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# Innovative Hazard Recognition Training for Underground Limestone Miners

## Objective

To develop and test a training program that enhances the hazard recognition skills of underground limestone miners. This program can help job performance and lead to enhanced safety in the underground workplace.

## Background

The National Institute for Occupational Safety and Health (NIOSH), Pittsburgh Research Laboratory, has developed the *Hazard Recognition Training Program for Underground Limestone* (figure 1) to teach miners to recognize visual cues that distinguish poor ground conditions. This prototype training module is believed to be the first of its kind for this segment of the U.S. mining industry.

The impetus behind this effort was to test the hypothesis that worker safety, in all segments of the mining industry, can be improved if individual hazard recognition skills are enhanced. Earlier studies have shown that the ability of coal miners to recognize hazards in their work environment was significantly improved through the "degraded" method of training.

The degraded-image concept was originally developed and used for military target detection training. Military research has shown


**Figure 1.—Materials for the NIOSH-developed Hazard Recognition Training Program for Underground Limestone include four 3-D slide reels, an instructor's guide, and a slide viewer. (Photo by John J. Haggerty, NIOSH Pittsburgh Research Laboratory.)**

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that pilots who were trained with less than ideal, or degraded, pictures were more successful in subsequent identification of targets than those trained using ideal (or "highlighted") pictures of targets. Degraded images are scenes in which the subjects are partially hidden from view, observed from an eccentric angle, viewed through haze or dust, inadequately illuminated, or otherwise obstructed so as to camouflage the target. This new training program combines the degraded method with three-dimensional (3-D) slides.

## Approach

The program consists of four 3-D slide reels (each reel contains seven 3-D slides for a total of 28 scenes), a set of instructor's notes, attachments for making overhead transparencies, a true/false review exercise, and trainee handouts of the specific information covered. In the primary instructional segment of the module, the 3-D slides and instructor's notes are coordinated into an interactive exercise in which common roof, rib, and floor hazards are depicted in the slides and the visual cues associated with these hazards are discussed. The instructor and class "travel" through an underground limestone mine as they view 3-D slides of roof and rib conditions. The instructor leads participants in discussions as they consider the key points depicted in each slide. The slide reels depict examples of the following ground control concepts: loose rock in the roadway, reduced visibility, scaling tracks, pillar integrity, slips/fractures in the roof/rib, different vantage points, sand channels/clay veins, and basic physics of roof falls. The instructor's notes contain directions for using the materials and a bounty of subject information on the content of the slides. The time required to complete the exercise is about 1 hr.

## Results

The face validity, content validity, and split reliability of the instrument used to assess trainees' understanding of concepts in the training module were measured in field tests. It was concluded that the assessment instrument exhibits reasonably high levels of validity and reliability. The subjects also indicated a high degree of satisfaction with the training program.

## For More Information

The *Hazard Recognition Training Program for Underground Limestone* can be purchased from the Mine Safety and Health Administration, National Mine Health and Safety Academy, Attention: Office of Academy Services, P.O. Box 1166, Beckley, WV 25802-1166 (phone: (304) 256-3257, fax: (304) 256-3368). The cost is $4.00 for each 3-D slide set (you'll need one set per student) and $1.00 for the instructor's guide. You'll also need a slide viewer for each student, which can be purchased inexpensively at most toy stores. Because all materials are reusable, these are one-time expenses.

For more information on this innovative training module, contact Kathleen M. Kowalski, Ph.D., NIOSH Pittsburgh Research Laboratory, Cochrans Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070, phone: (412) 892-4021, fax: (412) 892-6678, e-mail: **kek2@cdc.gov**

To receive additional information about mining issues or other occupational safety and health problems, call **1-800-35-NIOSH (1-800-356-4674)**, or visit the NIOSH Home Page on the World Wide Web at http://www.cdc.gov/niosh

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