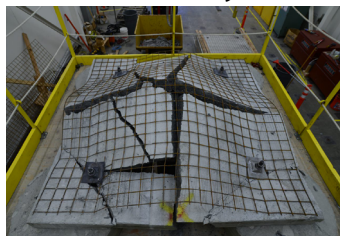


The **Spokane Mining Research Division (SMRD)** is part of the **National Institute for Occupational Safety and Health (NIOSH)**. SMRD works to eliminate mining fatalities, injuries, and illnesses across all mining sectors, focusing on mining in the western United States. SMRD partners with labor, mining associations, equipment manufacturers, mine operators, and other government agencies to study worker health and safety problems, and to develop products and interventions that offer solutions to workplace challenges.

SMRD conducts field research at various mine sites across the western United States, as well as laboratory research at the SMRD testing facilities.

### SMRD Support and Rock Properties Laboratory:

This laboratory is where various rock, cemented backfill samples, shotcrete, and ground support technologies are prepared, characterized, and tested. The laboratory has multiple test machines to simulate ground stresses to test a sample's strength characteristics. Shown here is a test to determine the strength and deformation characteristics of a combination of support types: bolts, steel mesh, and shotcrete.



### Health Studies Laboratories:

These laboratories include: 1) an environmental chamber where temperature and humidity can be varied to simulate mining conditions and tasks to study health effects such as heat stress, and 2) a new industrial hygiene laboratory for preparation and analysis of field samples to understand and characterize exposure to respiratory and other health hazards.



### Machine Safety Laboratory:

This laboratory is where machine safety issues related to maintenance, manual operation, automation, and situational awareness are studied and proposed solutions are tested to improve worker safety. A test conveyor

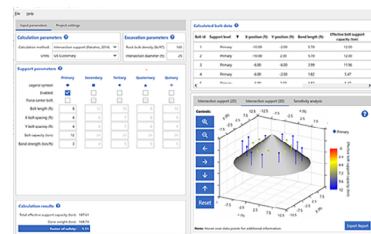
allows distributed sensors, automation, and mobile interfaces to be evaluated to improve worker awareness of machine status, maintenance activities, and proximity to hazardous areas.



## Technology & Product Highlights

### Ground Stability Software:

The Ground Support Factor of Safety Calculator software determines the deadweight factor of safety (FOS) for an underground mining excavation's ground support design based on user inputs and established methods. Both two-dimensional (2D) design and three-dimensional (3D cone) options are available for drift and intersection design. In addition to support design tools, NIOSH has developed new open-source software libraries to automate and improve analysis of seismic data related to the effect of mining on ground stability. This package, called ObsPlus, is available on Github.



### Heat Stress Fact Sheets:

This series of six fact sheets and poster offer practical information about working in hot mining conditions. They provide an overview on heat stress and focus on risk factors, acclimatization, hydration, work and rest schedules, and first aid. Miners can use these fact sheets to promote safe behavior while working in the heat.

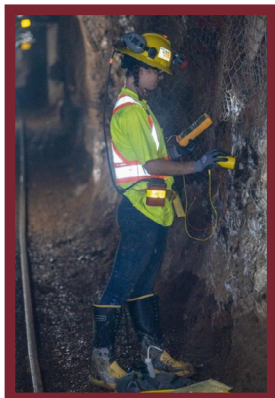


# Our Health and Safety Research Areas

Surface Mine Safety



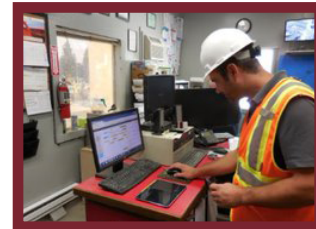
Ground Support Technologies



Mine Stability and Seismicity



Automation and Machine Safety



Miner Health



Exposure Science



## Centers and Programs

The **Miner Health Program** (MHP) was recently established as a long-term, systematic effort to understand and improve the health and well-being of all miners through focused integration of research, transfer of findings, evaluation, and community engagement. The MHP is part of the NIOSH Mining Program, whose mission is to eliminate mining fatalities, injuries, and illnesses through relevant research and impactful solutions.

## OUR STAFF

SMRD has 50 full time positions and has offices and labs in Spokane, Washington. Staff have experience in the following areas:

**Engineering:** General Engineers | Mining Engineers | Mechanical Engineers | Chemical Engineers | Electrical Engineers | Materials Engineers

**Physical Science:** Geophysicists | Physical Scientists

**Epidemiology and Surveillance:** Epidemiologists | Industrial Hygienists | Statisticians

**Human Factors and Workplace Health:** Behavioral Scientists | Medical Officers