2008, MSHA published in the *Federal Register* a proposed rule to require that underground coal mines provide refuge alternatives to protect miners when a

life-threatening event occurs that makes escape impossible. MSHA's proposed rule is based on the Agency's data and experience, recommendations from the NIOSH report, research on available and developing technology, and the regulations of several states.

Under the proposed rule, a refuge alternative would provide a protected, secure space with an isolated atmosphere that creates a life-sustaining environment to protect miners and assist them with escape in the event of a mine emergency. The proposed rule includes requirements that the manufacturer or third party test a refuge alternative and its components, such as breathable air and air monitoring, prior to obtaining MSHA approval. The proposed rule allows the use of several types of refuge alternatives and requires that persons who examine refuge alternatives be trained.

### **Section 14 - Brookwood-Sago Mine Safety Grants**

On July 25, 2007, MSHA published a *Federal Register* notice soliciting applications for Brookwood-Sago grants. In October 2007, MSHA awarded approximately half a million dollars in grants to seven organizations to develop new training modules and best practices materials to improve miner training. MSHA intends to once again issue these grants in the next fiscal year, with the solicitation for grant applications to be published this summer.

To date, MSHA has reviewed three of the grants and will continue to monitor the remaining four until they are completed. Those reviewed include:

- Vincennes University, where a program to improve communications in the command center during a mine emergency was developed and tested. We monitored a mine emergency exercise and received positive feedback from participants interviewed.
- The Virginia Department of Mines, Minerals and Energy who developed a responsible person training program to assist in the training of "responsible persons" as required in MSHA's Mine Rescue Teams final rule, published earlier this year (February 8, 2008). We have reviewed their training materials and have determined that it supports our responsible person training requirement.
- Penn State University's grant program focused in part, on improving escape in the event of a mine emergency. MSHA recently participated in and monitored a town hall meeting that brought together experts to share mine emergency escape best practices with the mining industry.

### **POST CRANDALL CANYON GROUND CONTROL ACTION**

In addition to implementing provisions of the MINER Act, MSHA has worked steadily to improve the safety and health of our nation's miners in other ways as well. Since the Crandall Canyon tragedy, MSHA has taken important actions aimed at improving safety at deep cover mines. These actions include the following:

*Retreat Mining Plans.* Last August, during the Crandall Canyon rescue effort we determined it was necessary to re-examine retreat mining plans under deep cover and mine plans in bump prone areas. We rescinded our approval of all retreat mining plans

(other than longwall plans) for mines with cover depths of 1,500 feet or more in District 9 which has some of the deepest cover in the country. These mines were required to resubmit their mine plans to MSHA for re-evaluation.

*Ground Control Investigations.* We also conducted ground control investigations at 17 coal mines with identified bump prone conditions. These investigations were conducted by our Technical Support personnel beginning in August 2007 and continuing through early February 2008. Recommendations stemming from these investigations addressed such important safety protections as: mine design to improve ground stability; a more thorough evaluation of geologic hazards; the use of personal protective equipment; the installation of guards on longwall face equipment; and the implementation of administrative controls to keep personnel out of high-risk or bump prone areas during the mining cycle.

*Targeted Staff.* In February 2008, MSHA detailed a Technical Support engineer to the District 9 Denver office to serve as the acting roof control supervisor pending selection of a new supervisor. The District 9 roof control supervisory position was permanently filled, effective June, 8, 2008.

*Best Practices.* In February 2008, MSHA posted on its Web site, [www.MSHA.gov](http://www.MSHA.gov), a list of Best Practices addressing "Ground Control for Deep Cover Coal Mines."

*Ground Control Analytical Tools.* To improve ground control analytical tools, MSHA has been working with researchers from NIOSH to determine how best to improve the Analysis of Retreat Mining Pillar Stability (ARMPS) computer program which was updated in December 2007. The ARMPS computer program is the most widely used program by ground control specialists to model and analyze pillar design during room and pillar retreat mining operations. MSHA recently issued a PIB concerning "Precautions for the use of the ARMPS computer program." These precautions will provide guidance on the proper use of the ARMPS program.

*Roof Control Plan Enhancements.* To further strengthen roof control plans submitted to MSHA, we have instituted a comprehensive, national checklist for all plan submissions and reviews. We are asking mine operators to justify and provide to us detailed information for non-typical roof control plans and a process has been established to involve Technical Support in the review of non-typical and potentially problematic roof control plans. Our inspection personnel will visit all retreat mining sections at least monthly to evaluate the retreat mining plans and will assure that the plans are effective and that the miners are familiar with their plans.

*Additional Training.* MSHA provided training for 60 of its employees in November and December 2007 on ARMPS and another commercially available computer modeling program for roof and pillar stability. The commercial software program was purchased and installed in both Coal Mine Safety and Health and Metal and Non Metal districts, as well as in MSHA headquarters, and the Triadelphia and Pittsburgh Offices of Technical Support. MSHA and NIOSH are coordinating additional training for the future.

*Reengineered Roof Control Plan Approval Process.* MSHA has developed a revised roof control plan approval process that includes specific criteria and a detailed checklist to document the steps of the plan review and issued guidance to District Managers for the review of roof control plans specifying those plans that should also be reviewed by Pittsburgh Tech Support.

## COMPREHENSIVE ENFORCEMENT

I believe that our recently implemented comprehensive approach to enforcement has greatly improved our effectiveness. This approach consists of increasing MSHA's presence at mine sites, improving the quality of each MSHA inspection, increasing the amount of penalties and aggressively going after scofflaw mine operators.

Through this comprehensive enforcement effort, MSHA has:

- Increased our number of enforcement personnel;
- Implemented a new inspection tracking system;
- Improved inspector training;
- Enhanced overall inspection quality; and
- Better utilized enforcement tools to aggressively deal with flagrant and repeat violators.

Since June 2006, we have hired 322 coal mine enforcement personnel. Once fully trained, I strongly believe the increased presence of these MSHA enforcement staff at the job sites will have a positive impact on mine safety and health.

To make sure MSHA has an increased presence at mining operations, and complies with the Mine Act's requirement for mandated inspections of both coal and metal/nonmetal mines, last October I announced the launch of MSHA's 100 Percent Inspection Plan. The successful implementation of this plan will mark the first time in the history of the Agency that we have completed all of our mandated regular safety and health inspections of both coal and metal and nonmetal mines. The Plan calls for the temporary reassignment of MSHA inspectors to areas where they are most needed, and it provides for increased overtime and travel needed to complete inspections until all of our new enforcement personnel who were hired in 2006 and 2007 have completed their training and are fully certified. We have developed a monthly Key Indicator report to track progress in each field office and District toward reaching the 100% completion rate. Since we instituted this program, I am pleased to say that all mandated regular inspections for the first half of the year have been completed (in both coal and metal and nonmetal), and we are firmly on target to meet our requirements moving forward.

We have also implemented changes to improve overall quality and oversight of our inspections. We developed a new inspection handbook that clearly defines all 172 items that must be inspected as part of a complete, regular underground mine inspection. The handbook was developed in response to MSHA internal reviews and also addresses concerns raised in a report by the OIG last November. Additionally, the handbook establishes documentation requirements for each item to be inspected, which will assist in the management and oversight of the process.

MSHA also developed an Inspection Tracking System (ITS) to supplement the inspection handbook. The ITS is fully integrated with the handbook and provides a uniform way for inspectors to document each item they inspect. Coal field office supervisors will be required to document that an inspection is thorough before it is counted as complete.

MSHA has also taken steps to improve the quality of inspections by strengthening supervisory and managerial oversight. Steps include the following directives:

- 
- Supervisors are to accompany inspectors four times per month to evaluate whether inspections are complete.
  - Supervisors are to annually visit each producing mine to assess the level of enforcement.
  - Assistant district managers must visit a mine at least monthly to ensure enforcement activity is consistent with conditions at the mine.
  - District Managers are to visit a mine with a poor compliance record at least monthly. These mines have citation records above the national average (for their mine type and classification) for Significant and Substantial (S&S) violations and elevated enforcement.
  - Peer reviews and supervisory reviews must include an inspection of belt conveyor entries.
  - Eleven Key Indicator reports we developed for review of critical data are to be used by managers and supervisors to monitor inspections and enforcement. Reports are distributed monthly and include a completion rate report.
  - Headquarters Accountability review process was revised to evaluate District and Field Office inspection and enforcement activities. Headquarters is required to conduct a minimum of four Coal and two Metal/Nonmetal Districts reviews per year. These reviews are rotated to ensure that each District is reviewed, at a minimum, every three years.
  - Performance plans of all supervisors and managers were revised to hold them accountable for using MSHA Key Indicators to direct resources, monitor and improve enforcement performance and quality, and ensure that the completion rate of all “complete” inspections is 100%.

Another component of the comprehensive enforcement approach is increasing penalties to a level that truly gets an operator’s attention. Monetary fines can not be thought of as “the cost of doing business.” The ability to impose a meaningful penalty is an essential component of our enforcement plan. MSHA has taken several actions toward that end.

We have also implemented several changes to improve our civil penalty payment process to streamline debt collection and make the process more efficient. I believe that this increased penalty structure will provide a greater incentive for operators to ensure that safety and health laws are followed, which will result in safer working conditions for miners.

We continue to be particularly aggressive with those mine operators who repeatedly violate MSHA standards. The Mine Act authorizes MSHA to issue a withdrawal order for each S&S violation after the mine operator has been given a pattern of violations notice. MSHA has instituted this pattern of violations process under the Mine Act to address mines with an inspection history of recurrent S&S violations that show a mine operator’s disregard for the health and safety of miners. MSHA developed a database and computer screening process to objectively identify those mines that may have a potential pattern of violations and has to date sent out three rounds of notices to mines that exhibit a potential pattern of violations. The notices identified the potential pattern and contained a set of criteria and timeframes the operator had to meet in order to not be issued a pattern of violations notice.

The first round of notices was sent in June 2007 to eight mining operations. Seven of the operators met or exceeded the necessary criteria for reducing violation rates. They successfully and dramatically reduced their S&S violation rates - on average, by 50%, but we

strongly encourage these operators to continue to improve their compliance record. The eighth operator has been inactive since July 2007.

In December of last year, we notified 20 additional mine operators that they met the criteria for potential pattern of violations. These mine operators all instituted corrective action plans and MSHA closely monitored their progress in reducing serious violations. The results were dramatic; with 20 mines reducing S&S violation rates an average of 65%. Although MSHA regulations require an annual screening of mines to identify those exhibiting a potential pattern of violations, the agency has performed its third screening since last June. The third screening identified 14 coal mines with notifications to the mine operators delivered on June 12, 2008.

These and other efforts to enhance enforcement under the Mine Act resulted in a 100% increase in the percent of violations contested by mine operators in CY 2007. At current contest rates, we expect the number of violations contested to continue to significantly increase. We continue to work with the Department's Office of the Solicitor to ensure that all these contests are handled thoroughly and timely, and that high priority enforcement cases involving flagrant violations, pattern of violations, fatal accidents and scofflaw operators are fully supported.

## **ASSESSMENTS**

Several months ago, MSHA discovered a systemic problem with the assessment of violations. While 99.6% of all citations have been properly assessed since 1995, less than one half of one percent were not assessed over this period of time. We identified two issues that led to the small percentage of un-assessed citations. The first was a technical issue with the MSHA Standardized Information System (MSIS). The computer system was erroneously changing the type of assessment for some violations from a computer-generated fine to one requiring a manual penalty assessment. The second was identified as management oversight deficiencies that, once discovered, were immediately addressed.

District Managers have been directed to immediately mark "assessment ready" all un-assessed violations that are between 13 and 18 months past the issue date and to monitor system reports to ensure that all future citations and orders are marked "assessment ready" within 11 months of the date of issuance.

Revisions have been made to the Un-assessed Violation Report which is now transmitted automatically each month to District Managers, Administrators, Director of Assessments, Deputy Assistant Secretaries, and the Assistant Secretary as a Key Indicator report.

## **MANAGEMENT AND OVERSIGHT**

We have also made important changes to hold ourselves to strict standards. MSHA's Accountability Program has been revised based on the internal review findings after the Sago, Aracoma, and Darby accidents and the findings of an August 2007 Audit by the OIG on the prior Accountability Program. Last June, I announced the creation of a new Office of Accountability (OA) that has been integrated into MSHA's overall Accountability Program

approach and associated Handbook. The purpose of this office is to increase focused oversight and examination of existing enforcement programs within the agency. This new division conducts oversight reviews, including in-mine inspections, to ensure that management controls are in place and fully implemented to maintain consistent and effective enforcement policies and procedures, and to ensure the implementation of actions recommended as a result of MSHA audits and internal reviews. The Director of this office reports directly to the Office of the Assistant Secretary.

The Accountability Office has already audited MSHA oversight of five underground Coal mines in five districts and three MNM mines in two districts. The mines are selected through an analysis of the enforcement data, trends of injuries and the rate of violations written per day per inspector.

The audits focused on current “in mine” roof control conditions and plan adequacy, MINER Act ERP adequacy and enforcement of ERPs. On site inspection of self-contained self-rescuers (SCSR) maintenance and storage, and miner interviews about hands-on expectations training were conducted. Audit subjects included documentation of complete and thorough inspections of both underground and surface mines, and assessment of the level of enforcement and MSHA management oversight.

## **OTHER RULEMAKING**

In addition to the rulemaking required by the MINER Act and the other safety enhancements mentioned above, MSHA also issued a final rule on Asbestos Exposure Limits on February 29, 2008. MSHA is also working on a final rule addressing Mine Rescue Team Equipment and Fire Extinguishers in Underground Coal Mines. In addition, MSHA is working on a proposed rule on the Prohibition of and Testing for the Use of or Impairment from Alcohol and Drugs by Miners Working in Coal and Metal and Nonmetal Surface and Underground Mines. Finally, in an important non-rulemaking action, MSHA issued a notice of a practical sampling strategy concerning enforcement of the diesel particulate matter (DPM) final exposure limit at metal and nonmetal mines on May 20, 2008.

## **CONCLUSION**

We have made significant changes and improvements to mine safety over the last two years. We look forward to continuing our efforts to bring about needed reforms at MSHA. Implementing provisions of the MINER Act and improving MSHA’s effectiveness remain my top priorities.

Thank you for inviting me to testify today. I look forward to answering your questions and to working with this committee to continue to improve mine safety.





*Chapter 6*

**STATEMENT OF RICHARD E. STICKLER ASSISTANT  
SECRETARY OF LABOR MINE SAFETY AND HEALTH  
ADMINISTRATION BEFORE THE COMMITTEE ON  
EDUCATION AND LABOR U.S. HOUSE OF  
REPRESENTATIVES MAY 16, 2007**

Chairman Miller, Ranking Member McKeon, and the Members of the Committee, I am pleased to appear before you today to discuss the actions the Mine Safety and Health Administration (MSHA) is taking to protect the health and safety of our nation's miners. I would also like to provide you a report on the significant progress MSHA is making in implementing the Mine Improvement and New Emergency Response (MINER) Act of 2006, signed by the President on June 15, 2006.

I have been involved in the coal mining industry for more than 40 years. My experience includes working shifts in underground coal mines as well as working in and around the mine site and mining community every day. I know firsthand that every fatality, injury, and illness is devastating for miners, their families, and the communities they live in.

**ACCIDENT INVESTIGATIONS**

In March and April, MSHA released the results of its investigations of the Aracoma Alma No. 1 and Darby mining accidents of last year. MSHA released the results of the Sago investigation last week. The internal MSHA reports evaluating MSHA's activities surrounding the Aracoma, Darby, and Sago disasters will be released over the next month. In these reports, MSHA will review its policies and practices and develop action plans to address identified shortcomings.

## MSHA ACTIONS TO IMPROVE MINE SAFETY

Following the tragedy at Sago Mine, MSHA has taken swift action to provide new regulatory protections for miners at the same time that it has increased its enforcement efforts. For example, MSHA issued an emergency temporary standard on March 9, 2006, addressing many of the safety provisions that were ultimately included in the MINER Act, such as increasing the number of Self-Contained Self-Rescuers (SCSRs) in underground coal mines, additional safety training for underground coal miners, and immediate notification of mine accidents applicable to all mines.

In 2006, MSHA also stepped up its enforcement actions in both coal and metal and non-metal mines, issuing 77,129 citations and orders in coal mines, up nearly 12 percent from 69,124 in 2005. MSHA also increased the number of citations issued in metal and non-metal mines to 62,937, up nearly 7 percent from 59,101 the year earlier. Proposed assessments issued by MSHA in 2006 totaled \$35 million, up 40 percent from \$25 million in 2005.

When the MINER Act became law, even before the publication of the new civil penalty regulation, MSHA began enforcing new civil penalties for flagrant violations, unwarrantable failures, and failure to immediately notify MSHA of mine accidents. MSHA has already issued the first ever citations for flagrant violations. Six of these, totaling \$874,500, were assessed against R&D Coal Company for the October 23, 2006 death of one of its employees. A flagrant violation is defined in the MINER Act as "a reckless or repeated failure to make reasonable efforts to eliminate a known violation of a mandatory safety and health standard that substantially and proximately caused, or reasonably could have been expected to cause, death or serious bodily injury." MSHA will continue to use this important enforcement tool to bring about future compliance.

MSHA also initiates special emphasis inspection programs that focus special enforcement activities on specific aspects of mining. For example, this past February and March, MSHA initiated special emphasis inspection programs in Coal Districts 4 in Southern West Virginia and District 6 in Eastern Kentucky to examine roof controls plans and roof support methods in mines that use retreat mining methods. In District 4, MSHA issued 234 citations and orders during a two-week period.

District 6 conducted a special initiative which targeted all mines in the district that are conducting or will conduct retreat mining. The purpose was to observe retreat mining practices and to ensure that adequate safety precautions for retreat mining were included in each mine's roof control plan. Between March 5 and 22, 2007, MSHA inspectors inspected 33 mines and issued 8 citations related specifically to roof control issues. Of the 33 mines involved in the initiative, 21 were verified to have adequate safety precautions for retreat mining, and 12 were required to provide additional safety precautions.

In February, MSHA also conducted a nationwide targeted Special Health Emphasis enforcement program to ensure operator compliance with the applicable respirable dust standard at specific mines during normal production cycles, and that ventilation and dust control parameters were adequate and effective in protecting miners' health at all times. Over 1,130 dust samples were collected from February 20<sup>th</sup> to March 3<sup>rd</sup>, 2007 at 61 selected underground coal mines in all eleven coal districts. Thirty-two citations and one unwarrantable failure order for ventilation plan violations were issued during the health inspections, two citations were issued for excessive dust, and 44% of the enforcement actions

---

were designated as Significant & Substantial (S&S). Further evaluation will be conducted to identify good and bad ventilation plans and practices.

### **IMPLEMENTING THE MINER ACT OF 2006 AND INITIATING NEW POLICIES**

Last year, Congress passed and the President signed the MINER Act - the most significant mine safety legislation in nearly 30 years. The provisions of the MINER Act that have been implemented by MSHA include:

- The approval or partial approval of emergency response plans for the 466 currently active underground coal mines;
- Requiring more Self-Contained Self-Rescue (SCSR) devices for each miner in every underground coal mine;
- Requiring flame resistant life lines for evacuation in all underground coal mines;
- Mandating additional mine evacuation safety training and training on the use of SCSRs;
- Implementing a new maximum civil penalty of up to \$220,000 for flagrant violations, and new minimum penalties for “unwarrantable failure” and “immediate notification” violations.
- Requiring all mine operators to notify MSHA immediately after an accident;
- Installing redundant underground-to-surface communications systems;
- Requiring a supply of breathable air to miners who are trapped in underground coal mines;
- Training 14 MSHA officials to be Family Liaisons;
- Requiring post accident tracking of underground miners and;
- Requiring realistic “expectations” training for miners who use SCSRs.

Keeping miners safe and healthy is MSHA’s top priority. Implementation of the MINER Act is critical to achieving this goal, and I am proud of MSHA’s work in this regard. I want to review with the Committee in detail the objectives of the MINER Act that MSHA has already met.

### **EMERGENCY MINE EVACUATION**

On December 8, 2006, the Department of Labor published its final rule on Emergency Mine Evacuation in the *Federal Register*. The final rule helps ensure that miners, mine operators, and MSHA will be able to respond quickly and effectively in the event of an emergency. The rule includes requirements for mine operators to provide increased capability for mine emergency response and evacuation; includes additional requirements for SCSRs and their storage; improved training and escape drills; lifelines, tethers, and multi-gas detectors; and accident notification. This final rule includes many provisions that MSHA

initially included in the Emergency Temporary Standard issued March 9, 2006, and were later incorporated in the MINER Act. The provisions include:

- Increased numbers and storage of SCSRs;
- Improved mine emergency evacuation drills and training;
- Installation and maintenance of directional lifelines in underground coal mines, which must be fire resistant within three years; and
- Immediate accident notification for all mines.

Once again, MSHA went beyond the requirements of the MINER Act by requiring mine operators to provide multi-gas detectors to miners working alone and to each group of miners. While this provision was not part of the MINER Act, MSHA believes it is important to highlight the addition of this requirement in our final emergency mine evacuation standard because, in the event of a mine emergency, it will enable miners to know whether there are toxic gases in the mine atmosphere.

This rule was effective immediately on December 8, 2006, with the exception of certain training and equipment provisions. All provisions are now effective; SCSR training units for annual expectations training have now been developed. On March, 30 MSHA published a notice in the Federal Register notifying mine operators that the units were available. Mine operators must have had a purchase order for these training units by April 30 and must conduct training with them within 60 days of receipt of the units.

MSHA has also developed an SCSR database to enable the agency to locate SCSRs affected by future recalls or other approval actions, and to help our enforcement personnel inspect the SCSRs at the mines by cross checking reported inventories with units in use. In addition, NIOSH and MSHA will use this database to randomly select and collect SCSRs deployed at mines for testing in the Long Term Field Evaluation Program.

## **EMERGENCY RESPONSE PLANS**

The MINER Act requires underground coal mine operators to develop and adopt written Emergency Response Plans (ERPs) specific to the mines they operate. In accordance with the MINER Act, MSHA required operators to submit plans by August 14, 2006. MSHA provided operators with guidance related to the requirements for breathable air on February 8, 2007. This meant that ERPs could only be partially approved. Revised ERPs, indicating how breathable air will be provided, were required by March 12, 2007. In addition to breathable air, the ERPs must address post-accident communications and tracking, lifelines, training, and local coordination.

We are ensuring that the plans are reviewed in a timely manner, approved, and implemented for all underground coal mines as specified in the Act. As of May 8, 2007, there were 466 active underground coal mines. Of those, 261 have submitted ERPs that have been partially approved, and another 205 have been fully approved. MSHA is reviewing and discussing plan submissions with operators with the goal of providing full approval of all submitted plans in the near future.

---

## **POST-ACCIDENT BREATHABLE AIR**

With respect to post-accident breathable air, MSHA issued a Program Information Bulletin (PIB) on February 8, 2007, to provide guidance to mine operators concerning acceptable quantities and delivery methods in underground coal mines. This PIB was placed on MSHA's Web site and was distributed widely to the coal mining community.

The PIB provides the following options for meeting the breathable air requirements of the MINER Act:

- Establish boreholes within 2,000 feet of the working section; or
- Provide forty-eight hours of breathable air located within 2,000 feet of the working section of the mine, with contingency arrangements to drill boreholes if miners are not rescued within 48 hours; or
- Provide ninety-six hours of breathable air located within 2,000 feet of the working section; or
- Provide other options that provide equivalent protection based on unique conditions at a mine.

Methods of providing breathable air (in barricaded or other areas that isolate miners from contaminated air) include:

- Drilling boreholes;
- Air line supplied by surface positive pressure blowers; or
- Compressed air cylinders, oxygen cylinders, or chemical oxygen generators; and
- Other means that provide 96 hours of breathable air.

In addition to the PIB, we have also posted related materials on MSHA's website, including a hazard awareness information sheet on use of compressed air and compressed oxygen; information sheets on methods of providing breathable air, including calculations; and questions and answers addressing specific breathable air issues.

## **POST-ACCIDENT COMMUNICATIONS AND POST-ACCIDENT TRACKING**

Section 2 of the MINER Act requires that each mine evacuation plan provide a redundant means of communications with the surface for persons underground. It also requires that the plan provide a means of tracking the pre-accident location of all underground miners. The MINER Act requires that mine operators adopt wireless communications and electronic tracking systems by June 2009.

To comply with the requirements of Section 2, as of May 2, 2007, MSHA has met with representatives of 49 communication and tracking system companies, and observed the testing or demonstration of 20 post-accident communications and tracking systems at various mine sites around the country. When these systems are presented to MSHA for approval, we will expedite the approval process to ensure that safe, durable and reliable systems get into

the mines as quickly as possible. To date, MSHA has approved 19 systems, including four new devices. These new devices are:

- The Kenwood portable hand held radio;
- Marco RFID (radio frequency identification) Tracking Tag;
- Matrix Design Group RFID Tracking Tag; and
- NL Technologies Model Standalone WiFi Tracking Tag

In order to meet the long range communications and tracking requirements of the MINER Act, MSHA is reviewing all the available technology and working with the National Institute for Occupational Safety and Health (NIOSH) and manufacturers to help in the development of safe, reliable systems for underground coal mines. MSHA's responsibilities are to ensure these devices do not present an explosion or fire hazard in the mining environment, and also verify that they will function underground, while NIOSH is responsible for researching and developing these devices. MSHA has had contact with 137 parties about systems to track and/or communicate with miners while they are underground. However, as of today, there is no truly wireless tracking or communications system that meets the requirements of the MINER Act.

## **MINE RESCUE TEAMS**

The MINER Act requires the Department of Labor to issue regulations with regard to mine rescue teams by December 2007. These regulations must address improved training, certification, availability, and composition requirements for underground coal mine rescue teams. MSHA is currently drafting a proposed rule to implement the MINER Act provisions for mine rescue teams.

## **CIVIL PENALTIES**

After passage of the MINER Act, MSHA promptly increased penalties for immediate accident notification and unwarrantable failure violations. On March 22, 2007, MSHA published a final rule to increase civil penalty amounts for mine safety and health violations; the rule became effective on April 23, 2007. Issuance of this rule fulfills another requirement of the MINER Act and demonstrates the commitment of MSHA to protect the safety and health of our nation's miners.

As prescribed by the Act, the final rule:

- Establishes a maximum penalty of \$220,000 for "flagrant" violations, as proposed in the President's previous budgets.
- Sets minimum penalty amounts of \$2,000 and \$4,000 for "unwarrantable failure citations and orders."

- Imposes a minimum penalty of \$5,000 (up to a maximum of \$60,000) for failure to timely notify MSHA of a death or an injury or entrapment with a reasonable potential to cause death.

Other major provisions of the final rule applicable to all mine operators and contractors are:

- Increases civil penalties overall – by an estimated *179 percent* using 2005 violation data – targeting the most serious safety and health violations with escalating penalties.
- Adds a new provision to increase penalties – notwithstanding the severity – for operators who *repeatedly* violate MSHA standards.
- Replaces the \$60 single penalty with higher formula assessments for non-significant and substantial (non-S&S) violations.

### **FAMILY LIAISON PROGRAM**

The MSHA Family Liaison Policy has been put into place to provide for an MSHA liaison to be with families at the site of a mine accident where miners are unaccounted for or there are multiple fatalities. A Program Policy Letter has been issued and 14 designated family liaison personnel have completed their initial training sessions. The National Transportation Safety Board and the American Red Cross have helped train these individuals. Three MSHA family liaisons were present in Barton, Maryland, to be with the families of the miners during the recent accident at Tri-Star Mining Company.

### **SEALING OF ABANDONED AREAS IN UNDERGROUND COAL MINES**

The MINER Act requires MSHA to issue mandatory health and safety standards relating to the sealing of abandoned areas in underground coal mines. The MINER Act requires the health and safety standards to “provide for an increase in the 20 psi standard currently set forth in section 75.335(a)(2) of title 30, Code of Federal Regulations.”

As an interim step, last year MSHA issued a temporary moratorium on new construction of alternative seals and then raised the psi standard for existing and new alternative seals by 150% from 20 to 50 psi. MSHA also issued guidance on the design and evaluation of new seals and the inspection of existing seals.

MSHA is currently drafting an emergency temporary standard which addresses improved seal strength, design, construction, repair and sampling of the atmosphere behind seals.

## **TECHNICAL STUDY PANEL ON BELT AIR**

Section 11 of the MINER Act required MSHA to establish a Technical Study Panel on Belt Air. The purpose of this Panel is to “provide independent scientific and engineering review and recommendations with respect to the utilization of belt air and the composition and fire retardant properties of belt materials in underground coal mining.” Congress provided the Panel one year from the Panel’s appointment to issue its report, and the Secretary of Labor is given an additional 180 days to respond to the Panel’s report.

The charter governing the Panel was published in the *Federal Register* on December 22, 2006. The first two meetings of the Technical Study Panel have already taken place – the first on January 9-10, 2007 and the other on March 28-30 in Pittsburgh, Pennsylvania. The third meeting is being held now in Salt Lake City, Utah, and a fourth is scheduled for June 20-22 in Birmingham, Alabama. Members of the Panel are prominent and experienced mine safety and health professionals. As mandated in the MINER Act, two of the Panel members were appointed by the Department of Health and Human Services, two by the Department of Labor, and two members were appointed by Congress.

## **REFUGE ALTERNATIVES**

NIOSH is conducting research and field tests on refuge alternatives. By the end of this year, NIOSH is scheduled to report the results of the research to the Department of Labor. By mid-2008, in accordance with the MINER Act, the Department of Labor will report to Congress on the actions MSHA will take in response to the NIOSH report. MSHA is aware of requirements by some states for refuge chambers, and MSHA is accepting state approved refuge chambers as a means of providing breathable air.

## **RECRUITMENT**

The Emergency Supplemental Appropriations Act of 2006 (P.L.109-234) provided an additional \$25.6 million for MSHA for coal enforcement, including the hiring of coal mine inspectors and other enforcement personnel. MSHA is pressing ahead with recruitment, training and deployment of the additional 170 coal mine enforcement personnel funded by the emergency supplemental appropriation. Through the first three quarters of MSHA’s hiring plan, 126 new enforcement personnel staff has been hired. While MSHA faces significant challenges to both replace the enforcement personnel who will likely retire this year and expand our enforcement ranks, I am confident that the agency will meet its goal of hiring 170 net new personnel. The President’s FY 2008 budget request includes \$16.6 million to maintain these enforcement staff.

MSHA continues to conduct recruitment drives in local communities around the country, and we have hired additional staff at our Mine Health and Safety Academy to ensure that we can properly and expeditiously train our new inspectors and get them out to the job sites where they will make a difference. I believe this training is the best, most effective program MSHA has ever had and will enable these new inspectors to meet today’s challenges. In the



---

end, I strongly believe the increased presence of MSHA enforcement staff at the job sites will have a positive impact on mine safety and health.

## **CURRENT ENFORCEMENT ACTIVITIES**

MSHA will use all of the tools available to achieve our goal of safer and healthier mines, including tough enforcement, education and training, and technology. MSHA will be particularly aggressive with those mine operators who habitually violate MSHA standards and seem to view penalties as just another cost of doing business. In order to better identify these persistent repeat violators, MSHA is developing a database to provide for a more objective analysis of accident trends and enforcement results. MSHA will use the data developed from this database to target those operators who refuse to follow the laws and regulations governing mine safety and health.

One particular tool- pattern of violations- has been in MSHA's arsenal for over 30 years but the agency has never used it. The Mine Act authorizes MSHA to issue a withdrawal order under certain conditions disclosed by an inspection conducted within 90 days after a notice that the mine operator has a pattern of violations of mandatory standards that could have significantly and substantially contributed to mine hazards. MSHA has a regulation that provides for a letter warning mine operators that they have a potential pattern of violations before the statutory notice is issued. While MSHA has issued such letters, it has never proceeded to issue the statutory notice. MSHA has recently initiated the development of objective criteria to identify mines that may have a pattern of violations. Once this new criteria is in place, MSHA will issue pattern of violations notices and orders where warranted. This measure is tough, but I believe it is also necessary in instances where the safety of miners is routinely jeopardized.

MSHA will also continue to conduct focused inspections on known hazards, such as the program we recently completed on retreat mining. In addition to implementing the MINER Act, MSHA will continue to inspect each underground mine four times annually, and each surface mine twice a year, as required by statute.

## **CONCLUSION**

MSHA continues to move forward to both implement the MINER Act and to enforce the provisions of the Mine Act. Over the past 14 months, MSHA has issued --

- An Emergency Temporary Standard to improve mine safety;
- Two major regulations to implement the MINER Act;
- A Program Information Bulletin on breathable air;
- A Program Information Letter on flagrant violations; and
- Another Program Information Bulletin on seals.

These actions have been taken to implement provisions of the MINER Act. In addition, two major rules to implement the MINER Act are in various stages of the regulatory process and should be in final form by the end of 2007 as mandated by Congress.

Today, every single person at MSHA remains focused on our core mission: to improve the safety and health of America's miners and to work toward the day when every miner goes home safe and healthy to family and friends, after every shift of every day. MSHA cannot do this alone. The entire mining community – mine operators and miners included – must also do their part to improve mine health and safety. Together MSHA, mine operators and miners can achieve this important goal.

Thank you for allowing me to testify today. I look forward to answering your questions and to working with this committee to continue to improve mine safety.

*Chapter 7*

**TESTIMONY OF BRUCE WATZMAN VICE PRESIDENT  
OF SAFETY AND HEALTH, NATIONAL MINING  
ASSOCIATION BEFORE THE COMMITTEE ON  
HEALTH, EDUCATION, LABOR AND PENSIONS  
SUBCOMMITTEE ON EMPLOYMENT AND  
WORKPLACE SAFETY OF THE UNITED STATES  
SENATE JUNE 19, 2008**

Thank you Madam Chairman. My name is Bruce Watzman, and I am the vice president of safety, health and human resources for the National Mining Association (NMA).

NMA and its member companies appreciate the opportunity to again discuss with the subcommittee the industry's progress in implementing the Mine Improvement and New Emergency Response (MINER) Act of 2006, the challenges that remain and voluntary steps we are initiating to exceed the expectations of the MINE Act.

Our objective remains, as it has been all along, to ensure that every miner returns home safely to their loved ones every day. It is this single purpose that has guided the actions of NMA as we strive to find and deploy the new technologies and techniques that will improve the protection of underground coal miners.

**MINER ACT**

NMA supported the MINER Act and we continue to believe that its core requirements are sound. The requirements recognize the need for a forward-looking risk assessment, that good safety practices continually evolve based upon experience and technological development, and that every underground coal mine presents a unique environment and what may work in one may not be effective or desirable in another. As the Act's legislative history succinctly states:

The goals of optimizing safety and survivability must be unchanging, but the manner for doing so must be practical and sensible.

S. Rep. No. 109-365 p. 3.

We believe that this passage not only aptly captures the intent of the law, but also serves as a useful reminder to the industry and regulators that there is often more than one way to achieve our singular purpose to improve workplace safety.

The industry continues to make substantial investments in safety equipment and practices to meet the expectations of the MINER Act. Survey data of NMA members, representing about 65 percent of all underground coal production, indicate actual and planned investments in the following areas for 2007-2008:

- \$70 million to purchase 150,000 additional self-contained self-rescuers (SCSRs) and training units.
- \$55 million in communication and tracking systems.
- \$53 million for facilities to maintain trapped miners (752 in total)
- \$70 million to enhance the integrity of seals.
- \$19 million to establish and equip 45 new mine rescue teams.
- \$60 million for safety equipment, training, and manpower beyond the mandates of the MINER Act.

These numbers simply reflect one quantifiable measurement of our commitment to the MINER Act. All told we estimate that all of underground coal mining has committed more than \$500 million to comply with the MINER Act requirements. This is only the beginning, just as the MINER Act itself is not the end, but rather one means for reaching our desired goal to protect our nation's miners.

## **VOLUNTARY ACTIONS**

Beyond the actions we've taken to comply with federal and state rules we have and continue to undertake several voluntary initiatives to enhance miner safety.

In 2006 NMA established the Mine Safety Technology and Training Commission (MSTTC) to undertake a study of new technologies, procedures and training techniques that can further enhance safety in the nation's underground coal mines.

The commission's report contains unanimously adopted 75 recommendations that address the areas of communications technology, emergency preparedness, response and rescue procedures, training, and escape and protection strategies. The central theme of the commission's recommendations focuses on a systematic and comprehensive risk assessment-based approach toward prevention.

The industry is currently implementing a number of the commission's near-term recommendations and is developing a blueprint for action on the more far-reaching items. For example, we are working with the National Institute for Occupational Safety and Health (NIOSH) to develop risk-based management tools and templates to assist us in implementing the central recommendation of the commission. The use of risk-analysis risk-management, while not a common practice throughout underground coal mining the industry, is familiar to many of the larger companies. Our goal is to create operational tools that will help every company identify and address significant hazards before they create situations that threaten

life or property. The effort builds upon a series of pilot projects undertaken last year to introduce and examine the use of risk assessment at 10 underground mines.

Risk assessment and management are well-established practices that are employed in many industrial settings. Our goal is to formalize this process for use throughout mining so that we can identify, eliminate and manage conditions or practices that have the greatest potential to cause injury. In so doing we hope to develop a system that recognizes the MSTTC objective to foster an approach that is “founded on the establishment of a value-based culture of prevention that focuses all employees on the prevention of all accidents and injuries.”

Working with representatives of the Mine Safety and Health Administration (MSHA) and NIOSH, we 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. This resulted in the development of a generic mine rescue handbook that can serve as a guide for those forming mine rescue teams and developing mine rescue protocols, as well as a review tool for those with established procedures in place. This document has been distributed throughout the mining industry to be used as a pre-event planning template that will expedite the delivery of mine rescue services in an efficient manner, should they be required.

Working with the industry’s communication specialists and outside experts we have developed a protocol for communications with the media during a mining crisis. The protocol recognizes the important role of the media in keeping communities informed about the facts surrounding a mining accident or fatality and the obligation of mine operators to contribute to that understanding. The protocol provides a framework for effective communications and cooperation with MSHA, as envisioned by the MINER Act and is being widely disseminated throughout the industry.

These activities will be a focal point at MINExpo<sup>®</sup> International2008, which NMA will sponsor later this year. This quadrennial gathering of mining experts from around the world will showcase new safety technologies and the technical sessions and accompanying workshops will highlight new techniques and applications to expedite technology transfer.

## CREATING A CULTURE OF PREVENTION

We have so far commented on technical improvements and these are clearly important. But perhaps the most important element in improving safety is the relentless focus on a “culture of prevention”. For successful companies a culture of prevention exists at every level of the organization. In those companies with outstanding safety performance accident prevention is emphasized at every meeting, at every shift at the mines and is an integral part of the business model. This is a common theme among the winners of the annual *Sentinels of Safety* award.

In its 2006 report, *Improving Mine Safety Technology and Training: Establishing U.S. Global Leadership*, the MSTT stated that:

Compliance is an important aspect of prevention, but it is more important to realize that it is only a starting point in a more comprehensive process of risk management. A critical action to ensure success of the process for any company is the creation of a

“culture of prevention” that focuses all employees on the prevention of all accidents and injuries... In essence the process moves the organization from a culture of reaction to a culture of prevention. Rather than responding to an accident or injury that has occurred, the company proactively addresses perceived potential problem areas before they occur.

To achieve these goals we will be working with recognized experts to develop a safety management system that encourages integration of safety and accident prevention into the entire suite of business management systems. Again, building upon pilot work cooperatively conducted with NIOSH, we will use MINExpo<sup>®</sup> to showcase the results of this work and to provide the tools for all companies to embrace this as part of their normal operating practice.

Our objective is prevention of accidents, injuries and illnesses and reinforcing a culture of prevention. Decisions will be based upon sound science, recognizing technologic limits, where they exist. By developing risk-based safety priorities we will identify and focus resources on conditions that most directly place miners in potential peril. Our goal is to foster industry-wide partnerships among coal companies and equipment and service supply providers for the research, development and commercialization of new practices and technology that will raise the performance bar industry-wide.

## CONCLUSION

Madam Chairman we have accomplished much but more work remains. With your help and the vital support you provide to the mining research program at NIOSH we will achieve our shared goal - to ensure that every miner returns home safely to their loved ones every day.

On behalf of the members of the National Mining Association, thank you for the opportunity to give our perspective on this vital public policy matter.

I would be happy to answer any questions.

*Chapter 8*

## **COAL MINE SAFETY AND HEALTH\***

*Linda Levine*

Specialist in Labor Economics  
Domestic Social Policy Division

### **ABSTRACT**

Safety in the coal mining industry is much improved compared to the early decades of the twentieth century, a time when hundreds of miners could lose their lives in a single accident and more than 1,000 fatalities could occur in a single year. Fatal injuries associated with coal mine accidents fell almost continually between 1925 and 2005, when they reached an all-time low of 23. As a result of 12 deaths at West Virginia's Sago mine and fatalities at other coal mines in 2006, however, the number of fatalities more than doubled to 47. Fatalities declined a year later to 33, which is comparable to levels achieved during the late 1990s.

In addition to the well above-average fatal injury rates they face, coal miners suffer from occupationally caused diseases. Prime among them is black lung (coal workers' pneumoconiosis, CWP), which still claims about 1,000 fatalities annually. Although improved dust control requirements have led to a decrease in the prevalence of CWP, there is recent evidence of advanced cases among miners who began their careers after the stronger standards went into effect in the early 1970s. In addition, disagreement persists over the current respirable dust limits and the degree of compliance with them by mine operators.

In the wake of the January 2006 Sago mine accident, the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) was criticized for its slow pace of rulemaking earlier in the decade. MSHA standard-setting activity quickened starting later that year, however, after enactment in June of the Mine Improvement and New Emergency Response Act (MINER, P.L. 109-236). The MINER act, the first major amendment to federal mine safety law since 1977, emphasized factors thought to have played a role in the Sago disaster (e.g., emergency oxygen supplies, post-accident communication and tracking systems, deployment of rescue teams) and imposed several rulemaking deadlines on MSHA. Accordingly, the agency published final regulations on

---

\* Excerpted from CRS Report RL34429, dated March 31, 2008.

emergency mine evacuation in December 2006, civil penalties in March 2007, and rescue teams as well as asbestos exposure in February 2008.

Some policymakers remain dissatisfied with MSHA's performance. These sentiments most recently led to House passage, in January 2008, of the Supplemental Mine Improvement and New Emergency Response Act (S-MINER, H.R. 2768). It incorporates language from the Miner Health Enhancement Act (H.R. 2769), such as requiring MSHA to adopt as mandatory exposure limits the voluntary limits (to chemical hazards, for example) recommended by the National Institute for Occupational Safety and Health. S-MINER also requires MSHA to more closely review and monitor operator plans that include retreat mining, the practice used at Utah's Crandall Canyon mine where six miners and three rescuers lost their lives in 2007. The President has said he will veto S-MINER as passed by the House.

In light of rulemaking activity required this year by the MINER act and the Consolidated Appropriations Act, 2008 (P.L. 110-161), MSHA asked the Occupational Safety and Health Administration for assistance. Congress increased MSHA's appropriation between FY2007 (\$302 million) and FY2008 (\$334 million). The Administration's FY2009 budget request for MSHA is \$332 million.

News accounts of miners losing their lives as a result of accidents at coal mines have appeared more often in recent years. The methane explosion in 2006 at West Virginia's Sago mine, in which 12 trapped miners died, shined a bright light on working conditions at the nation's coal mines. The partial collapse in 2007 at Utah's Crandall Canyon mine further drew attention to the plight of coal miners. These among other incidents during the current decade have prompted Congress to step up its legislative and oversight activities with respect to the safety and health of those who toil in the country's coal mines.

This report begins by reviewing the record of working conditions in the coal mining industry. It then describes the regulatory regime and recent funding of the

U.S. Department of Labor's Mine Safety and Health Administration. The report closes with an analysis of current regulatory and legislative initiatives.

## **WORKING CONDITIONS IN THE COAL MINING INDUSTRY**

### **Safety**

Safety in the coal mining industry is much improved compared to the early decades of the twentieth century, a period in which hundreds of miners could lose their lives in a single accident and more than 1,000 fatalities could occur in a single year. Fatalities associated with coal mine accidents fell almost steadily between 1925 and 2005, when they reached an all-time low of 23.[1]

Nevertheless, coal mining remains one of the most dangerous employment sectors as measured by fatal work injuries. The fatality rate among persons employed in the private sector was 4.2 per 100,000 workers in 2006, the latest year for which data are available from the U.S. Bureau of Labor Statistics, compared to 49.5 fatalities per 100,000 workers in coal mining.[2] In terms of non-fatal accidents, mining does not diverge greatly from the all-industry average.[3] In what follows, then, the concentration is on fatal accidents.



A variety of factors may have contributed to the long-term improvement in safety at the nation's coal mines (e.g., decreased employment, shift from underground to surface mining, and increased productivity). New machinery such as longwall systems not only reduced the total number of workers needed, but also did so at the most dangerous spots (e.g., the active cutting face). Other measures that likely have prevented many large-scale accidents include controlling coal dust, monitoring methane gas (which is both explosive and poisonous), adequately supporting roofs, and avoiding spark-producing equipment.[4]

It would be very difficult to determine conclusively how much of the progress in safety has been due to the activities of the Mine Safety and Health Administration (MSHA). Much of the industry might have voluntarily adopted the safety requirements in MSHA standards (regulations) without that inducement. And indeed, safety increased for a long time before Congress passed the Federal Mine Safety and Health Amendments Act of 1977 (P.L. 95-164) in which MSHA was established within the Department of Labor.[5]

Despite the progress that has been made in worker safety and their disagreement on the specific course of action to be followed,[6] labor and management concur that there is still room for improvement — especially in light of incidents that occurred in the current decade. For example, the flooding of the Quecreek Mine in Pennsylvania in July 2002 raised questions about the accuracy of underground mine maps and their availability to operators of nearby mines. The Quecreek accident might have been avoided if the mine operator had access to the final map of a nearby abandoned mine that had since filled with water.

In January 2006, a methane explosion at West Virginia's Sago mine, which was precipitated by lightning that penetrated underground, killed one miner initially. Twelve of the 16 miners who survived the explosion became trapped and succumbed ultimately to carbon monoxide from the ensuing fire. The episode raised a number of safety issues that were discussed at a hearing of the Senate Appropriations Subcommittee on Labor, Health and Human Services, Education, and Related Agencies in January 2006, including the possibility that different communication and tracking devices might have enabled the trapped miners to escape or find better refuge, or rescuers to reach them more quickly. In addition, emergency breathing apparatus issued to the miners were rated for only one hour and a number of the apparatus reportedly did not work well. There also was criticism of the fact that it took 11 hours from the explosion until rescuers entered the mine.[7]

Accidents at Sago and other coal mines in 2006 more than doubled the number of fatalities from the record low of 23 in 2005, to 47 in 2006 — a level last reached in 1995. (See table 1.) In 2007, however, fatal work injuries declined to 33 — a level comparable to those of the late 1990s.

Despite this one-year improvement, the collapse of a section of Utah's Crandall Canyon mine in August 2007 — which resulted in deaths of six miners and three rescuers (including an MSHA inspector) and injuries sustained by six others — again highlighted the risks of working in the coal mining industry. Rescuers repeatedly sent messages on pager-like devices to the trapped miners, but it is unknown whether they ever were received. As mentioned in connection with the Sago tragedy, other technologies might have allowed communication with and location tracking of the miners.

**Table 1. Number of Fatalities and Fatal Injury Rate in the CoalMining Industry, 1995-2007**

Year	Number of Fatalities	Fatal Injury Rate (reported injuries per 200,000 hours worked)
1995	47	0.04
1996	39	0.03
1997	30	0.03
1998	29	0.03
1999	35	0.03
2000	38	0.04
2001	42	0.04
2002	27	0.03
2003	30	0.03
2004	28	0.03
2005	23	0.02
2006	47	0.04
2007	33	0.03

Source: U.S. Department of Labor, Mine Safety and Health Administration.

## HEALTH

Accidental injuries can be quantified much more reliably than the extent of occupationally caused disease. It is clear, though, that coal mining causes disability much more by way of long-latency disease than by traumatic injury. Prime among these diseases is black lung (coal workers' pneumoconiosis, CWP), which still claims some 1,000 fatalities per year despite being down by about half since 1990.[8] Deaths tend to occur after a long progression, resulting in one year of life expectancy being lost on average for these cases. However, many years of impaired breathing and debilitating weakness often precede death, which may not be counted as a mining-related fatality because the ill miner dies from other immediate causes.

Improved dust control requirements have led to a decrease in the prevalence of CWP. Among miners with 20-24 years of work experience, for example, the proportion of examined miners who had positive x-rays decreased from 23.2% in the mid-1970s to 2.2% in the late 1990s.[9] Interestingly, sharp drops in rates occurred at certain times: for workers with 25-29 years of mining experience, the rate fell from 20.2% in the 1987-1991 survey to 5.4% in the 1992-1996 survey; the former cohort began their careers around 1962, the latter around 1967. Under the Federal Coal Mine Health and Safety Act of 1969 (P.L. 91-173), commonly referred to as the Coal Act, tighter dust standards were phased in from 1970 to 1973.

During the current decade, however, the U.S. Department of Health and Human Services' Centers for Disease Control and Prevention (CDC) found advanced cases of CWP among underground miners younger than 50 to be particularly troubling because they were exposed to coal dust after the preventive measures in the Coal Act went into effect. The CDC suggested four explanations for the continuing development of advanced pneumoconiosis:

1. inadequacies in the mandated coal-mine dust regulations;

2. failure to comply with or adequately enforce those regulations;
3. lack of disease prevention innovations to accommodate changes in mining practices (e.g., thin-seam mining) brought about by depletion of richer coal reserves, and
4. missed opportunities by miners to be screened for early disease and take action to reduce dust exposure.[10]

## THE REGULATORY REGIME

MSHA is charged with overseeing the safety and health of those employed in coal and other mining industries. Its budget for FY2008 of about \$334 million is less than that of its sister agency, the Occupational Safety and Health Administration (OSHA), but OSHA is responsible for protecting many more workers: MSHA oversees a mining industry (including surface operations and all other minerals besides coal) of about 200,000 workers, while OSHA is responsible for most of the more than 100 million employees in the remainder of the workforce. Thus, while OSHA targets its inspections mostly on firms with the worst accident records in a few sectors, MSHA is able to cover its whole industry. Indeed, it is mandated to inspect each underground mine at least four times a year and each surface mine twice a year. Both agencies can assess financial penalties, but MSHA has direct authority to immediately shut down dangerous operations.

MSHA regulations, often referred to as standards, cover a wide range of equipment, procedures, certifications and training including methane monitoring, dust control, ventilation, noise, electrical equipment, diesel engines, explosives, fire protection, roof support, hoists and haulage, maps, communications and emergencies. (See *Code of Federal Regulations*, Title 30, Chapter 1; coal mines are specifically addressed in Subchapter O.)

### Safety

In the wake of the Sago accident in January 2006, the agency was criticized for its slow pace of rulemaking, allegedly withdrawing 18 proposed standards that had been pending as of January 2001.[11] The Administration said in response that it was pursuing a revised agenda,[12] and being more frank by no longer listing long-term projects on which little progress had been made.

MSHA rulemaking activity started to quicken later in 2006, however, after enactment in June of the Mine Improvement and New Emergency Response Act (MINER, P.L. 109-236). In December 2006, for example, a final rule on emergency mine evacuation went into effect that reconciled MSHA's emergency temporary standard with the new law. The final regulation includes requirements for increased availability and storage of breathing devices (self-contained self-rescuers, SCSRs), installation and maintenance of escape guides ("lifelines") in underground coal mines, and immediate notification of accidents at all mines. In March 2007 (as opposed to the MINER act's deadline of December 2006), MSHA issued another final rule; it raises the civil penalties for all mine safety and health violations including those specified in the MINER act.

In addition, MSHA announced in late January 2008 its first approval of a wireless communications system. "Since 2006, MSHA has issued 36 new or revised approvals for communications tracking systems.... Currently, the agency is examining 41 additional communications and tracking applications, including other wireless systems." [13] The MINER act imposed a deadline (June 2009) for underground mine operators to adopt two-way wireless communications and electronic tracking systems. The act also set a deadline (December 2007) for MSHA to promulgate new requirements that mine operators must meet concerning rescue teams; in February 2008, MSHA issued a final rule that among other things mandates the number of hours of training for mine rescue team members.

## **Health**

On the matter of preventing black lung and silicosis, MSHA is expressly required by its authorizing statute to enforce a dust control standard. The (mandatory) permissible exposure limit (PEL) to respirable dust currently set by regulation is 2 milligrams per cubic meter. The National Institute for Occupational Safety and Health (NIOSH) developed a (voluntary) recommended exposure limit (REL) for coal mine dust of 1 milligram per cubic meter and for silica dust of 0.05 milligrams per cubic meter. [14]

Besides the limit itself, controversy continues about how dust concentrations are measured in mines, and how MSHA monitors operators' plans and performance. After MSHA proposed new regulations in 2000 (superceded by revised proposals in March 2003), it suspended work on a final rule in June 2003 to obtain information on personal dust monitors (PDMs) that NIOSH was testing. PDMs are a new technology that can give personalized, real-time readings of dust concentration and help resolve longstanding disputes about how air samples are to be handled. In May 2007, Jeffrey Kohler, NIOSH's associate director for mining and construction safety, testified at a hearing of the Senate Committee on Health, Education, Labor and Pensions' Subcommittee on Employment and Workplace Safety, that the institute's research showed miners equipped with PDMs were able to greatly reduce respirable dust exposure based on having real-time dosimetry. The firm that now has the rights to the PDM informed NIOSH that it could have the devices available within four to six months after rulemaking is completed. [15]

## **Funding**

Congress increased MSHA's appropriation from \$302 million in FY2007, to \$334 million in FY2008. In response to rulemaking activity required in 2008 by Congress in the MINER act and other legislation, MSHA asked the Occupational Safety and Health Administration for volunteers to help develop standards. MSHA's Office of Standards, Regulations, and Variances develops standards for coal and other mining industries covered by the agency; it also processes petitions for modifications that are submitted to MSHA and administers the agency's Freedom of Information Act program. The office employs about 17 full-time equivalent employees.

The Administration has requested a somewhat lower sum, \$332 million, for MSHA in FY2009. According to the agency's budget justification, the Administration attributes much

of the \$2 million net decrease (\$20 million gross decrease) to the cost in FY2008 of hiring and training new coal mine inspectors and for overtime and travel of currently employed inspectors (almost \$11 million). Only a small portion (\$367,000) is associated with cessation of “one-time costs in FY2008 for service contracts pertaining to rule making related to the MINER Act.”

## LEGISLATIVE ACTIVITY

### The MINER Act

The legislative activity undertaken at both the state (e.g., West Virginia, Kentucky, and Illinois) and federal levels in 2006 emphasized factors thought to have played a part in the Sago mine disaster (e.g., emergency oxygen supplies, tracking and communication systems, deployment of rescue teams). The most prominent measure, and first major revision of federal mine safety legislation since 1977, is the Mine Improvement and New Emergency Response Act (MINER, P.L. 109-236).[16] Congress passed the MINER act, and the President signed it into law on June 15, 2006, within a month of its introduction.

Among its major points that require action on the part of MSHA are:

- *Emergency response* (section 2). Each mine is to have a plan approved by MSHA that addresses post-accident communications, tracking, and breathable air and lifelines; and sets procedures for coordination between operators, rescue teams, and local emergency response personnel.
- *Rescue teams* (section 4). Each mine with more than 36 employees is required to have an employee on each shift knowledgeable about emergency response; two certified teams familiar with the mine available, who participate in rescue contests and training, within one hour from the rescue station. More flexibility is provided for smaller mines.
- *Penalties* (section 8). Increases the scale and scope of penalties including imprisonment and fines up to \$250,000 (\$500,000 second offense) for willful violators of standards or orders, and a civil penalty of up to \$220,000 per violation for a new “flagrant violation” category.
- *Sealing of abandoned mine areas* (section 10). Increases the existing standard of 20 pounds per square inch pressure resistance.

Dissatisfaction has been expressed with the speed at which MSHA is implementing the statute. As a result, the Consolidated Appropriations Act, 2008

(P.L. 110-161), signed in December 2007, set deadlines for a proposed rule (June 20, 2008) and a final rule (December 31, 2008), consistent with the recommendations of the Technical Study Panel established by section 11 of the MINER act, on the use of belt haulage entries to ventilate active working places.[17] P.L. 110-161 also directed the Secretary of Labor, within the same time frame, to propose and finalize regulations consistent with the recommendations of NIOSH, pursuant to section 13 of the MINER act, requiring rescue chambers or equally protective rescue facilities in underground coal mines.

## The S-MINER Act

At the time of the MINER act's passage, some Members characterized the law as only a "first step" that would be followed by more measures. In January 2008, the House passed the Supplemental Mine Improvement and New Emergency Response Act (S-MINER, H.R. 2768) which incorporates language from the Miner Health Enhancement Act (H.R. 2769).

On the health front, section 8 of the bill would require:

- NIOSH, within 30 days of enactment, to transmit to MSHA its recommended exposure limits (RELs) for chemicals and other substances hazardous to miners; MSHA would then have up to 30 days from receipt of the RELs to adopt them as permissible exposure limits (PELs);
- NIOSH to submit each year new or revised RELs, and DOL to adopt them within 30 days as PELs;<sup>[18]</sup> and ! MSHA to apply OSHA's asbestos standard to the mining industry within 30 days of the bill's enactment.<sup>[19]</sup>

An amendment to the bill also requires the Secretary of Labor to study and report on miner substance abuse issues that pose safety risks. Another amendment authorizes \$10 million for the Secretary, in consultation with the Secretary of Health and Human Services, to award grants for provision of rehabilitation services to current and former miners suffering from mental health impairments.

Section 7 addresses another health issue, namely, respirable dust. H.R. 2768 would, effective on the date of enactment, have mine operators adopt NIOSH's RELs of 1 milligram of respirable coal dust and 0.05 milligrams of respirable silica dust per cubic meter of air. To ensure that the coal dust standard is being met, MSHA and mine operators would have to sample the amount of dust in the mine atmosphere using personal dust monitors (PDMs) that provide real-time information to the miners equipped with the devices. An amendment to the bill appropriates \$30 million to the Secretary to buy PDMs for this purpose.

In light of the use of retreat mining in the 2007 Crandall Canyon tragedy, the bill contains provisions that address the practice.<sup>[20]</sup> For example, mine operators would be required to have a current pillar extraction or barrier reduction plan approved by MSHA before performing such activities; the Secretary must establish a special internal review process for plans involving miners working at depths of more than 1,500 feet; and the agency must more closely monitor implementation of these practices. The National Academy of Sciences, in consultation with NIOSH, would be required to make recommendations within one year of enactment about ways to better protect miners during retreat mining and when working at great depths.

In addition to the retreat mining provisions in section 4 of S-MINER, this section revisits and supplements the emergency response provisions in the MINER act.

<sup>18</sup> The Secretary of Labor would be allowed to review the feasibility of a PEL before it is put into effect if mine operators or miners provide evidence that feasibility may be an issue. If operators or miners provide evidence that an REL issued by NIOSH lacks the specificity needed to serve as a PEL, the Secretary may defer implementation until NIOSH recommends a more detailed REL.

Among other things, MSHA would have to issue regulations in 2008 or 2009 concerning such safety issues as rescue chambers or other refuge designs recommended by NIOSH, survivable mine ventilation controls, flame resistant conveyor belts, and ventilation of active working places. H.R. 2768 similarly sets deadlines on mine operators related to such safety issues as post-accident communication and electronic tracking systems, a pre-shift communication program, and atmospheric monitoring of carbon monoxide levels.

Section 4 also would repeal section 10 of the MINER act, which imposed a deadline (December 2007) for a final rule on sealing of abandoned mine areas. In its stead, S-MINER would require MSHA to issue a final rule on the matter not later than three months after enactment.[21] Section 4 would, as well, have the National Academy of Sciences (not later than one year from enactment) report on ways to protect miners from the risk of lightning strikes near mines; this was a factor in the Sago mine accident.

Section 5 of S-MINER focuses on enforcement authority. To ensure the agency has sufficient qualified and trained inspection personnel on board before current inspectors retire, the bill would abolish for five years any ceilings on the number of persons in the position. In addition, an office of miner ombudsman would be created in the Labor Department's Office of Inspector General. S-MINER also would permit in instances where a pattern of violations is found (1) assessment of a penalty beyond those already authorized and (2) withdrawal of all miners from an entire mine. The bill would raise the amount of some currently authorized penalties and establish a procedure for dealing with operators who fail to pay final assessments. The Secretary would be required to establish an advisory committee to recommend whether the government should license mines, their operators, and related personnel to guarantee they are not frequent violators of the 1977 statute.

Section 6 of H.R. 2768 addresses rescue, recovery and incident investigating authority. It includes a requirement that within 30 days of enactment a communications emergency call center be created for coal and other mine operations; it must be staffed and operated 24 hours a day 7 days a week by at least one employee of MSHA. Within six months of S-MINER's enactment, guidelines for rescue operations would have to be developed and disseminated; the guidelines must delineate lines of authority within MSHA and between the agency, the private sector and state responders so each can perform their respective responsibilities.

In addition to MSHA conducting all accident and incident investigations, section 6 would authorize an independent investigation for incidents involving multiple injuries or deaths, or multiple entrapments. NIOSH would appoint team members. Not less than 30 days after its enactment, rulemaking would have to commence on the procedures to be followed in the conduct of independent investigations; rulemaking must be completed by October 1, 2008. However, the bill would not have these other investigations limit the investigative authority of the Chemical Safety and Hazard Investigations Board or the department's inspector general.[22]

Section 6 of H.R. 2768 also would strike section 7 of the MINER act concerning family liaisons. In its place, S-MINER would have the Secretary designate a full-time permanent employee of MSHA to serve as a family liaison who will, at least in incidents involving multiple miners, serve as the primary communicator with the families of those miners.

A third amendment to H.R. 2768 created section 9, which establishes a mine safety program fund. Into this account in the Treasury would be deposited mine safety civil penalties and private donations. Sums in the account would be available for mine safety inspections and investigations only.

***The Administration's Position***

The President has said he will not sign the bill if it arrives at his desk in its current form. When the House Education and Labor Committee was marking up S-MINER in late October 2007, the OSHA Fairness Coalition wrote the Committee to express its opposition to the legislation. It specifically was concerned that requiring MSHA to adopt NIOSH's voluntary RELs as mandatory PELs would circumvent the participatory rulemaking process because RELs do not go through a comparable public review.[23] In a statement of Administration policy issued when the House was preparing to vote on H.R. 2768, the Office of Management and Budget (OMB) similarly noted that "This provision would mandate the adoption of potentially hundreds of PELs without any input from stakeholders and without [prior] determination of whether the PEL is economically and technologically feasible."

The OMB further said in the statement of Administration policy that rulemaking already is underway as a result of other bills the President previously signed: H.R. 2768 would "overturn regulatory processes that were required by the MINER Act ... and would impose burdensome and unrealistic time requirements." Moreover, by allowing entities in addition to MSHA investigate certain accidents, S-MINER would, according to the OMB,

undermine the government's ability to hold accountable mine operators who violate mine safety and health regulations since multiple investigations potentially using different methodologies and reaching different conclusions could prejudice the government's ability to prosecute civil or criminal violations of mine safety and health standards that contributed to, or exacerbated, an accident.

***Related Legislation***

S-MINER was referred to the Senate in January 2008. It joins S. 1655 (the Miner Health and Safety Enhancement Act of 2007) which was introduced on June 19, 2007, the same day as the initial version of the S-MINER act. While otherwise quite similar, S. 1655 does not contain the retreat mining provisions included in the substitute to H.R. 2768 that the Education and Labor Committee considered in November 2007 (after the Crandall Canyon incident had occurred). In addition, S. 1655 does not include the provisions in H.R. 2768 about a study of substance abuse and related rehabilitation grants (at section 8), a mine safety program fund (at section 9), and the appropriation for MSHA to purchase PDMs.

S-MINER also joins in the Senate H.R. 3877/S. 2263 (the Mine Communications Technology Innovation Act), which the House passed on October 29, 2007. H.R. 3877 would have the Director of the National Institute of Standards and Technology (NIST) establish a research, development and demonstration program to develop best practices, adapt existing technology, and accelerate development of next generation technology and tracking systems for mine communications. The Department of Commerce's NIST also would coordinate with industry and relevant federal agencies to develop consensus standards for communications in underground mines.

Previously, the MINER act (section 6) created within NIOSH an Office of Mine Safety and Health "to enhance the development of new mine safety technology and technological applications and to expedite the commercial availability and implementation of such technology in mining environments." The 2006 statute further states that the NIOSH office is "responsible for research, development, and testing of new technologies and equipment designed to enhance mine safety and health," and to carry out this responsibility has the



authority to award grants to encourage the development and manufacture of mine safety equipment and to award contracts to perform product testing. Separately, the Emergency Supplemental Appropriations Act of 2006 (P.L. 109-234) awarded \$10 million to NIOSH to target research into safety technologies specifically related to communications and tracking, among other things, that would be available for use in mines within 24-36 months.

NIOSH, which is part of the CDC, has organized a Mine Emergency Communications Partnership “to facilitate the development, evaluation, and implementation of” post-accident communication and tracking technologies. The partnership initially has focused on applications suited for coal mines. Its members, who include mining associations, unions, state and federal regulatory agencies, equipment manufacturers, and researchers, “are expected to share their knowledge of, and experiences with, communication and tracking systems and provide mine sites where tests and demonstrations of communication and tracking systems can be conducted.”[24] MSHA notes that it has been working with this NIOSH partnership to help arrange field tests of new communication and tracking technologies, which could enable mine operators to meet the MINER act’s June 2009 deadline for inclusion in MSHA-approved plans of wireless two-way post-accident communication devices and electronic tracking technologies.[25]

## REFERENCES

- [1] Data available at [<http://www.msha.gov/stats/coalstats.asp>].
- [2] The fatality rate in the goods-producing sector, of which mining is a part, was 8.2 per 100,000 persons employed in the sector in 2006. BLS, *The National Census of Fatal Occupational Injuries in 2006*, August 8, 2007.
- [3] BLS, *Workplace Injuries and Illnesses in 2006*, October 15, 2007.
- [4] For an overview of safety trends, see Ramani, Raja and Jan Mutmanský, “Mine Health and Safety at the Turn of the Millennium,” *Mining Engineering*, September 1999.
- [5] In prior decades, Congress initiated and gradually expanded safety and health regulation of coal and other mining industries within the Department of the Interior.
- [6] The United Mine Workers (UMW) union wants MSHA to be more active. It asserts that there are not enough inspectors and that penalties (proposed and negotiated) are not large enough. In general, the UMW would make enforcement of standards the highest priority. The mining industry generally supports the current regulatory approach, but it urges that inspections be focused on mines with evident problems rather than on all mines as currently required by law.
- [7] Ironically, one of the “lessons learned” from a September 2001 accident at Alabama’s Jim Walter No. 5 mine appears to have led to the delay at Sago. Because most of the victims in the earlier accident were responding to a relatively small explosion when a larger one occurred, considerable time was taken to verify the state of the atmosphere in the Sago mine before rescue teams were sent in.
- [8] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, *Work-Related Lung Disease Surveillance Report 2002*, Section 2 (CWP and Related Exposures), DHHS (NIOSH) report no. 2003-111, May 2003.

- [9] Ibid.
- [10] “Advanced Pneumoconiosis Among Working Underground Coal Miners — Eastern Kentucky and Southwestern Virginia, 2006,” *MMWR Weekly*, July 6, 2007.
- [11] Joby Warrick, “Federal Mine Agency Considers New Rules to Improve Safety,” *Washington Post*, January 31, 2006, p. A3.
- [12] Standards proposed and adopted in the 2001-2005 period include methane testing (alternate means), emergency evacuations, belt entries as air intakes, and training shaft and slope construction workers.
- [13] “First Wireless Tracking System Approved, May Keep Mandated Rulemaking on Time,” *Daily Labor Report*, February 1, 2008.
- [14] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, *Criteria for a Recommended Standard: Occupational Exposure to Respirable Coal Mine Dust*, DHHS (NIOSH) publication no. 95-106, September 1995.
- [15] “MSHA Regulation on Dust Monitors Needed to Require Use in All Coal Mines,” *Daily Labor Report*, May 23, 2007.
- [16] Earlier in the decade, Congress gave MSHA \$10 million to collect and digitize mine maps and new technologies for detecting mine voids (Consolidated Appropriations Resolution, 2003, P.L. 108-7). The Emergency Supplemental Appropriations Act of 2006 (P.L. 109-234) made available \$26 million for MSHA to hire 170 coal mine inspectors above the agency’s June 2006 level, and \$10 million for NIOSH to conduct research on new safety technologies.
- [17] On December 18, 2007, MSHA received the final report of the Technical Study Panel on the Utilization of Belt Air. “Belt air” is air directed underground to ventilate active work areas via the same tunnels in which conveyor belts remove coal from mines. Because these tunnels consequently contain a great deal of highly flammable coal dust, some think that using them for ventilation increases the risk of directing fires toward the work areas of miners and toward their evacuation routes.
- [18] The Secretary of Labor would be allowed to review the feasibility of a PEL before it is put into effect if mine operators or miners provide evidence that feasibility may be an issue. If operators or miners provide evidence that an REL issued by NIOSH lacks the specificity needed to serve as a PEL, the Secretary may defer implementation until NIOSH recommends a more detailed REL.
- [19] In February 2008, MSHA published a final asbestos standard that includes exposure limits equal to those set by OSHA.
- [20] When an underground area has been completely mined of its coal, the coal pillars that have been holding up that area of the mine’s roof are pulled to obtain their coal content. For an examination of (1) how the operator at the Crandall Canyon mine “conceived, designed, and tested its plans to mine the barrier pillars in the Main West section and (2) MSHA’s review of those plans and its monitoring of safety conditions during mining of the barrier pillars,” see U.S. Senate Health, Education, Labor and Pensions Committee, *Report on the August 6, 2007 Disaster At Crandall Canyon Mine*, March 6, 2008. The House Education and Labor Committee is conducting an investigation of the Crandall Canyon incident. MSHA is preparing an accident report as well.

- 
- [21] In May 2007, MSHA issued an emergency temporary standard to increase protections for those working in underground mines with sealed off abandoned areas. It reopened the comment period for one month (to January 18, 2008) to give individuals time to submit comments on a report by the U.S. Army Corps of Engineers and to prepare testimony for a hearing that was held in mid-January 2008.
- [22] The Chemical Safety and Hazard Investigations Board is an independent agency of the federal government that, among other things, investigates and identifies the causes of chemical accidents.
- [23] In addition, the employer group reportedly is concerned that this requirement would set a precedent that Congress subsequently could apply to OSHA. "House Committee Approves S-MINER Bill, Amendment Adds Retreat Mining Provisions," *Daily Labor Report*, November 1, 2007.
- [24] See the following for additional information: [<http://www.cdc.gov/niosh/mining/mineract/mineemergencycommunicationspartnership.htm>].
- [25] See the following for MSHA-approved communications and tracking technologies: [<http://www.msha.gov/techsupp/PEDLocating/MSHAApprovedPEDproducts.pdf>].



*Chapter 9*

## **COAL MINE SAFETY\***

*Edward Rappaport*

Analyst in Industry Economics  
Domestic Social Policy Division

### **ABSTRACT**

Dramatic mine accidents early in 2006 have led to passage of the first major amendment to federal mine safety law since 1977. The Mine Improvement and New Emergency Response Act (MINER, P.L. 109-236) requires each mine to have an emergency plan, increased supplies of oxygen, and improved rescue teams. Penalties for violations have also been increased. Although the bill had wide support in Congress, some Members have characterized it as only a “first step,” to be followed by additional measures that would include a lower maximum limit on dust concentrations, underground refuges, communications and tracking devices, and greater emphasis on enforcement of standards.

On January 2, 2006, the nation was reminded of the dangers of underground mining, as 12 miners died in an explosion and fire in the Sago mine in West Virginia. Subsequently, the Mine Safety and Health Administration (MSHA) issued new regulations; Congress has passed the first major revision of the mine safety law since 1977 and has taken further bills under consideration; and state legislatures in West Virginia, Kentucky, and Illinois have tightened their own laws. These responses have emphasized factors thought to have played a part in the Sago tragedy, including emergency oxygen supplies, tracking and communication systems, and deployment of rescue teams. There have also been proposals to increase the penalties for violations of safety standards.

This report reviews the safety and health record of the mining industry, describes the regulatory regime, and analyzes current legislative and regulatory initiatives.

---

\* Excerpted from CRS Report RS22461, dated June 23, 2006.

## THE RECORD — PAST AND PRESENT

### Injuries

Safety in the coal industry has undergone a steady trend of improvement since 1925, an era when hundreds of miners could be lost in a single incident. In that year, there were a total of 2,518 fatalities in accidents, whereas the number has since fallen almost continually, down to 22 in 2005. Some of this trend is explained by a decrease in coal industry employment (from 749,000 in 1925 to 110,000 currently) and other structural changes in the industry, but much of it by real safety improvement.[1] Thus, the overall annual fatality rate decreased over the period from 3.36 per thousand workers to 0.20 per thousand. Nevertheless, mining of coal and other minerals remains one of the most dangerous sectors in which to work, with its fatality rate being more than seven times the average for all private industry, and exceeding that of many industries generally thought to be dangerous, such as construction and trucking. In terms of more ordinary accidents (non-fatal), mining is not far from the all-industry average, and indeed there is less variation overall among these industry groups. In what follows, the concentration is on fatal accidents.

Statistically, most of the 7.6% per year reduction in fatalities per ton (the average rate of improvement over the period 1980 to 2004) can be attributed to productivity (i.e., fewer workers on the job), most of the rest coming from a reduction in fatalities per actual worker. Some is also attributable to an ongoing shift from underground to surface mining. In truth, what lies behind all these factors is mechanization. New machinery such as longwall systems have not only reduced the total number of workers needed, but done so especially at the most dangerous spots (e.g., the active cutting face). Other measures, which have prevented many large-scale accidents, include controlling coal dust, monitoring methane gas (which is both explosive and poisonous), adequately supporting roofs, and avoiding spark-producing equipment.[2]

It would be very difficult to determine conclusively how much of the progress in safety has been due to MSHA. Although the most important safety measures are found in MSHA standards, it could be argued that many mines would have adopted them without that inducement. And indeed, safety had been increasing for a long time before MSHA's founding. Be that as it may, all parties involved agree that there is still room for improvement, but they disagree on the specific course to be followed. The United Mine Workers union has often contended that MSHA has not been sufficiently active. It contends that there are not enough inspectors and that penalties, both as proposed and as negotiated, are not large enough. In general, the union would make enforcement of standards the highest priority. The mining industry generally supports MSHA's existing regulatory approach, although it has urged that inspections be focused on mines where problems are evident, rather than regularly spread among all mines as currently required.

Some recent, widely publicized incidents have highlighted specific areas that may merit further attention. The flooding of the Quecreek Mine in Pennsylvania in July 2002 raised questions about the accuracy of underground mine maps and their availability to operators of nearby mines. The Quecreek accident might have been avoided if the mine operator had access to the final map of a nearby abandoned mine that had since filled with water. In response, \$10 million was appropriated to MSHA (in Labor Department appropriations for

FY2003) for collection and digitization of abandoned mine maps and new technologies for detecting underground voids. In response to the Jim Walter No. 5 mine accident in Alabama in September 2001 (which took 13 lives), MSHA made a number of changes, including a new standard on mine emergency response. The mine workers union alleges that MSHA had not followed up properly on numerous previous violations at the site.[3]

The Sago explosion, caused by lightning that penetrated underground and set off a methane explosion, killed only one miner initially. Sixteen miners escaped; 12 survived the explosion but were trapped and succumbed ultimately to carbon monoxide from the ensuing fire. The episode raised a number of issues. It has been suggested that communication and tracking devices currently available might have enabled the trapped miners to escape or find better refuge, or rescuers to reach them more quickly. Emergency breathing apparatus issued to the miners were rated for only one hour, and reportedly a number of them did not work well. Also, there has been criticism of the fact that it took 11 hours from the explosion until rescuers entered the mine.[4] (Ironically, though, one of the “lessons learned” from the Jim Walter case may have compounded the problems at Sago. Because most of the victims in the former incident were responding to a relatively small explosion when a larger one occurred, considerable time was taken at Sago to verify the state of the mine atmosphere before rescue crews were sent in.)

## **Illnesses**

Accidental injuries can be quantified much more reliably than the extent of occupationally caused disease. It is clear, though, that coal mining is causing disability much more by way of long-latency disease than by traumatic injury. Prime among these diseases is black lung (coal workers’ pneumoconiosis (CWP)), which still claims about 1,000 fatalities per year (down by about half since 1990).[5] The deaths tend to occur after a long progression, so that only about one year of life expectancy is lost on average for these cases. However, this is usually preceded by many years of impaired breathing and debilitating weakness, as well as many more cases not counted as fatalities (ending with death by other causes). As of 2002 (the latest year tabulated), there were 16,000 cases on the rolls of the black lung program (i.e., deemed totally disabled).

Improved dust control requirements have led to a decrease in prevalence of the disease since the 1970s. Among miners with 20-24 years of work experience, for example, the proportion of examined miners who had positive x-rays decreased from 23.2% in the mid-1970s to 2.2% in the late 1990s.[6] While this is a great improvement, there is still dispute about whether the current dust limits should be lowered, as well as questions about the degree of compliance by mine operators with current limits.

## **REGULATORY REGIME**

The Mine Safety and Health Administration (MSHA) is charged with overseeing the safety of coal and other mining industries. MSHA’s budget of \$278 million (FY2006) is somewhat less than the \$472 million of its sister agency, the Occupational Safety and Health

Administration (OSHA), but OSHA is responsible for protecting a far larger number of workers.[7] MSHA oversees a mining industry(including surface operations and all other minerals besides coal) of about 200,000 workers, whereas OSHA is responsible for most of the rest of the economy. Thus, while OSHA must target its inspections mostly on firms with the worst accident records in a few sectors (notably manufacturing and construction), MSHA is able to cover its whole industry. Indeed, it is mandated to inspect each underground mine at least four times a year and each surface mine twice. In addition to financial penalties, and in contrast to OSHA, MSHA has direct authority to immediately shut down dangerous operations.

Substantively, the regulations promulgated by MSHA cover a wide range of equipment, procedures, certifications and training, including methane monitoring, dust control, ventilation, noise, electrical equipment,diesel engines, explosives, fire protection, roof support, hoists and haulage, maps, communications, and emergencies.[8]

In the wake of the Sago accident, the agencywas criticized by many for its slow pace of rulemaking in recent years, allegedly dropping 18 proposed standards that had been pending as of January 2001.[9] The Administration has said that it was pursuing a revised agenda,[10] and that it was being more frank by no longer listing long-term projects that had not been making much progress. Since the outset of 2006, however, MSHA has started action on a number of measures. As mentioned, the recent emphasis has been on emergency preparedness and response. A new temporary standard (with formal rulemaking for a permanent standard) was issued on the subject of evacuations, which includes provisions for additional breathing apparatus (self-contained self-rescuers — SCSRs), additional training on SCSRs, escape guides (“lifelines”), and prompt notice of emergencies. Requests for information and proposals were issued for communications and tracking technologies, rescue chambers and rescue teams. MSHA indicated it will revise its penalty assessment formula and has asked the Congress for an increase in the authorized maximum from \$60,000 to \$250,000.

On the matter of preventing black lung and silicosis, MSHA is expressly required by its authorizing statute to enforce a dust control standard. The limit is currently set by regulation at 2 milligrams/cubic meter as an eight-hour average “for each miner in the active workings of each mine,” although NIOSH has recommended a limit of 1 mg.[11]

Besides the limit itself, there has been continual controversy about how concentrations are to be measured in the mines, and how MSHA will monitor operators’ plans and performance. In July 2000, MSHA proposed new regulations (superceded by revised proposals in March 2003) under which its inspectors would verify plans and performance by directly collecting single full-shift samples, rather than the previous practice of multiple samples retrieved by the operators. This proceeding was suspended on June 24, 2003, in favor of the development of personal dust monitors (PDMs), a new technology that could give personalized, real-time readings of dust concentration and finesse longstanding disputes about how air samples are to be handled. Initial tests of PDMs have been promising.[12]

## LEGISLATION

Much legislative activity, at both state and federal levels, has occurred in response to the Sago and other accidents in early 2006. The most prominent measure has been the Mine



Improvement and New Emergency Response Act (MINER), P.L. 109-236 (S. 2803 (Enzi, Kennedy et al.) / H.R. 5432 (Capito et al.)), which went from introduction to passage in about three weeks.[13] Among the major points in this bill:

- *Emergency preparedness.* Each mine to have a plan which includes coordination with local emergency agencies, tracking and communication devices, and a two hour oxygen supply with each miner plus supplementary supplies positioned along escapeways.
- *Rescue teams.* Each large mine to have two teams familiar with the mine (including a “knowledgeable” mine employee), available within one hour. More flexible rules for smaller mines (fewer than 36 employees). Limitations on legal liabilities of teams.
- *Penalties.* Willful violations may be subject to imprisonment and fines up to \$250,000 (\$500,000 second offense), compared to current \$25,000 (\$50,000). Up to \$220,000 civil penalty for “flagrant” failure to correct cited conditions. MSHA empowered to seek court orders to collect penalties.
- *Sealing of abandoned mine areas.* MSHA to issue new standard, with strength criterion greater than current 20 pounds per square inch pressure resistance.

While S. 2803 had broad bipartisan support (passed by unanimous consent in the Senate and under suspension of the rules in the House), some Members characterized it as only a “first step,” to be followed by more measures. For example, as compared with S. 2803, H.R. 5389 (George Miller, Rahall et al.) / S. 2798 (Kennedy et al.) would feature:

- additional specific safety measures, including continuous monitoring of the mine atmosphere, refuges stocked with five days of supplies (these measures to be enforced by a withdrawal order if found to be lacking), and a lower limit on dust concentrations;
- more stringent requirements for rescue teams, e.g. that they must be composed exclusively (in larger mines) of mine employees and be immediately available for deployment;
- public hearings and family involvement in accident investigations, which are to be conducted independently of MSHA if so requested by miners’ union or majority of affected family members;
- stricter penalties, e.g. \$1 million penalty and entire-mine withdrawal order if “pattern of violations” identified; fines to be paid into escrow pending appeals; elimination of consideration of mine size or financial viability;
- a safety ombudsman within the Department of Labor Office of Inspector General; and
- implicitly, a shift of budgetary resources from technical support to enforcement personnel.[14]

## REFERENCES

[1] Data available at [<http://www.msha.gov/ACCINJ/BOTHCL.HTM>].

- 
- [2] For an overview of safety trends, see Ramani, Raja and Jan Mutmansky, "Mine Health and Safety at the Turn of the Millennium," *Mining Engineering*, Sept. 1999, pp. 25-30.
  - [3] Notably, the \$435,000 in fines that MSHA assessed after the accident were reduced by an administrative law judge to \$3,000. "Judge Vacates Citations, Reduces Fines for Jim Walters Resources' Fatal Explosion," *Daily Labor Report*, Nov. 9, 2005, pp. A4, A5.
  - [4] These issues were discussed at a hearing of the Senate Appropriations subcommittee on labor on Jan. 23, 2006.
  - [5] Data cited here are from the NIOSH "Worlds" report, Section 2 (CWP). U.S. Department of Health and Human Services, *Work-Related Lung Disease Surveillance Report*, DHHS report no. 2003-111, 2002, available at [<http://www.cdc.gov/niosh/docs/2003-111/pdfs/2003-111c.pdf>] .
  - [6] Worlds report, *ibid*. Interestingly, sharp drops in rates occurred at certain times. For 25-29 year workers, the rate fell from 20.2% in the 1987-1991 survey to 5.4% in 1992-1996. The former cohort began their careers around 1962, the latter around 1967. Under the 1969 Coal Act, tighter dust standards were phased in from 1970 to 1973.
  - [7] The emergency supplemental appropriations bill of 2006 (H.R. 4939, P.L. 109-234) includes \$26 million for additional mine inspectors and \$10 million to NIOSH for research on new safety technologies.
  - [8] Mine safety regulations are found generally in *Code of Federal Regulations*, Title 30, Chapter 1. Coal mines specifically are addressed in Subchapter O.
  - [9] Joby Warrick, Federal Mine Agency Considers New Rules to Improve Safety. *Washington Post*, Jan. 31, 2006, p. A3.
  - [10] Standards proposed and adopted since 2001 include methane testing (alternate means), emergency evacuations, belt entries as air intakes, and training shaft and slope construction workers.
  - [11] U.S. Department of Health and Human Services. Criteria for a Recommended Standard / Occupational Exposure to Respirable Coal Mine Dust. Cincinnati: NIOSH, September 1995. (DHHS report no. 95-106)
  - [12] Volkwein, Jon, et al. Laboratory and Field Performance of a Respirable Personal Dust Monitor. Pittsburgh: NIOSH Pittsburgh Research Laboratory, May 2006 (draft report). Available at [<http://www.cdc.gov/niosh/review/public/dustmonitor>].
  - [13] There were predecessor bills with similar ideas, beginning 1 February 2006 with H.R. 4695 / S. 2231, which was sponsored by all members of the West Virginia delegation.
  - [14] See Section 10 of the bill, "Transition to a new generation of inspectors." The approach of S. 2803 with regard to human resources is to establish scholarships for the training of miners, inspectors and researchers (funding levels to be determined by appropriations).

# INDEX

## A

academics, 3  
access, 9, 10, 82, 130, 169, 182  
accident prevention, 165, 166  
accidents, vii, 2, 17, 67, 73, 94, 95, 119, 127,  
143, 150, 153, 154, 165, 166, 167, 168, 169,  
171, 176, 179, 181, 182, 184  
accountability, 18, 62, 111  
accuracy, 32, 70, 98, 101, 169, 182  
ad hoc, 15  
adaptation, 132  
administration, 28, 32  
administrative, 1, 3, 5, 21, 29, 67, 113, 147, 186  
afternoon, 63, 111  
age, 125  
agent, 128  
agents, 64, 112, 118, 128  
aging, 20  
agriculture, 17  
aid, 75, 84, 114, 128  
air, 9, 70, 71, 72, 75, 76, 78, 79, 80, 81, 82, 83,  
84, 85, 89, 90, 91, 94, 95, 96, 100, 102, 103,  
113, 114, 123, 124, 126, 128, 130, 136, 142,  
146, 155, 156, 157, 160, 161, 172, 173, 174,  
178, 184, 186  
air quality, 126  
Alabama, 160, 177, 183  
alternative, 66, 76, 81, 82, 84, 85, 114, 142, 146,  
159  
alternatives, 70, 71, 76, 84, 85, 86, 87, 114, 131,  
133, 136, 142, 145, 146, 160  
AMS, 124  
analog, 136  
analytical tools, 147  
APA, 1, 7  
appendix, 3, 28, 32, 71, 96

application, 21, 86, 125, 132  
appropriate technology, 72  
appropriations, 76, 131, 134, 182, 186  
Army, 132, 135, 179  
Army Corps of Engineers, 179  
asbestos, 168, 174, 178  
assessment, 22, 25, 64, 65, 66, 93, 97, 98, 119,  
121, 125, 150, 151, 165, 175, 184  
assignment, 62  
atmosphere, 64, 124, 145, 146, 156, 159, 174,  
177, 183, 185  
attacks, 118  
auditing, 3, 71, 101  
authority, 7, 14, 15, 64, 77, 112, 119, 121, 122,  
123, 171, 175, 177, 184  
availability, 4, 10, 133, 142, 158, 169, 171, 176,  
182  
averaging, 2  
awareness, 157

## B

barrier, 174, 178  
batteries, 135  
battery, 134, 135  
benefits, 16, 18, 22, 86, 132, 133  
Best Practice, 147  
bipartisan, 185  
black lung, 167, 170, 172, 183, 184  
BLM, 140  
blocks, 128  
blood, 117  
bodily injury, 64, 122, 154  
bonding, 128  
breakdown, 102  
breathing, 4, 6, 7, 9, 11, 12, 13, 14, 15, 64, 65,  
71, 75, 97, 169, 170, 171, 183, 184  
budgetary resources, 185

building blocks, 134  
 Bureau of Land Management (BLM), 140  
 business management, 166  
 business model, 165  
 bypass, 87

## C

cable system, 83, 86  
 cables, 113, 145  
 cache, 141  
 capacity, 10, 16, 85, 133  
 carbon, 69, 70, 85, 94, 128, 169, 175, 183  
 carbon dioxide, 85  
 carbon monoxide, 69, 70, 94, 169, 175, 183  
 category a, 91  
 CDC, 131, 170, 177  
 cell, 86  
 cellular phone, 143  
 Census, 177  
 Centers for Disease Control, 7, 16, 70, 131, 170, 177, 178  
 certification, 133, 142, 145, 158  
 certifications, 14, 171, 184  
 chemicals, 174  
 Cincinnati, 186  
 classification, 149  
 classroom, 6, 11  
 clients, 18  
 closure, 7, 30, 33  
 Co, 28, 67  
 coal, 1, 2, 3, 5, 6, 7, 8, 9, 11, 13, 14, 15, 16, 17, 19, 20, 23, 24, 26, 27, 29, 30, 32, 33, 65, 66, 69, 70, 71, 72, 73, 74, 76, 77, 81, 82, 83, 84, 85, 86, 87, 88, 91, 92, 94, 96, 97, 99, 100, 112, 113, 114, 115, 117, 123, 125, 126, 127, 131, 133, 135, 136, 140, 141, 142, 144, 145, 147, 148, 150, 153, 154, 155, 156, 157, 158, 159, 160, 163, 164, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 177, 178, 182, 183  
 coal dust, 5, 7, 19, 136, 169, 170, 174, 178, 182  
 coal mine, 1, 2, 3, 5, 6, 8, 9, 11, 13, 14, 15, 16, 17, 23, 24, 26, 27, 29, 30, 32, 33, 65, 69, 70, 71, 72, 73, 74, 76, 77, 81, 82, 83, 85, 86, 87, 88, 91, 92, 94, 96, 97, 99, 100, 112, 113, 114, 115, 117, 125, 126, 127, 131, 133, 135, 136, 140, 141, 142, 144, 145, 147, 148, 150, 153, 154, 155, 156, 157, 158, 159, 160, 163, 164, 167, 168, 169, 171, 172, 173, 177, 178  
 coalfields, 126  
 cohort, 170, 186  
 collaboration, 18, 86, 132  
 Colorado, 127  
 commercialization, 133, 166  
 Committee on Appropriations, 28, 29  
 communication, vii, 12, 18, 19, 71, 76, 83, 86, 87, 90, 125, 127, 129, 134, 135, 136, 137, 140, 144, 157, 164, 165, 167, 169, 173, 175, 177, 181, 183, 185  
 communication systems, vii, 71, 135, 173, 181  
 communities, 153, 160, 165  
 community, 16, 71, 78, 79, 96, 97, 125, 131, 153, 157, 162  
 competition, 3, 29  
 complement, 133  
 complexity, 66  
 compliance, 22, 25, 26, 65, 66, 70, 72, 88, 92, 93, 94, 119, 120, 121, 122, 123, 140, 141, 142, 145, 149, 150, 154, 167, 183  
 components, 70, 71, 72, 75, 76, 77, 79, 82, 83, 85, 86, 88, 91, 94, 95, 97, 100, 101, 103, 115, 146  
 composition, 13, 142, 158, 160  
 concentration, 168, 172, 182, 184  
 confidence, 3, 10, 28, 33  
 confidence interval, 3, 33  
 confidence intervals, 3, 33  
 configuration, 125  
 conflict, 13  
 Congress, iv, vii, 6, 18, 19, 62, 69, 73, 74, 76, 111, 117, 118, 119, 120, 121, 125, 126, 127, 130, 131, 133, 136, 155, 160, 162, 168, 169, 172, 177, 178, 179, 181, 184  
 consensus, 123, 124, 176  
 consent, 185  
 Consolidated Appropriations Act, 168, 173  
 constraints, 4, 86, 128  
 construction, 124, 145, 159, 172, 178, 182, 184, 186  
 contaminants, 64, 81  
 contingency, 142, 157  
 contractors, 144, 159  
 contracts, 132, 133, 173, 177  
 control, 7, 17, 18, 94, 114, 118, 119, 121, 125, 136, 140, 147, 151, 154, 167, 170, 171, 172, 183, 184  
 control condition, 151  
 conviction, 64  
 coordination, 5, 6, 15, 16, 19, 20, 26, 27, 28, 76, 77, 102, 143, 156, 173, 185  
 cost-effective, 74, 135  
 costs, 4, 9, 12, 13, 22, 67, 85, 120, 173  
 Court of Appeals, 7  
 courts, 8  
 coverage, 134, 144  
 covering, 13

credibility, 67  
 credit, 123  
 criticism, 169, 183  
 CRS, 167, 181  
 crystalline, 126  
 CSR, 129  
 culture, 123, 137, 165, 166  
 current limit, 183  
 customers, 136  
 cycles, 154

## D

danger, 64, 74, 112, 130, 140  
 data analysis, 32  
 data collection, 32, 100  
 data communication, 87, 144  
 database, 4, 15, 32, 149, 156, 161  
 death, 17, 64, 122, 126, 144, 154, 159, 170, 183  
 deaths, 167, 169, 175, 183  
 debt, 149  
 decision makers, 18  
 decision making, 18, 19  
 decision-making process, 12  
 decisions, 3, 7, 25, 26, 29, 63, 67, 79, 97, 111  
 deficiency, 98  
 degradation, 135  
 delivery, 85, 136, 157, 165  
 demand, 2, 20, 85, 141  
 Department of Commerce, 176  
 Department of Energy, 132  
 Department of Health and Human Services, 2, 7, 27, 70, 72, 95, 96, 110, 131, 160, 170, 177, 178, 186  
 Department of Interior, 7, 66  
 Department of the Interior, 140, 177  
 desire, 18, 118  
 detection, 124  
 diesel, 151, 171, 184  
 diesel engines, 171, 184  
 diffusion, 131, 133, 137  
 digitization, 183  
 directives, 148  
 disability, 170, 183  
 disabled, 183  
 disaster, 20, 117, 118, 119, 122, 126, 127, 135, 167, 173  
 discrimination, 130  
 diseases, 2, 17, 170, 183  
 dispatcher, 80, 81, 83, 113  
 disputes, 172, 184  
 distribution, 96, 125  
 divergence, 67

division, 19, 80, 81, 86, 140, 144, 151  
 donations, 175  
 doors, 85  
 dosimetry, 172  
 draft, 5, 25, 27, 66, 72, 95, 96, 186  
 dust, vii, 5, 7, 18, 19, 90, 125, 126, 136, 154, 167, 169, 170, 171, 172, 174, 178, 181, 182, 183, 184, 185, 186  
 duties, 13

## E

earth, 86, 132, 134, 135, 136, 137  
 Education, v, 28, 29, 69, 96, 117, 118, 133, 140, 153, 163, 169, 172, 176, 178  
 electricity, 1  
 emergency management, 65  
 emergency preparedness, 9, 164, 184  
 emergency response, 12, 17, 70, 71, 72, 73, 74, 76, 77, 78, 79, 81, 82, 83, 85, 87, 88, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 113, 114, 115, 140, 142, 143, 155, 173, 174, 183  
 Emergency Supplemental Appropriations Act, 133, 160, 177, 178  
 employees, 13, 20, 30, 65, 139, 147, 154, 165, 166, 171, 172, 173, 185  
 employment, 129, 168, 169, 182  
 empowered, 185  
 energy, 2, 135  
 engines, 171, 184  
 entrapment, 118, 144, 159  
 environment, 4, 11, 16, 19, 22, 96, 133, 134, 135, 143, 146, 158, 163  
 equipment, 2, 7, 12, 13, 17, 20, 70, 71, 76, 79, 82, 83, 85, 86, 89, 90, 91, 96, 113, 120, 147, 156, 164, 166, 169, 171, 176, 177, 182, 184  
 ERPs, 141, 142, 151, 156  
 estimating, 133  
 evacuation, 4, 6, 9, 10, 11, 32, 65, 76, 141, 155, 156, 157, 168, 171, 178  
 exercise, 121, 123, 146  
 expert, iv  
 expertise, 25, 133  
 explosions, 10, 134, 136, 145  
 explosives, 171, 184  
 exposure, 64, 112, 125, 151, 168, 171, 172, 174, 178  
 Exposure, 151, 178, 186  
 extraction, 174

**F**

failure, 21, 64, 89, 91, 122, 129, 134, 144, 154, 155, 158, 159, 171, 185  
 faith, 7, 23, 67, 120, 121  
 false alarms, 124  
 family, 129, 130, 143, 159, 162, 175, 185  
 family members, 129, 130, 143, 185  
 fatalities, 1, 159, 167, 168, 169, 170, 182, 183  
 fear, 9  
 February, 32, 78, 89, 91, 113, 114, 119, 122, 142, 146, 147, 151, 154, 156, 157, 168, 172, 178, 186  
 federal government, 2, 7, 62, 94, 111, 179  
 federal law, 70, 97  
 Federal Register, 18, 64, 65, 112, 139, 141, 145, 146, 155, 156, 160  
 feedback, 4, 15, 18, 27, 32, 65, 146  
 fees, 67  
 feet, 113, 125, 127, 128, 136, 142, 147, 157, 174  
 fiber, 86  
 financial resources, 18  
 fines, 64, 120, 129, 144, 149, 173, 185, 186  
 fire, vii, 16, 17, 65, 70, 74, 76, 87, 118, 124, 131, 141, 142, 156, 158, 160, 169, 171, 181, 183, 184  
 fire hazard, 158  
 fire-resistant, 141  
 fires, 10, 178  
 firms, 171, 184  
 flame, 76, 80, 83, 123, 124, 128, 155, 175  
 flammability, 123, 124  
 flexibility, 135  
 flooding, 74, 169, 182  
 focusing, 126, 142  
 food, 84, 90, 114  
 Freedom of Information Act, 172  
 funding, 12, 18, 63, 111, 126, 132, 136, 168, 186  
 funds, 19, 62, 111, 125, 133, 134

**G**

GAO, v, 1, 10, 17, 18, 22, 23, 24, 28, 31, 33, 62, 63, 66, 69, 76, 83, 90, 92, 96, 99, 102, 103, 111, 113, 114, 140  
 gas, 12, 64, 65, 74, 80, 112, 123, 124, 141, 155, 156, 169, 182  
 gases, 69, 70  
 gauge, 15  
 General Accounting Office, 125  
 generation, 129, 186  
 generators, 157

geology, 123  
 geothermal, 132  
 Global War on Terror, 133  
 gloves, 90  
 goals, 18, 163, 166  
 goggles, 11  
 good faith, 7, 23, 67, 120, 121  
 government, 2, 3, 6, 7, 62, 71, 94, 101, 111, 175, 176, 179  
 Government Accountability Office, 62, 63, 111, 112, 140  
 Government Accountability Office (GAO), 140  
 Government Performance and Results Act, 17, 18  
 GPRA, 18, 66  
 grants, 7, 17, 132, 146, 174, 176, 177  
 gravity, 5, 7, 21, 22, 23, 24, 25, 120, 121  
 groups, 19, 182  
 guidance, 15, 65, 70, 71, 72, 74, 77, 78, 79, 80, 84, 85, 87, 88, 89, 91, 93, 94, 95, 96, 97, 113, 114, 119, 131, 141, 142, 147, 156, 157, 159  
 guidelines, 4, 14, 67, 96, 132, 136, 142, 175

**H**

HA, 128  
 hands, 4, 9, 11, 151  
 hanging, 90  
 harm, 21, 137, 140  
 hazards, 6, 16, 17, 19, 64, 91, 112, 127, 147, 161, 164, 168  
 health, 2, 5, 6, 7, 8, 15, 16, 17, 18, 21, 23, 26, 64, 73, 74, 77, 91, 117, 118, 119, 120, 121, 122, 123, 125, 126, 127, 130, 132, 136, 139, 140, 144, 146, 148, 149, 153, 154, 158, 159, 160, 161, 162, 163, 168, 171, 174, 176, 177, 181  
 Health and Human Services, 2, 5, 7, 27, 28, 29, 59, 70, 72, 95, 96, 110, 131, 160, 169, 170, 174, 177, 178, 186  
 health care, 17  
 health problems, 136  
 hearing, 18, 117, 169, 172, 179, 186  
 hearing loss, 18  
 heat, 9, 65  
 helmets, 113  
 high-risk, 147  
 hiring, 140, 160, 173  
 House, v, 29, 69, 127, 133, 153, 168, 174, 176, 178, 179, 185  
 human, 18, 163, 186  
 human resources, 163, 186

**I**

id, 80  
 identification, 158  
 Illinois, vii, 173, 181  
 images, 83  
 impairments, 174  
 implementation, 26, 70, 72, 85, 86, 88, 94, 96,  
 97, 100, 101, 115, 133, 134, 139, 147, 148,  
 151, 174, 176, 177, 178  
 imprisonment, 64, 173, 185  
 inactive, 150  
 incentive, 149  
 inclusion, 177  
 indicators, 32, 114  
 industrial, 165  
 industry, 1, 3, 6, 7, 10, 12, 14, 16, 18, 19, 26, 28,  
 32, 70, 74, 77, 86, 112, 118, 120, 122, 126,  
 133, 146, 153, 163, 164, 165, 166, 167, 168,  
 169, 171, 174, 176, 177, 181, 182, 184  
 ineffectiveness, 124  
 infection, 9  
 information sharing, 5, 27  
 Information System, 1, 33, 150  
 information technology, 18  
 infrared, 125  
 infrastructure, 86, 87, 134, 135  
 injuries, 2, 17, 129, 140, 151, 165, 166, 167, 168,  
 169, 170, 175, 183  
 injury, iv, 17, 21, 22, 23, 24, 64, 66, 67, 140, 144,  
 153, 159, 165, 166, 167, 170, 183  
 innovation, 86  
 Innovation, 176  
 insertion, 9  
 inspection, 15, 23, 70, 88, 90, 92, 97, 114, 129,  
 140, 147, 148, 149, 151, 154, 159, 161, 175  
 inspections, 2, 8, 16, 21, 24, 70, 72, 73, 88, 92,  
 94, 119, 120, 124, 148, 149, 151, 154, 161,  
 171, 175, 177, 182, 184  
 Inspector General, 92, 114, 117, 118, 129, 140,  
 175, 185  
 inspectors, 6, 7, 8, 13, 15, 16, 17, 21, 24, 25, 29,  
 64, 67, 70, 72, 73, 88, 89, 92, 93, 94, 96, 100,  
 112, 118, 124, 125, 129, 140, 148, 149, 154,  
 160, 173, 175, 177, 178, 182, 184, 186  
 instruction, 13  
 instructors, 4, 6, 10, 14, 15, 26, 27  
 integration, 166  
 integrity, 63, 111, 164  
 internal controls, 94  
 internet, 129  
 interoperability, 134, 135  
 intervention, 120, 121

interview, 3, 65  
 interviews, 29, 151  
 intimidation, 118  
 inventories, 156  
 Investigations, 147, 153, 175, 179  
 investigative, 62, 111, 117, 119, 126, 175  
 Iraq, 133  
 isolation, 93

**J**

January, vii, 1, 3, 8, 25, 33, 65, 69, 71, 78, 82, 83,  
 85, 92, 100, 123, 124, 127, 131, 136, 142, 145,  
 160, 167, 168, 169, 171, 172, 174, 176, 178,  
 179, 181, 184  
 judge, 1, 25, 28, 113, 186  
 judges, 3, 5, 21, 29, 67  
 judgment, 25  
 jurisdiction, 75  
 justification, 172

**K**

Katrina, 133  
 Kentucky, vii, 3, 6, 13, 29, 70, 97, 154, 173, 178,  
 181

**L**

labor, 13, 16, 18, 19, 32, 133, 169, 186  
 language, 80, 93, 168, 174  
 large-scale, 169, 182  
 latency, 170, 183  
 law, vii, 1, 3, 5, 21, 25, 29, 64, 70, 71, 73, 79, 86,  
 113, 117, 118, 120, 121, 123, 127, 139, 140,  
 141, 154, 164, 167, 171, 173, 174, 177, 181,  
 186  
 laws, vii, 2, 3, 70, 97, 117, 118, 119, 122, 126,  
 149, 161, 181  
 lead, 22, 24, 26, 72, 76, 126  
 leadership, 18  
 leakage, 136  
 leaks, 87  
 learning, 4, 6, 15, 27, 119  
 legislation, 117, 127, 155, 172, 173, 176  
 legislative, 163, 168, 173, 181, 184  
 liberation, 123  
 life cycle, 17  
 life expectancy, 170, 183  
 life-threatening, 64, 146  
 likelihood, 5, 21, 22, 24  
 limitations, 10, 85, 86

litigation, 1, 5, 21, 25, 29, 67  
 LM, 63, 111  
 local area network, 87  
 local government, 6  
 location, 76, 79, 80, 82, 90, 113, 114, 141, 157,  
 169  
 long period, 89  
 long-term, 17, 75, 78, 79, 80, 81, 82, 84, 89, 90,  
 91, 113, 125, 126, 169, 171, 184  
 lung, 167, 170, 172, 183, 184

## M

machinery, 169, 182  
 machines, 11, 81  
 magnetic, iv  
 maintenance, 13, 72, 89, 90, 91, 95, 102, 103,  
 113, 114, 145, 151, 156, 171  
 management, 18, 65, 119, 120, 148, 150, 151,  
 164, 165, 166, 169  
 mandates, 125, 126, 132, 133, 164, 172  
 manpower, 164  
 manufacturer, 3, 16, 29, 86, 133, 146  
 manufacturing, 85, 184  
 market, 16, 136  
 marketing, 71  
 Maryland, 159  
 maximum penalty, 144, 158  
 measurement, 164  
 measures, vii, 15, 134, 169, 170, 174, 181, 182,  
 184, 185  
 media, 143, 165  
 memorandum of understanding, 5, 6, 15, 16, 27,  
 28, 65, 77  
 men, 1, 69  
 mental health, 174  
 mesh networks, 86, 87  
 mesh node, 135  
 messages, 169  
 methane, 64, 74, 97, 112, 123, 128, 168, 169,  
 171, 178, 182, 183, 184, 186  
 military, 132  
 Millennium, 177, 186  
 milligrams, 172, 174, 184  
 minerals, 171, 182, 184  
 mines, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17,  
 18, 19, 20, 26, 29, 30, 31, 32, 33, 65, 70, 71,  
 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83,  
 84, 85, 86, 87, 88, 89, 91, 92, 93, 94, 95, 97,  
 98, 100, 101, 102, 103, 112, 113, 114, 115,  
 120, 121, 124, 126, 127, 128, 131, 133, 134,  
 135, 142, 145, 146, 147, 148, 149, 150, 151,  
 154, 156, 158, 161, 165, 167, 168, 169, 171,

172, 173, 175, 176, 177, 178, 179, 182, 184,  
 185, 186  
 mining, vii, 1, 6, 7, 10, 13, 14, 15, 16, 17, 18, 19,  
 26, 28, 29, 65, 71, 73, 74, 76, 78, 79, 87, 90,  
 96, 97, 112, 118, 119, 123, 124, 125, 126, 128,  
 130, 131, 132, 135, 136, 140, 146, 147, 148,  
 149, 153, 154, 157, 158, 160, 161, 162, 164,  
 165, 166, 167, 168, 169, 170, 171, 172, 174,  
 176, 177, 178, 179, 181, 182, 183  
 missions, 18  
 Mississippi, 6  
 Mississippi River, 6  
 misunderstanding, 18  
 modeling, 145, 147  
 models, 134, 136  
 modules, 16, 146  
 money, 63, 88, 111  
 moratorium, 159  
 morning, 131  
 MOU, 140  
 mouth, 134  
 MS, 128

## N

NASA, 132  
 nation, vii, 1, 6, 22, 26, 69, 117, 119, 120, 124,  
 126, 130, 139, 146, 153, 158, 164, 168, 169,  
 181  
*national*, 6, 147, 149  
 National Academy of Sciences, 18, 174, 175  
 National Institute for Occupational Safety and  
 Health, 1, 2, 69, 70, 97, 124, 131, 145, 158,  
 164, 168, 172, 177, 178  
 National Institute of Standards and Technology,  
 176  
 National Institute of Standards and Technology  
 (NIST), 176  
 negligence, 5, 21, 22, 23, 24, 25, 121, 122, 140,  
 144  
 negotiating, 25, 80  
 network, 86, 87, 137, 144  
 New York, iii, iv  
 next generation, 133, 176  
 NIST, 176  
 NO, 144  
 nodes, 87, 135, 137  
 noise, 18, 171, 184  
 normal, 154, 166



**O**

objective criteria, 161  
 obligation, 165  
 occupational, 16, 17, 125  
 Office of Management and Budget, 176  
 Offices of Congressional Relations and Public Affairs, 96  
 OMB, 176  
 operator, 5, 7, 8, 11, 21, 22, 23, 25, 33, 64, 66, 67, 73, 76, 82, 88, 90, 93, 113, 118, 119, 120, 121, 122, 126, 128, 130, 141, 143, 149, 150, 154, 161, 168, 169, 178, 182  
 Operators, 8, 12, 65, 80, 97, 121, 128, 142  
 opposition, 5, 21, 176  
 organization, 18, 165, 166  
 organizations, 27, 32, 65, 123, 146  
 oversight, 2, 4, 6, 14, 27, 63, 72, 88, 94, 95, 96, 111, 117, 118, 119, 148, 150, 151, 168  
 overtime, 148, 173  
 oxygen, vii, 64, 80, 81, 85, 89, 128, 131, 133, 136, 157, 167, 173, 181, 185  
 Oxygen, 133

**P**

particulate matter, 151  
 partnership, 19, 177  
 partnerships, 17, 19, 166  
 peer, 32, 66, 94, 135  
 peer review, 94  
 penalties, vii, 2, 3, 5, 6, 7, 8, 16, 17, 21, 23, 24, 26, 27, 28, 33, 66, 67, 74, 93, 95, 101, 120, 130, 140, 144, 148, 149, 154, 155, 158, 159, 161, 168, 171, 173, 175, 177, 181, 182, 184, 185  
 penalty, 3, 5, 6, 7, 8, 21, 22, 23, 24, 25, 26, 27, 28, 33, 64, 66, 67, 72, 73, 93, 97, 119, 120, 121, 122, 140, 143, 144, 149, 150, 154, 155, 158, 159, 173, 175, 184, 185  
 Penn State University, 146  
 Pennsylvania, 3, 6, 13, 29, 65, 73, 160, 169, 182  
 performance, 18, 62, 111, 131, 134, 142, 149, 165, 166, 168, 172, 184  
 permit, 15, 87, 120, 121, 124, 175  
 personal, 18, 19, 147, 172, 174, 184  
 phone, 86, 129, 143  
 planned investment, 164  
 planning, 5, 15, 17, 18, 65, 72, 125, 140, 165  
 pneumoconiosis, 167, 170, 183  
 point-to-point, 136  
 poisonous, 69, 134, 169, 182

police, 119, 126  
 policymakers, 168  
 poor, 141, 149  
 population, 3, 30, 31, 33, 65, 112  
 population size, 31  
 positive feedback, 146  
 power, 121, 122, 134, 135  
 prejudice, 176  
 preparedness, 71, 79, 185  
 president, 163  
 pressure, 121, 122, 123, 124, 126, 157, 173, 185  
 prevention, 136, 164, 165, 166, 171  
 preventive, 170  
 prior knowledge, 118  
 priorities, 66, 151, 166  
 private, 168, 175, 182  
 private sector, 168, 175  
 proactive, 120  
 probability, 30  
 production, 2, 26, 64, 85, 112, 119, 122, 129, 133, 136, 154, 164  
 productivity, 2, 13, 169, 182  
 professions, 6  
 profit, 118  
 program, 16, 18, 25, 28, 65, 73, 76, 118, 119, 132, 133, 136, 146, 147, 148, 154, 160, 161, 166, 172, 175, 176, 183  
 propagation, 87, 135  
 property, iv, 165  
 protection, 66, 85, 94, 120, 121, 126, 127, 134, 142, 157, 163, 164, 171, 184  
 protocol, 65, 87, 119, 165  
 protocols, 165  
 prototype, 135  
 public, 18, 28, 62, 65, 111, 130, 166, 176, 185, 186  
 public funds, 62, 111  
 public policy, 166

**Q**

qualifications, 4, 14, 143  
 quality research, 133  
 questionnaire, 32  
 questionnaires, 3, 32

**R**

R&D, 154  
 radio, 113, 135, 158  
 rail, 87  
 random, 3, 30, 32, 33, 128

range, 21, 86, 132, 135, 136, 158, 171, 184  
 reading, 7  
 real terms, 120  
 real time, 19  
 reality, 26, 122  
 recovery, 17, 136, 175  
 Red Cross, 143, 159  
 reduction, 5, 6, 23, 24, 25, 28, 67, 137, 174, 182  
 redundancy, 134  
 reforms, 6, 26, 74, 140, 151  
 refuge, 20, 70, 71, 76, 80, 81, 84, 85, 97, 100,  
 114, 132, 133, 136, 141, 145, 146, 160, 169,  
 175, 183  
 regional, 29  
 regular, 13, 17, 18, 64, 66, 70, 88, 124, 148  
 regulation, 6, 18, 93, 119, 120, 121, 154, 161,  
 171, 172, 177, 184  
 regulations, vii, 2, 3, 5, 6, 8, 9, 12, 13, 14, 17, 18,  
 19, 21, 22, 23, 29, 32, 64, 66, 67, 70, 72, 93,  
 95, 96, 97, 112, 114, 117, 118, 119, 123, 126,  
 128, 130, 140, 143, 146, 150, 158, 161, 167,  
 169, 170, 171, 172, 173, 175, 176, 181, 184,  
 186  
 regulators, 164  
 rehabilitation, 174, 176  
 relationships, 5, 19, 20  
 reliability, 33, 63, 70, 76, 98, 100, 101, 111  
 repair, 145, 159  
 research, 3, 5, 7, 16, 17, 18, 19, 20, 26, 29, 32,  
 65, 66, 70, 76, 77, 86, 97, 112, 114, 132, 133,  
 136, 145, 160, 166, 172, 176, 178, 186  
 research and development, 7, 20, 97  
 researchers, 16, 20, 29, 86, 136, 147, 177, 186  
 reserves, 74, 171  
 resistance, 9, 65, 130, 173, 185  
 resolution, 66  
 resources, 6, 11, 15, 16, 18, 28, 92, 125, 133,  
 142, 149, 163, 166, 185, 186  
 respiratory, 126  
 responsibilities, 2, 7, 16, 18, 20, 62, 82, 111, 119,  
 158, 175  
 retirement, 20, 125  
 retirement age, 125  
 returns, 163, 166  
 RFID, 158  
 risk, 147, 163, 164, 165, 166, 175, 178  
 risk assessment, 163, 164, 165  
 risk management, 165  
 risks, 74, 118, 169, 174  
 roadmap, 134  
 role playing, 65

<b>S</b>
----------

SA, 133  
 safety, vii, 2, 5, 6, 7, 8, 9, 11, 12, 13, 15, 16, 17,  
 18, 19, 20, 21, 23, 26, 27, 29, 32, 33, 64, 65,  
 66, 69, 70, 72, 73, 74, 76, 79, 85, 86, 91, 92,  
 94, 96, 97, 114, 117, 118, 119, 120, 121, 122,  
 123, 125, 126, 127, 128, 130, 131, 132, 133,  
 135, 136, 139, 140, 144, 145, 146, 147, 148,  
 149, 151, 153, 154, 155, 158, 159, 160, 161,  
 162, 163, 164, 165, 166, 167, 168, 169, 171,  
 172, 173, 174, 175, 176, 177, 178, 181, 182,  
 183, 185, 186  
 sample, 3, 30, 31, 32, 33, 64, 70, 95, 98, 101,  
 112, 113, 174  
 sampling, 33, 64, 124, 128, 145, 151, 159  
 sampling error, 33, 64  
 sanctions, 67, 121  
 satellite, 144  
 scholarships, 186  
 scientists, 5, 16, 20  
 seals, 124, 127, 132, 144, 145, 159, 161, 164  
 Self, 75, 85, 102, 141, 154, 155  
 Senate, v, 7, 28, 29, 85, 117, 129, 130, 133, 139,  
 140, 163, 169, 172, 176, 178, 185, 186  
 sensation, 65  
 sensations, 9  
 sensors, 124  
 series, 165  
 services, iv, 4, 13, 165, 174  
 settlements, 25, 66  
 severity, 21, 121, 144, 159  
 shares, 2, 31  
 sharing, 5, 27  
 sign, 176  
 signals, 86, 87, 113, 137  
 silica, 126, 172, 174  
 silica dust, 172, 174  
 silicosis, 172, 184  
 singular, 164  
 SIS, 33, 150  
 sites, 142, 148, 157, 160, 177  
 skills, 4, 14, 15, 27, 65  
 smoke, 11, 124, 143  
 software, 124, 147  
 specificity, 71, 77, 79, 174, 178  
 speed, 20, 26, 173  
 sponsor, 165  
 stability, 147  
 staffing, 18, 114, 140  
 stages, 162  
 stakeholder, 12  
 stakeholders, 3, 6, 12, 17, 18, 79, 135, 136, 176

- standard operating procedures, 5, 19
- standards, vii, 2, 3, 4, 5, 6, 8, 14, 16, 17, 18, 19, 23, 71, 73, 76, 77, 94, 95, 101, 114, 120, 126, 144, 149, 150, 159, 161, 167, 169, 170, 171, 172, 173, 176, 177, 181, 182, 184, 186
- Standards, 8, 114, 172, 178, 186
- state legislatures, vii, 181
- statistical analysis, 62, 111
- statutes, 29
- statutory, 5, 7, 21, 22, 25, 26, 66, 71, 93, 96, 161
- statutory provisions, 96
- storage, 90, 126, 141, 151, 155, 156, 171
- strategic, 5, 15, 17, 18, 66
- strategic planning, 5, 15, 17, 18
- strategies, 17, 18, 164
- strength, 145, 159, 185
- strikes, 175
- structural changes, 165, 182
- subjective, 21, 26
- substance abuse, 174, 176
- substances, 64, 112, 174
- suffering, 174
- summer, 78, 91, 133, 146
- supervision, 119
- supervisor, 147
- supervisors, 118, 140, 148, 149
- supplemental, 6, 19, 76, 131, 134, 136, 160, 186
- supplements, 174
- supply, 64, 131, 133, 136, 155, 166, 185
- support staff, 124
- surrogates, 118
- survivability, 76, 133, 134, 135, 163
- survival, 84, 85, 94, 95, 126
- surviving, 118
- switching, 9, 76
- syntax, 32
- systems, 7, 18, 19, 70, 71, 72, 76, 82, 83, 85, 86, 87, 95, 96, 113, 124, 125, 127, 130, 134, 135, 142, 155, 157, 158, 164, 166, 167, 169, 172, 175, 176, 177, 182, 133, 134, 136, 142, 146, 158, 161, 164, 165, 166, 172, 176, 184
- technology transfer, 165
- telecommunications, 86
- telephone, 32, 81, 90, 143
- testimony, 63, 111, 123, 125, 126, 127, 179
- text messaging, 86
- third party, 146
- threatening, 146
- time, 2, 8, 10, 13, 18, 19, 20, 26, 30, 32, 64, 65, 66, 71, 73, 76, 77, 79, 80, 81, 83, 85, 87, 89, 90, 92, 94, 96, 97, 100, 115, 119, 127, 128, 129, 130, 142, 148, 150, 154, 167, 168, 169, 172, 173, 174, 175, 176, 177, 179, 182, 183, 184
- time frame, 8, 19, 20, 73, 76, 79, 92, 100, 173
- title, 159
- toxic, 64, 112, 156
- toxic gases, 156
- tracking, vii, 28, 70, 72, 76, 79, 80, 81, 82, 83, 86, 87, 89, 90, 94, 97, 98, 102, 103, 125, 131, 132, 136, 142, 148, 155, 156, 157, 158, 164, 167, 169, 172, 173, 175, 176, 177, 179, 181, 183, 184, 185
- trainees, 6, 125
- training, 2, 3, 4, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 26, 27, 32, 64, 65, 66, 83, 103, 125, 133, 136, 140, 141, 142, 143, 145, 146, 147, 148, 151, 154, 155, 156, 158, 159, 160, 161, 164, 171, 172, 173, 178, 184, 186
- training programs, 2, 14
- transfer, 65, 132, 141, 165
- transparency, 5, 6, 27, 28
- transparent, 21, 26, 119
- travel, 13, 128, 141, 148, 173
- travel time, 13
- Treasury, 175
- trend, 1, 74, 182
- trial, 25
- trucking, 182
- turnover, 20
- two-way, 19, 66, 76, 85, 86, 87, 125, 132, 134, 137, 142, 172, 177

## T

- tactics, 118
- tanks, 85
- targets, 171
- teaching, 14
- teaching experience, 14
- team members, 3, 6, 13, 29, 143, 172, 175
- technical assistance, 16, 17
- technological change, 26
- technology, 2, 3, 7, 16, 18, 19, 20, 26, 29, 65, 75, 76, 85, 86, 87, 94, 95, 96, 97, 127, 129, 132,

## U

- UHF, 135
- uniform, 88, 114, 140, 148
- unions, 13, 16, 18, 19, 177
- United States, v, 3, 6, 29, 33, 69, 70, 73, 97, 117, 139, 163
- universities, 29
- Utah, 136, 160, 168, 169

**V**

values, 3, 21, 33, 63, 65, 111  
variability, 32  
variation, 182  
ventilation, 7, 114, 125, 129, 136, 143, 145, 154,  
171, 175, 178, 184  
Vice President, v, 163  
victims, 177, 183  
voice, 86, 87, 132, 134, 135, 144  
voids, 178, 183

**W**

War on Terror, 133  
*Washington Post*, 178, 186  
water, 65, 80, 84, 90, 114, 169, 182  
weakness, 170, 183  
wear, 19  
winning, 25

wireless, 66, 70, 71, 72, 76, 82, 85, 86, 87, 94,  
95, 96, 125, 134, 137, 142, 157, 158, 172, 177  
wireless systems, 71, 86, 87, 134, 172  
wireless technology, 82, 87, 125  
wires, 87  
withdrawal, 64, 73, 123, 130, 145, 149, 161, 175,  
185  
wood, 124  
workers, 1, 2, 4, 6, 9, 10, 11, 13, 15, 18, 19, 26,  
27, 29, 31, 65, 73, 74, 118, 133, 167, 168, 169,  
170, 171, 178, 182, 183, 184, 186  
workforce, 20, 66, 171  
working conditions, 2, 74, 149, 168  
workplace, 17, 164  
WP, 167, 170, 183  
writing, 80, 128

**X**

x-rays, 170, 183