



# Technology News

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## NIOSH Develops New Mine Refuge Chamber Training

### Objective

The objective is to provide effective training on refuge chambers for underground coal miners. This training will increase knowledge about how to teach miners to operate, transport, and inspect a refuge chamber; what to expect psychologically and physiologically inside a refuge chamber; and how to decide when to use a refuge chamber.

### Background

During 2006–2007, several disasters occurred at U.S. underground coal mines, resulting in 28 fatalities. These disasters led to new approaches to mine safety and health, as well as new federal regulations. One new technology mandated by federal legislation is the refuge chamber. Refuge chambers are movable shelters that are either made of steel or inflate from a steel skid as a tent. They can potentially save the lives of miners during an underground mine emergency by providing breathable air, food, water, and a safe environment for up to 96 hours. Because the refuge chamber is a new technology, recommendations, information, and training products are greatly needed.

### Approach

A multidisciplinary team at the National Institute for Occupational Safety and Health (NIOSH) has created three products about refuge chambers for underground coal mines. Extensive research was conducted for these products consisting of literature

reviews, meetings with Mine Safety and Health Administration employees, engineering tests of refuge chambers, and interviews with stakeholders, including mine operators and miners.

#### To Deploy Chamber:

1. Deploy unit
2. Purge
3. Activate oxygen
4. Activate scrubber

Figure 1.—An example quick start guide from “Guidelines for Instructional Materials on Refuge Chamber Setup, Use, and Maintenance.”

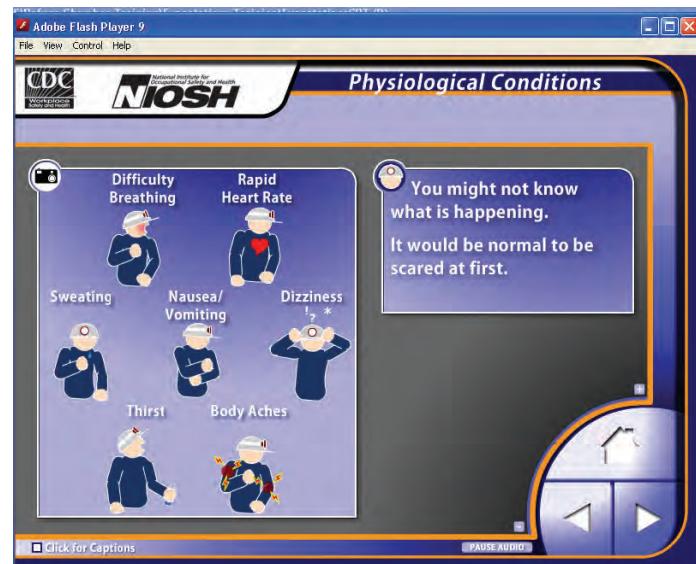


Figure 2.—Example of a screen in “Refuge Chamber Expectations Training.”



DEPARTMENT OF HEALTH AND HUMAN SERVICES

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One product to emerge from this work is a NIOSH Information Circular entitled “**Guidelines for Instructional Materials on Refuge Chamber Setup, Use, and Maintenance**” (NIOSH Publication No. 2009–148). Intended for mine trainers, refuge chamber manufacturers, and mine operators, this product offers suggestions for the preparation, maintenance, and movement of refuge chambers. As instructions for the operation of a refuge chamber can be complicated, this product also provides recommendations on ways to teach miners how to operate the chamber. One recommendation is to provide miners with a shortened version of the operation, or quick start guide, to help jog their memory. Sample quick start guides (Figure 1) are included.

Another product developed by NIOSH is “**Refuge Chamber Expectations Training**” (NIOSH Publication No. 2010–100). This multimedia training informs miners about what to expect psychologically and physiologically if they use a refuge chamber. In addition to a computer training program, there is an instructor’s guide and lesson plans for mine trainers.

Photos, videos, audio, and interviews with miners who used a refuge chamber in response to a mine fire in Canada have also been incorporated into the training package. Physiological effects, such as difficulty breathing and sleeping, rapid heart rate, sweating, nausea/vomiting, dizziness, thirst, and body aches may be experienced by miners while they are enclosed in the refuge chamber (Figure 2). Providing the miners with information on what they may encounter when using the refuge chamber will help them to be better prepared in the event of an emergency requiring the actual use of the refuge chamber.

NIOSH has also created decision-making training for refuge chambers. “**Harry’s Hard Choices**” (NIOSH Publication No. 2009–122) is a paper-and-pencil training simulation designed to help miners make decisions about when to use a refuge chamber. The training exercise is an interactive story that profiles Harry Hamilton, a section foreman on a long-wall setup section who must decide what course of action to take when he discovers there is a mine fire (Figure 3). As the story evolves, Harry must make a series of choices about how to increase the crew’s chances for survival. The scenario is taken in part from real-life mine emergencies.

## Results

All three training products were field tested and received positive evaluations. These products are a valuable resource for mine trainers, mine operators, and refuge chamber manufacturers to be used during initial refuge chamber training as well as annual refresher training.

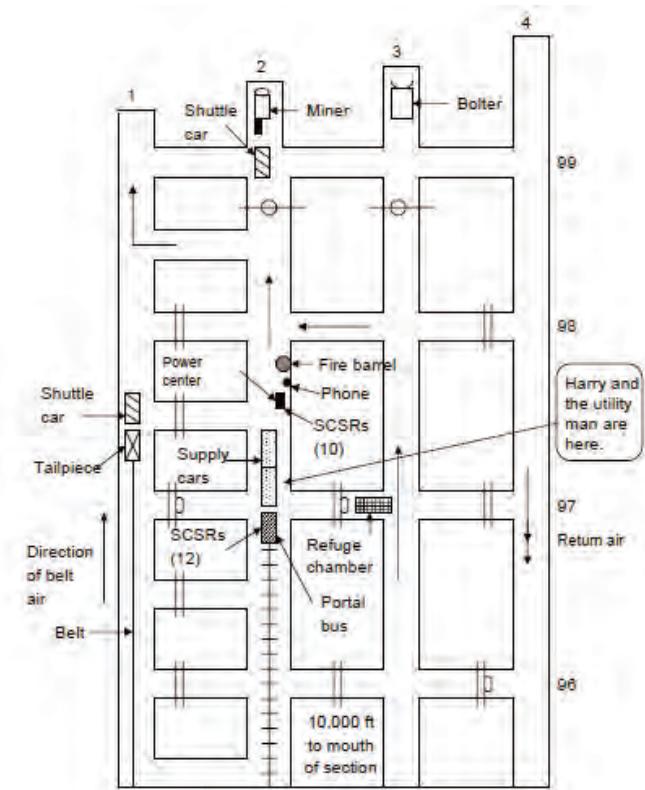


Figure 3.—Mine map used in “Harry’s Hard Choices.”

## For More Information

These publications may be downloaded from the NIOSH Mining Web site at: <http://www.cdc.gov/niosh/mining/>. Hard copies can also be ordered by calling 1-800-CDC-INFO.

For more information on these refuge chamber products, contact Katherine A. Margolis, Ph.D. (412-386-4627, [KMargolis@cdc.gov](mailto:KMargolis@cdc.gov)), or the Health Communications Coordinator ([OMSHR@cdc.gov](mailto:OMSHR@cdc.gov)), NIOSH Office of Mine Safety and Health Research, P.O. Box 18070, Pittsburgh, PA 15236-0070.

To receive NIOSH documents or for more information about occupational safety and health topics, contact: **1-800-CDC-INFO** (1-800-232-4636), **1-888-232-6348 (TTY)**, e-mail: [cdcinfo@cdc.gov](mailto:cdcinfo@cdc.gov), or visit the NIOSH Web site at <http://www.cdc.gov/niosh>

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