NIOSH Releases New AHSEM and ARBS Software Programs To Improve Ground Control

Analysis of Horizontal Stress Effects in Mining (AHSEM)

It is now widely accepted that horizontal stress is present nearly everywhere underground. Often it is more severe than the vertical stress. It is a major cause of roof control problems in underground mines.

The AHSEM computer program contains two modules to improve mine layouts for control of horizontal stress. For development, the user specifies the orientations of the maximum horizontal stress, the entries, and the crosscuts. Angled crosscuts may be used, and the angles may be different for the right- and left-hand crosscuts. AHSEM then shows the user how the stress condition would vary as the entry and crosscut orientations are changed.

The second module is for longwall mining. Severe stress concentrations can make headgate conditions hazardous when the entries are improperly oriented. AHSEM shows whether a particular longwall orientation and extraction sequence places the headgate corner in a stress concentration or in stress relief. It also estimates the magnitude of the stress concentration.

Analysis of Roof Bolt Systems (ARBS)

Selecting the proper roof bolt system from the great variety of available bolt types and patterns can be confusing. ARBS is designed to help. The input parameters required by the program are simple and easy to obtain. They are the most important factors that determine the roof bolt performance, including the roof quality, the depth of cover, and the intersection span. Using this information, ARBS suggests preliminary design values for the—

- Intersection span;
- Bolt length;
- Bolt capacity; and
- Bolt pattern.

Figure 1.—Severe cutter roof caused by horizontal stress.

Using ARBS, a mine planner can rapidly assess the effect of changes to any of these on the overall performance of the roof bolt system.

ARBS is based on a NIOSH statistical study of roof falls throughout the United States. Case histories were collected from 37 mines with a variety of roof bolt types and patterns in a wide range of geologic environments. Roof bolt performance was measured in terms of the number of roof falls that occurred per 10,000 ft of drivage. The study found that roof falls are rare when the roof is strong and the stress is low, even with light roof bolting patterns. ARBS addresses the more difficult conditions, where the roof is weaker and/or the stress is higher. In addition to helping to select primary support patterns, ARBS can also show where supplemental support may be needed.

Both AHSEM and ARBS are simple to install and easy to use. They contain extensive Help files that provide more background on the research upon which they are based.

For More Information

To obtain free copies of AHSEM and ARBS, along with other NIOSH ground control software, contact Donna Opfer at (412) 386-6564, e-mail: **dopfer@cdc.gov**. Or you may complete the order form below, detach, and mail to: Donna Opfer, NIOSH Pittsburgh Research Laboratory, Cochrans Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070, or fax to (412) 386-6891.

The software packages are also available at the NIOSH Mining Website at **http://www.cdc.gov/niosh/mining/software.html**.
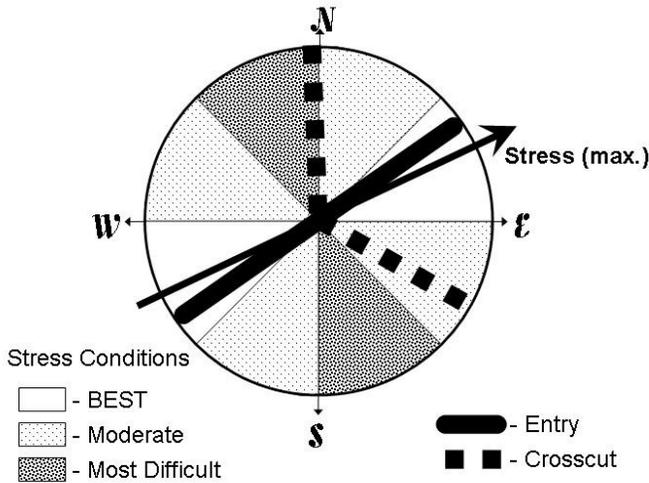
Figure 2.—Stress design diagram used in AHSEM.

Figure 3.—Installing a roof bolt in an underground coal mine.

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