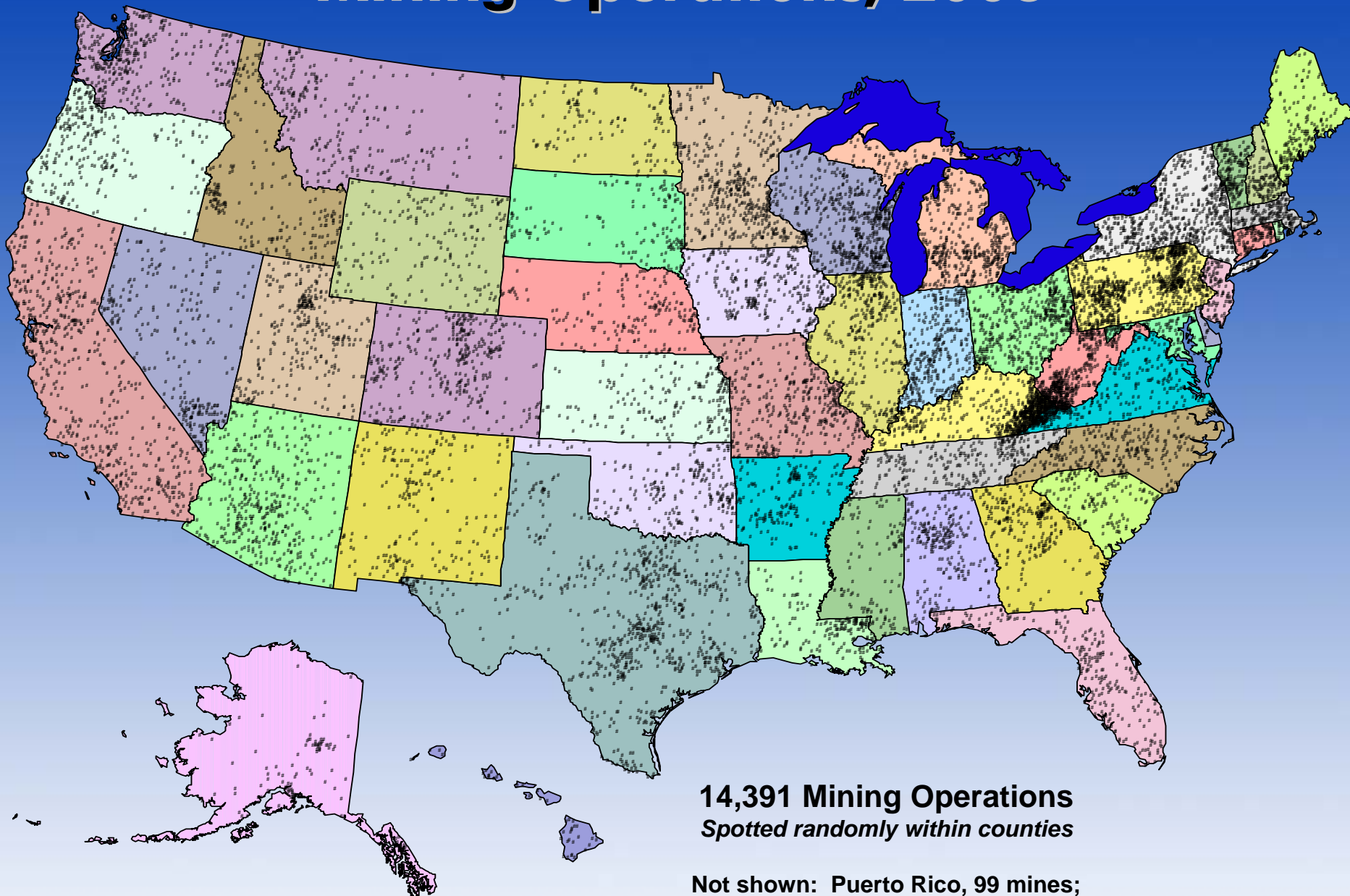




Improving Mineworker Health and Safety Through Research and Prevention



Mining Operations, 2003



14,391 Mining Operations
Spotted randomly within counties

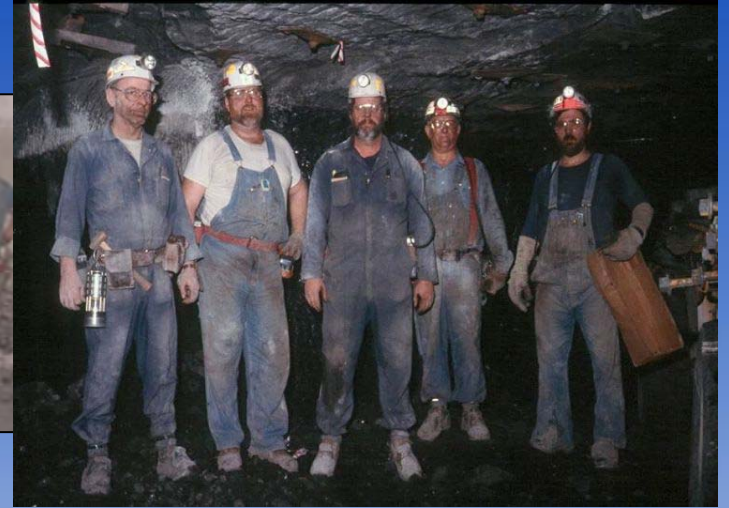
Not shown: Puerto Rico, 99 mines;
U.S. Virgin Islands, 3 mines

Data Source: MSHA

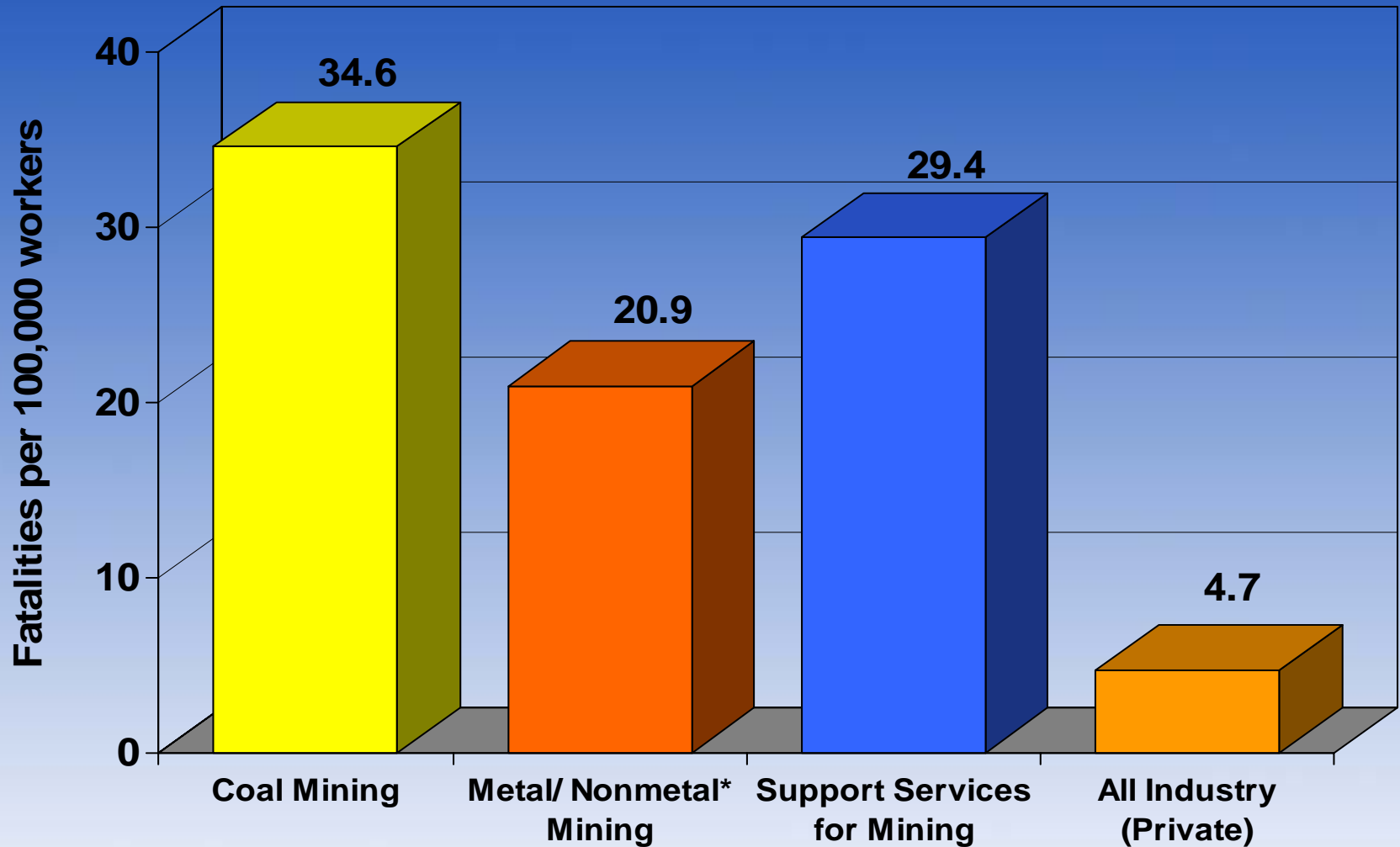
Mining in the United States

- A basic industry -- mined products are used in everything from computers to medicines to buildings
 - > 50% of electricity from coal-fired plants
 - > \$60 billion in mineral production
 - > \$415 billion in processed materials
- Economic impact distributed geographically
 - 300,000 miners
 - 3 million downstream jobs
 - \$1/2 to 1 trillion to the economy
- Strategic Value

Our Customers



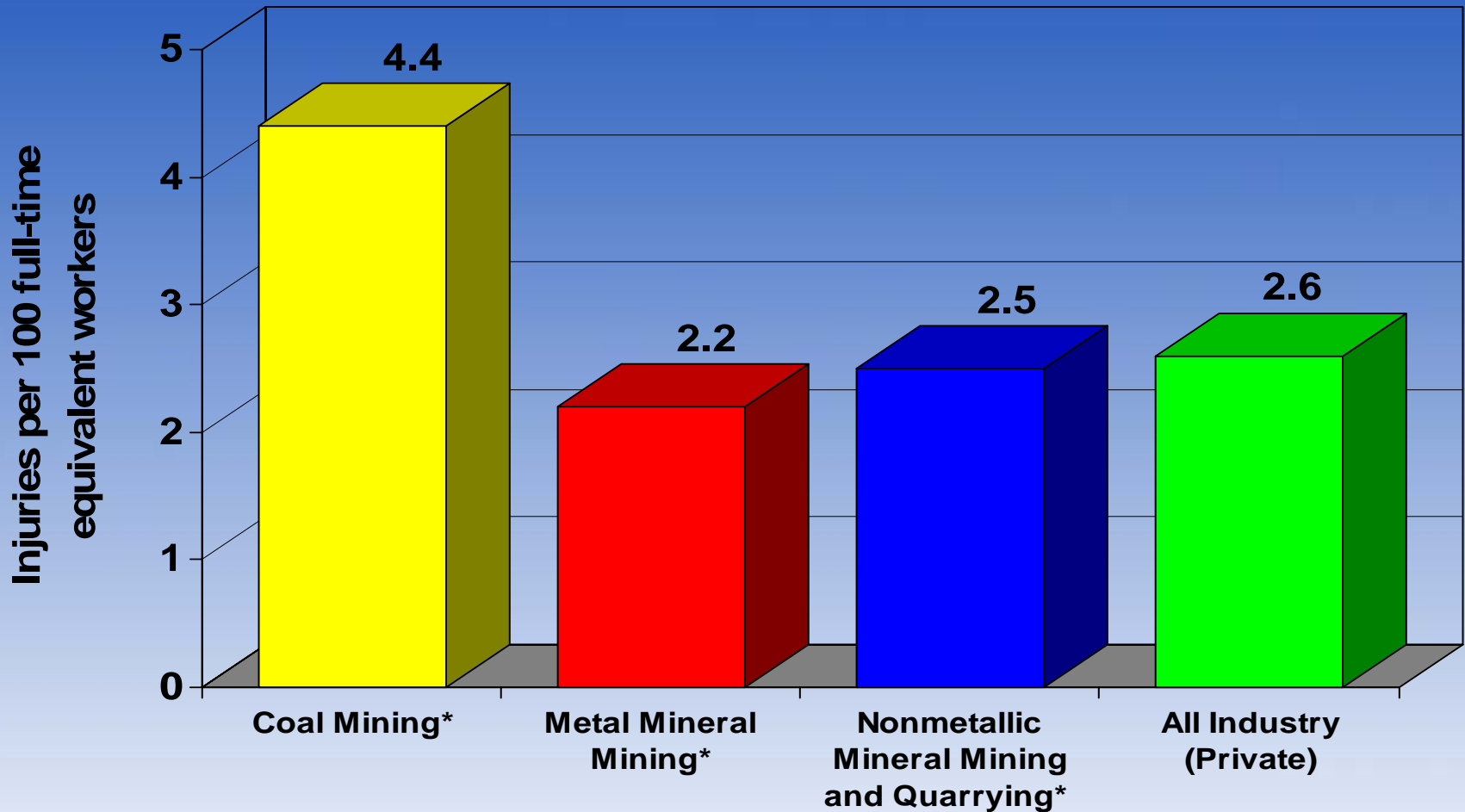
Fatality Rate in Mining Occupations and All Industry (Private), 2003



*Includes Metal, Nonmetal, Stone, and Sand and Gravel Mining

Data source: BLS, CFOI

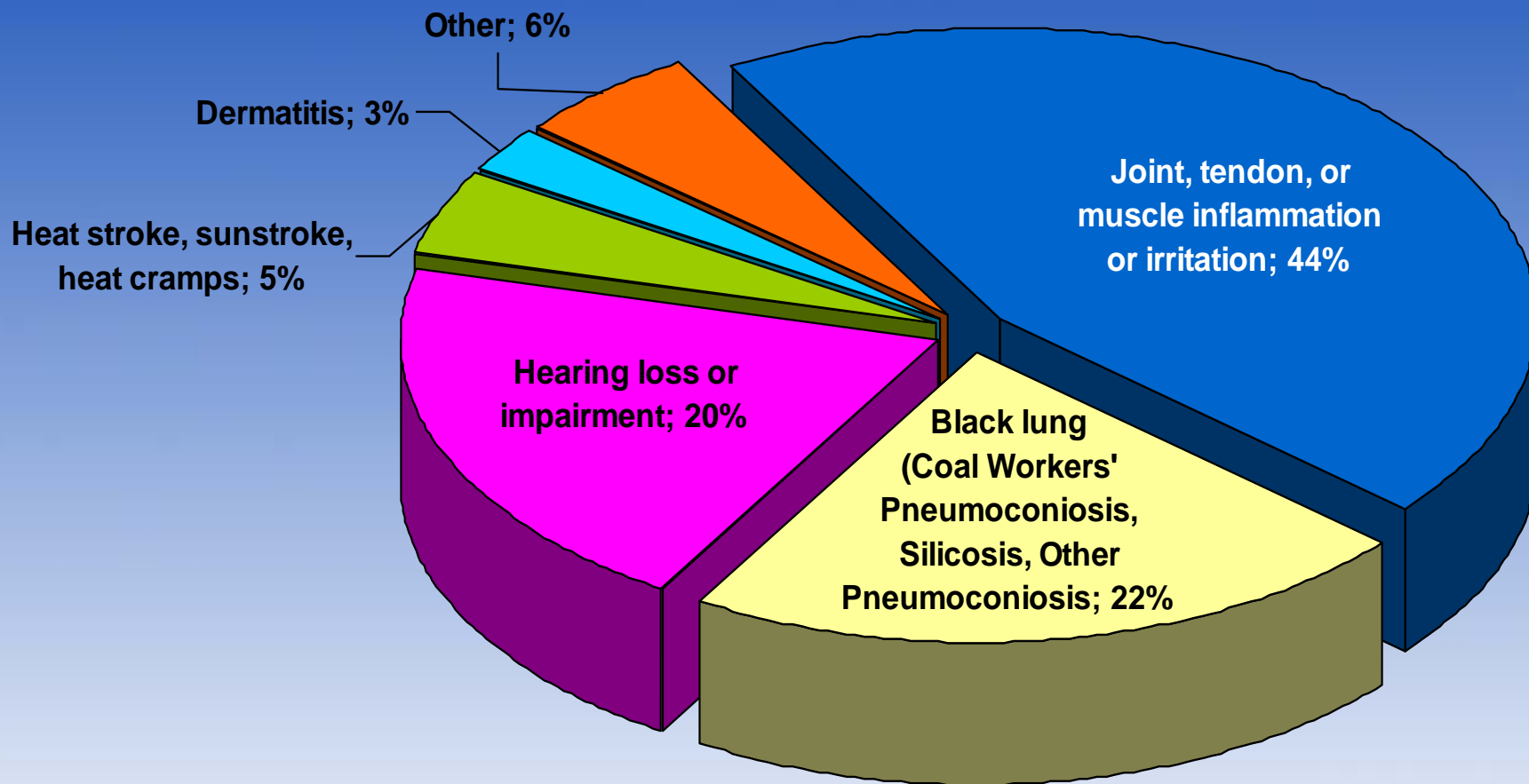
Nonfatal Lost-time Injury Rate in Coal Mining, Metal Mineral Mining, Nonmetallic Mineral Mining and Quarrying, and All Industry (Private), 2003



*Independent mining contractors are excluded

Data sources: MSHA; BLS

Distribution of Illnesses & Diseases Reported to MSHA in 2003



Note: Excludes office workers

Data source: MSHA

- **Spokane, WA**
- **100 Employees**



- **Pittsburgh, PA**
- **300 Employees**

Office of Mine Safety and Health

- Mission: Provide national and world leadership to prevent mining work-related illness, injury, and death by gathering information, conducting scientific research and demonstrations, and translating the knowledge gained into products and services.



**National Institute for
Occupational Safety and Health**

Organization Chart



Customer-Driven Outcome Focused Program

- Strategic and tactical research planning ensure long-term commitment to the solution of persistent H&S problems, while allowing flexibility to address emergent issues
- An emphasis on performance assessment at each stage and Research to Practice “r2p” help to ensure customer needs are being met

Plan Relationships



Mining Research Program Plan

- 8 Strategic Goals
- A set of intermediate goals defines the necessary research outcomes to achieve the strategic goal
- Annual goals define the research outputs that will lead to achievement of the intermediate goal.
- All goals have an associated performance measure

Strategic Goals 1 and 2

- Reduce Respiratory Diseases in Miners by Reducing Health Hazards Associated with CWP, Silicosis, and Diesel Emissions
- Reduce Noise-Induced Hearing Loss in Miners

Intermediate Goals for Strategic Goal #1

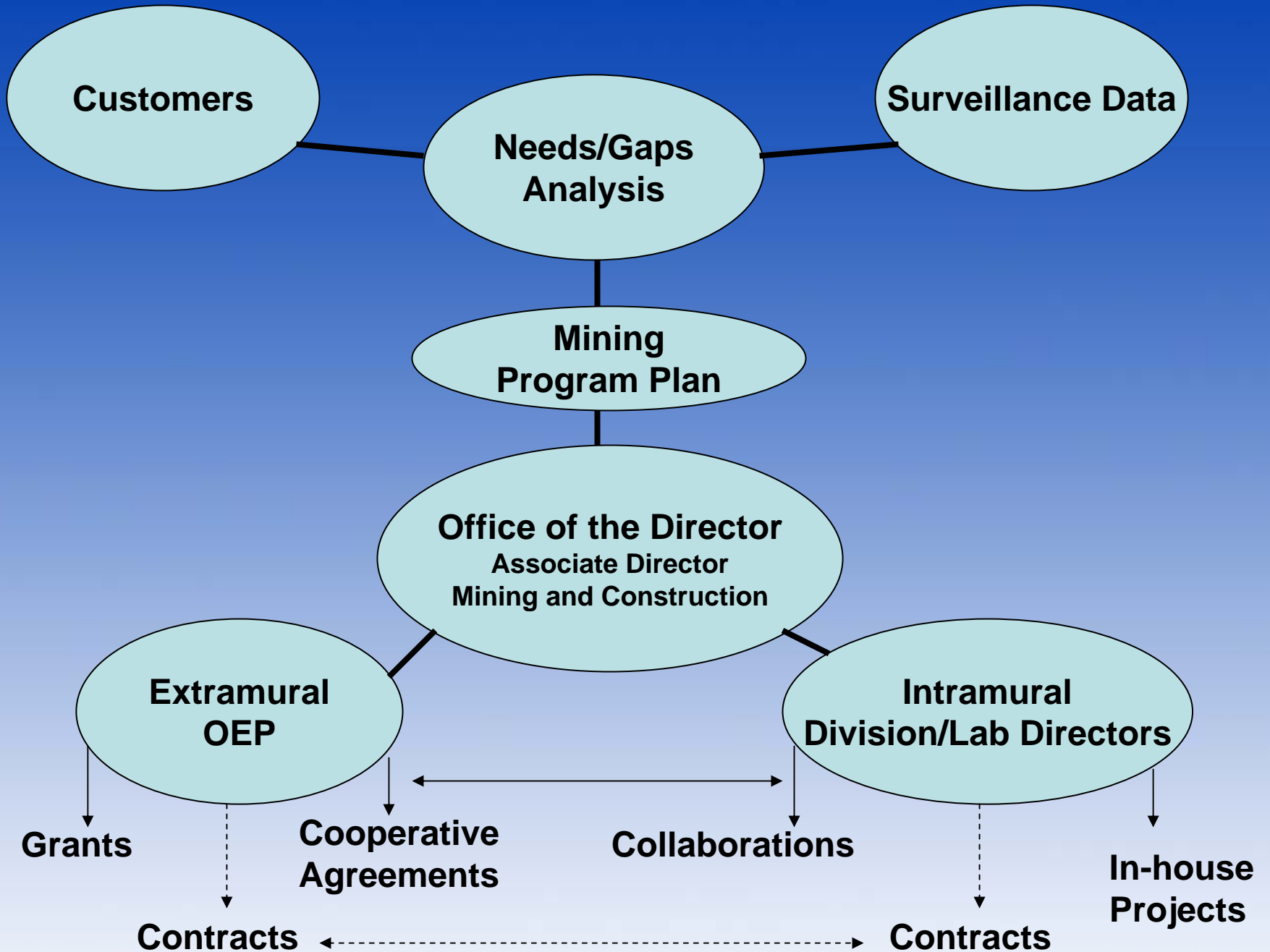
- Develop real-time person-wearable monitoring technology for respirable coal dust **(Goal 1.1)**
- Reduce exposure to coal dust for longwall miners **(Goal 1.2)**
- Reduce coal miner exposure to silica and coal dust **(Goal 1.3)**
- Reduce the silica dust exposure of workers in metal and nonmetal mines and mills **(Goal 1.4)**

Example of Intermediate Goal

- **Intermediate Goal 1.4: Reduce the silica dust exposure of workers in metal and nonmetal mines and mills.** Personal sampling results indicate that many high-risk occupations, such as crusher operators, heavy equipment operators, and stone cutters in metal and nonmetal operations are experiencing overexposure to silica dust levels. For example, 35% of silica compliance samples for dimension stone cutters exceed the allowable level. NIOSH is developing improved control technologies to reduce the silica dust exposure in these, and other high risk occupations.

Performance Measure for Goal 1.4

- Performance Measure: This goal will be achieved if improved controls are demonstrated to reduce silica exposures by 50% for crusher operators in mines and mills, for workers in enclosed equipment cabs, and for stone cutters in dimension stone plants within 4 years. (Baseline is 2003)

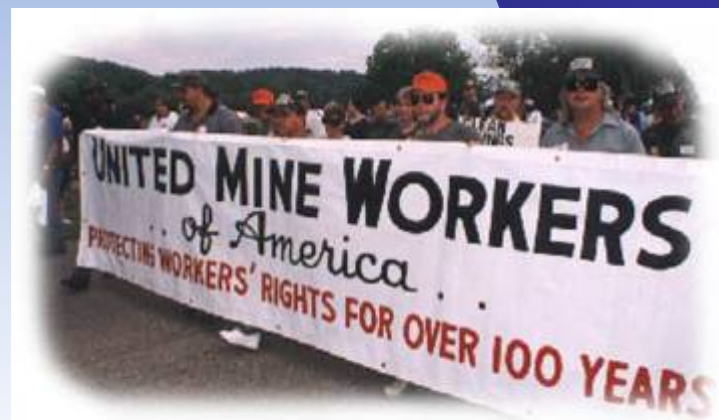




NATIONAL STONE, SAND & GRAVEL ASSOCIATION



Natural building blocks for quality of life



Health Challenges, Present and Future

- Noise
- Dust
 - Coal
 - Silica
- Diesel Particulate Matter
- Other possibly toxic substances

Safety Challenges, Present and Future

- Fatalities
 - Ground Control
 - Powered Haulage
- Injuries
 - Materials Handling
 - Slips and Falls
 - Musculoskeletal Disorders

Emerging Health & Safety Concerns

- Work Organization
 - Stress, Cardiovascular Disease, and Depression,
- Mining under more adverse conditions
 - Potential for increased hazards – *Sentinel Events*
- New mining technologies
 - Safer systems
 - Possible new safety or health hazards

Emerging Health & Safety Concerns

- Aging Workforce
 - Increased likelihood of injuries or accidents
 - Different training requirements
 - Possibility of increased accidents from a large influx of inexperienced workers

Research Portfolio

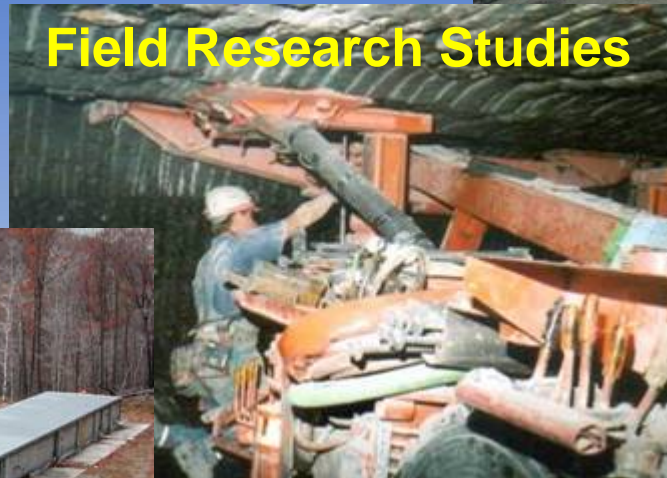


**Basic
Research**

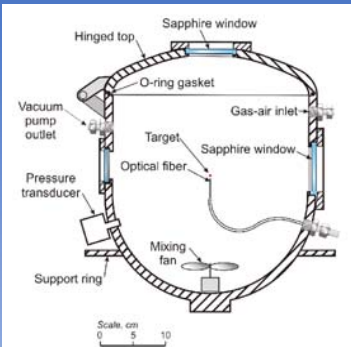
**Engineering Controls
for Existing Equipment**



Field Research Studies



**Specialized Labs for
Experimental Studies**

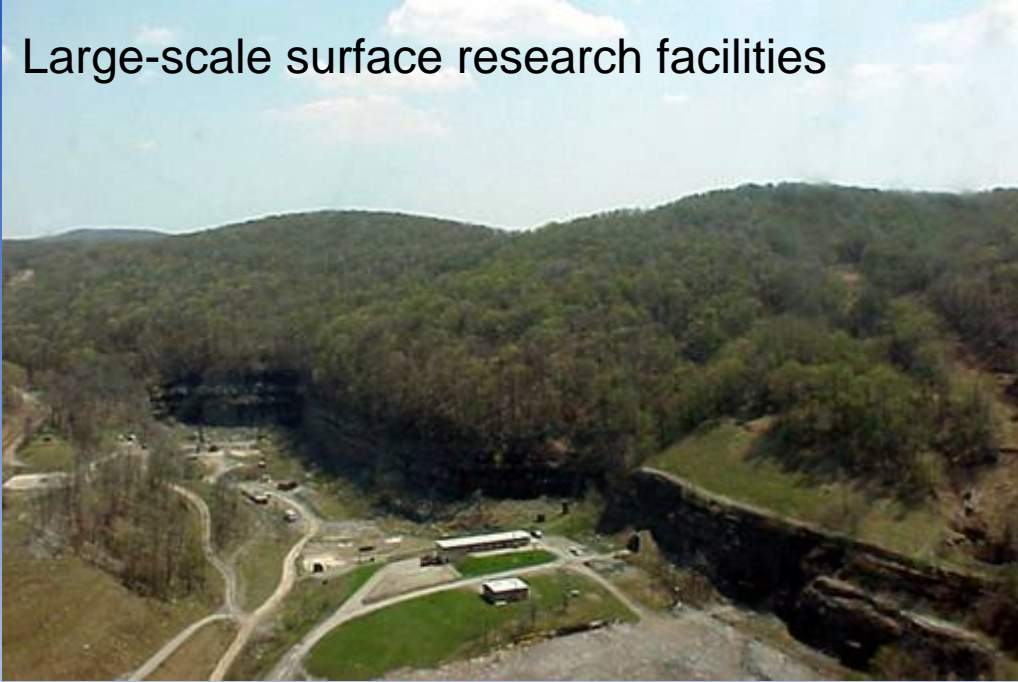


Longwall Dust Gallery



Lake Lynn Laboratory

Large-scale surface research facilities



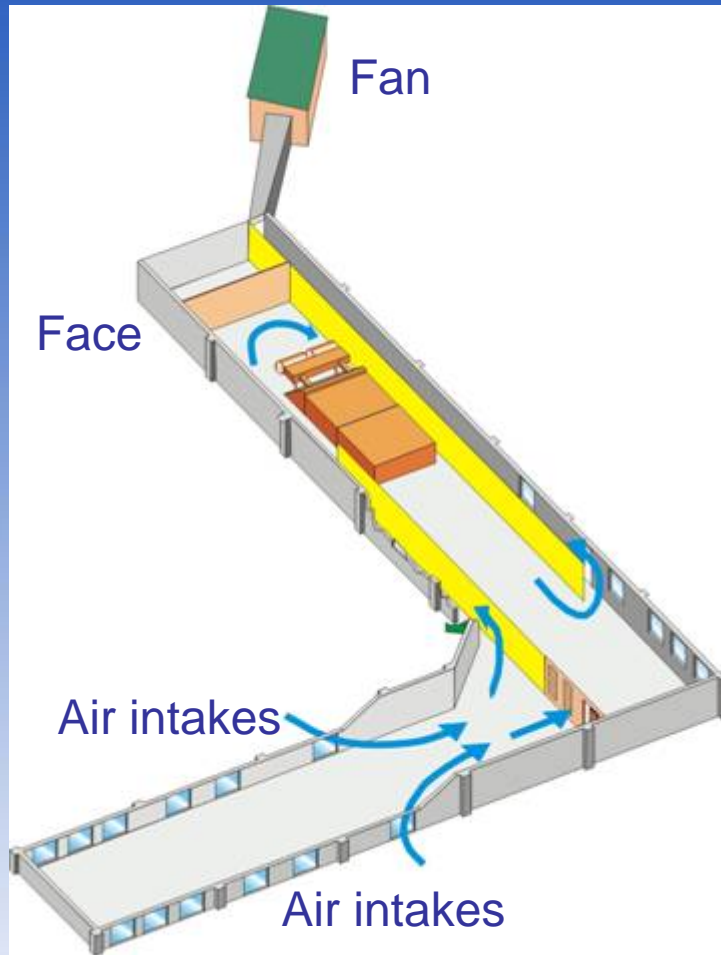
Full-scale
experimental mine



Methane ignition

**One of the world's foremost mining
laboratories for conducting large-scale
safety and health research**

Ventilation Test Gallery



- Full scale model
- Face simulation
- Adjustable entry width
- Exhaust fan
- Methane emitted at face

Explosives Research



12 Foot Sphere



Underground Blasting Chamber



Blasting Emissions

Fire Suppression Facility



- 20 ft x 7 ft x 153 ft main entry with 40 ft crosscut
- Completely fireproofed
- 2000 gal closed-circuit water supply
- Computerized temperature, gas, and video data acquisition system
- 100 hp, pneumatically controlled, variable speed mine fan

Dust Control



Personal Dust Monitor (PDM)

More than 20% of compliance dust samples exceed the legal limit



Longwall Dust Control

Between 1968 and 1990 CWP caused the deaths of over 55,000 U.S. miners

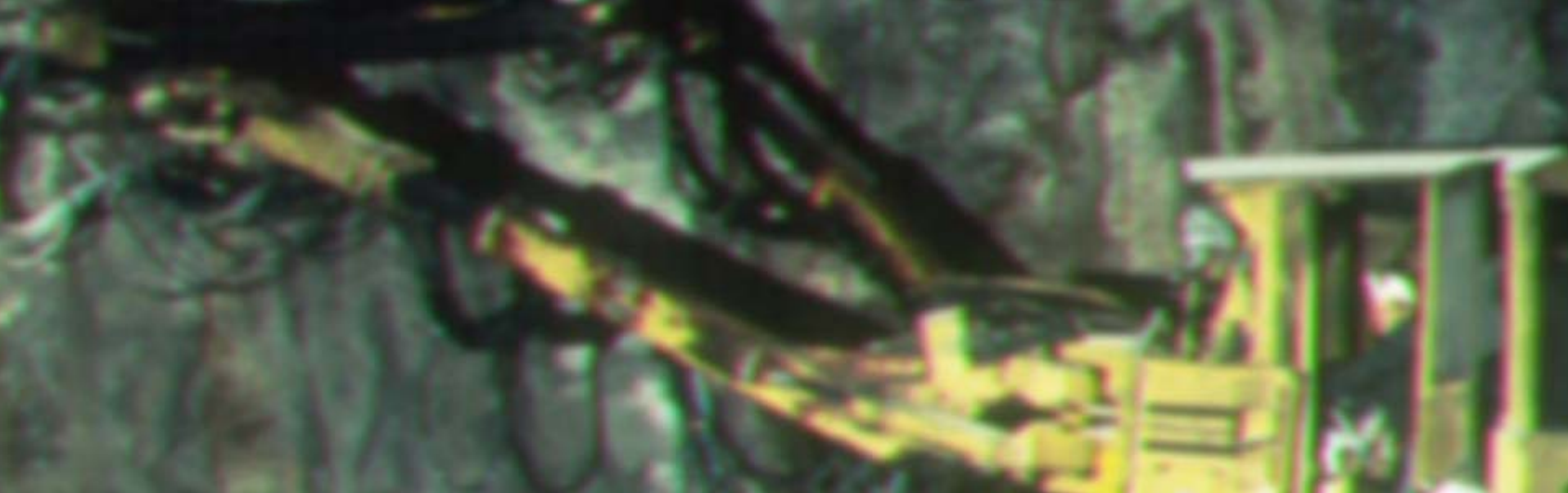
Hearing Loss Prevention

Research is being conducted on a number of fronts including laboratory testing of engineering controls, worker education and training, development of control and field investigations

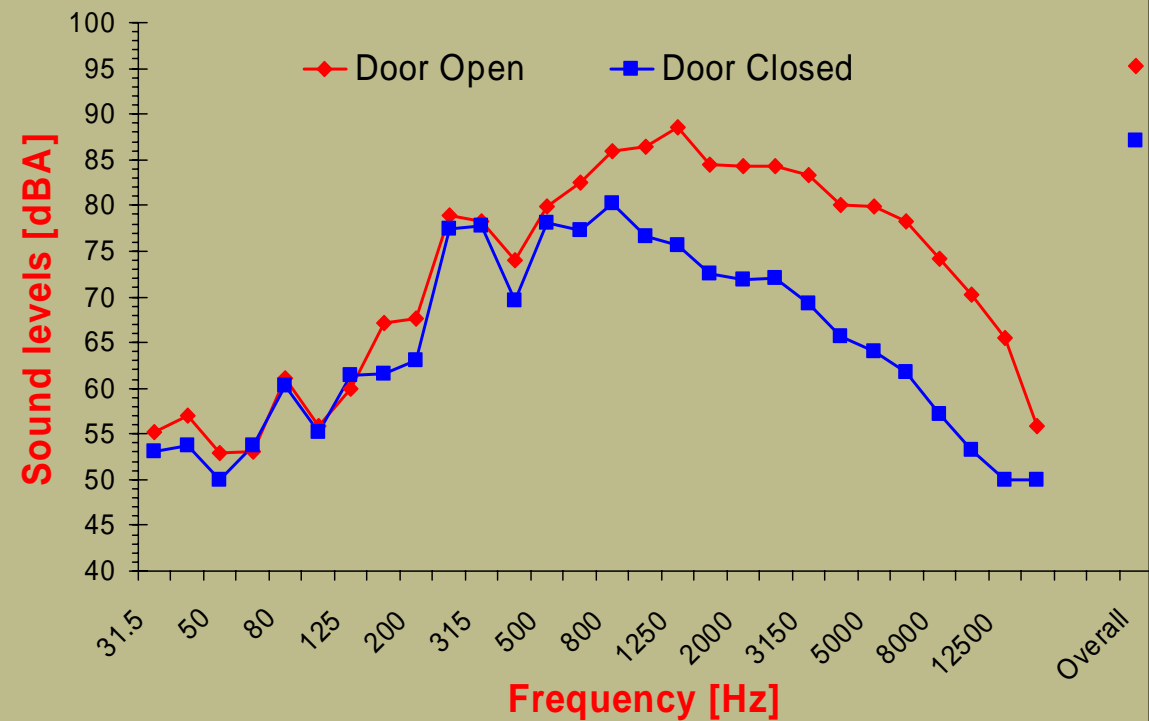


By age 51, more than 90% of coal miners and 49% of metal and nonmetal miners have hearing loss





Jumbo Drill Operator



Diesel Research

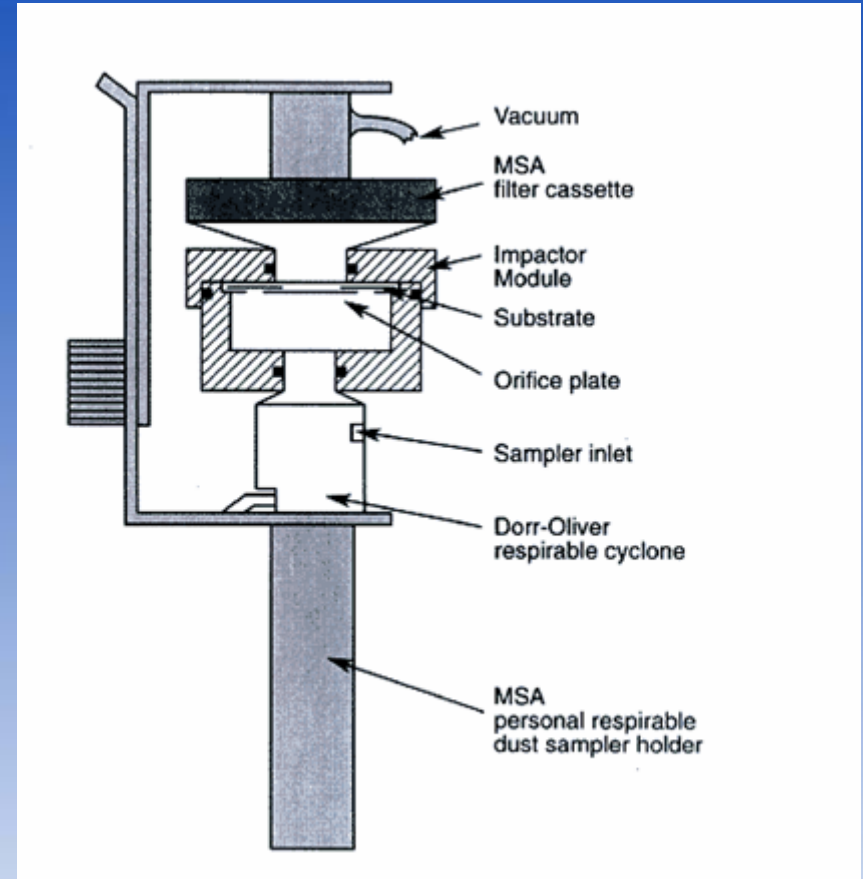


Filter Selection



In mine studies

Current research approach includes laboratory studies and an extensive field research program at operating mines

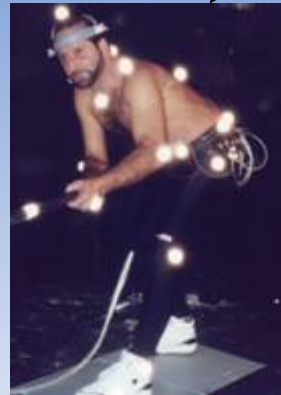


Monitoring Systems

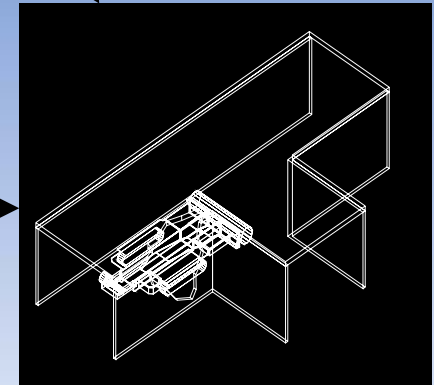
Musculoskeletal Disorders (MSD)



Field Studies



**Laboratory
Research**



**Simulation
Research**

**More than 1/3 of injuries at
underground mine sites
are classified as MSD**

Partnering For Successful Ergonomics

- A cooperative effort with Bridger Coal
- Improved safety for prill trucks used at the mine



Improved ladders



Better design for steps
and hand holds



Enhanced operator
visibility



Electrical Safety

Specifications:

Voltage:	12 Volts DC - Other Potency (Adapters available for other voltages.)
Display:	Backlit LCD Display with impact resistant, non-glass window
Self Test:	88 Local Panel (Operator Panel) external components exceed Coast Guard specs for water tightness (CFR 46 Part 100.20). It is recommended that the Remote Panel be mounted in an appropriate enclosure.
Prohibitions:	Selected and spaced for the "glove hand"
Communications:	RS-485, 19.2kbaud
Voice Messages:	One message for each warning light and each alarm light, Startup message and line contact message (8 messages total)
Speaker Output:	12 Watts maximum
Alarm Signals:	4 Selectable alarms for the Line-Contact Alarm
Relays:	4 - One Double-throw, double throw relay for each warning light and each alarm light
Warning Lights:	2 - Yellow Lights
Alarm Lights:	2 - Red Lights
Terminal Boards:	All terminal boards have spring-loaded terminals that are resistant to vibration and loosening.
Configuration:	Fully configured with all options when shipped. Customer can reconfigure any or all options on site if desired.

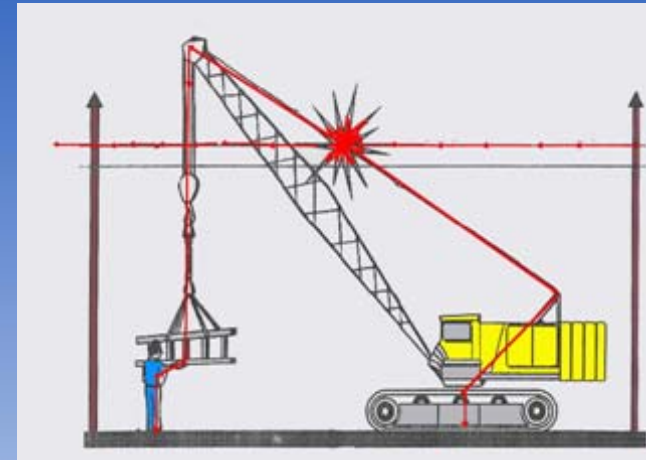
Specifications subject to change without notice.

HVP Systems

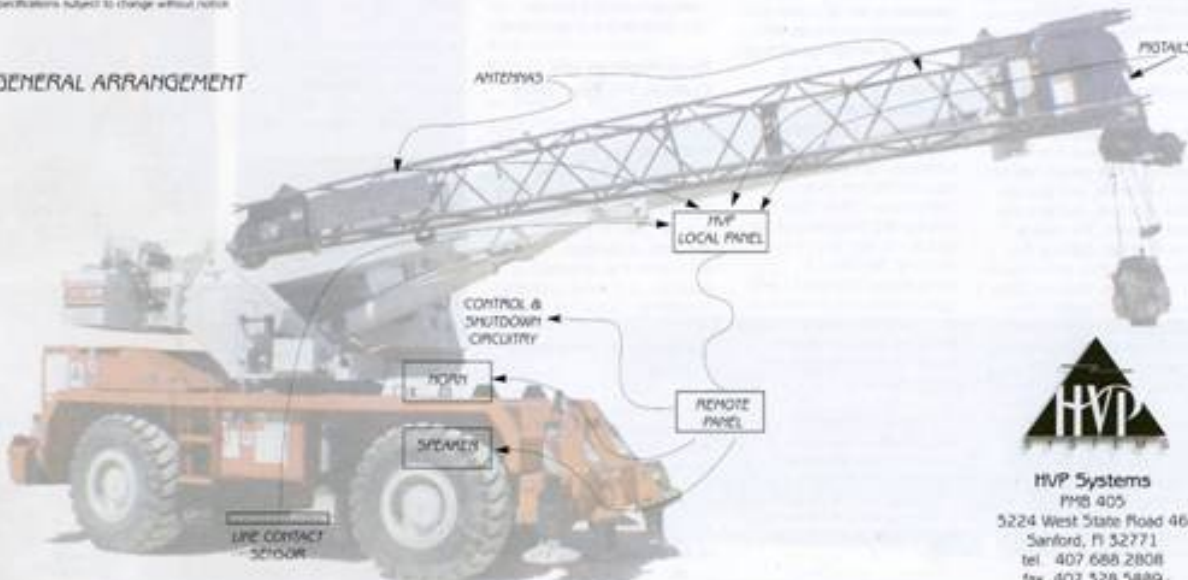
The need to protect personnel and equipment from contact with electrical lines is vital. High voltage proximity alarms have successfully provided a method of protection for over four decades. Their record is outstanding. To date, there has never been a death or injury on any vehicle that has had a high voltage proximity alarm installed.

HVP Systems has built upon this reputation by offering a range of devices that provide the most comprehensive protection available. HVP Systems is continuing to develop additional products that saves lives and protects equipment.

Safety is our business!



GENERAL ARRANGEMENT

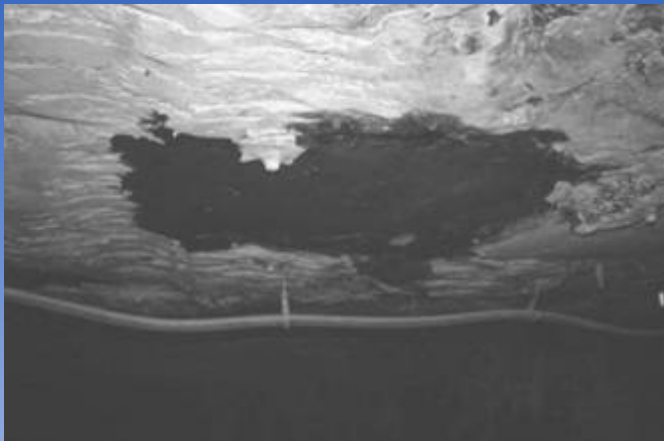


HVP Systems
 PMS 405
 5224 West State Road 46
 Sanford, FL 32771
 tel. 407.688.2808
 fax. 407.528.5889
 info@hvp-systems.com

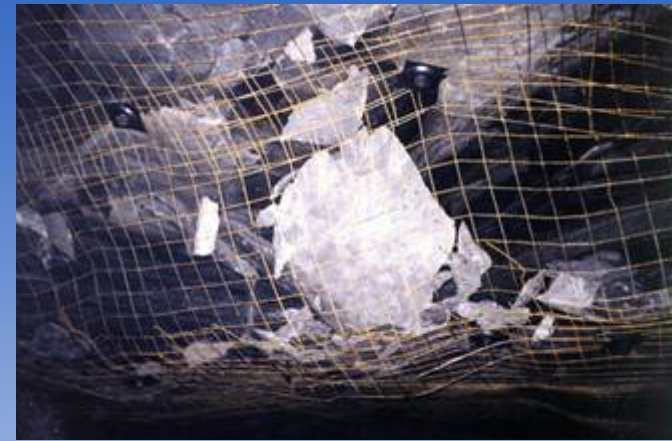


Preventing Roof Fall Injuries in Coal Mines

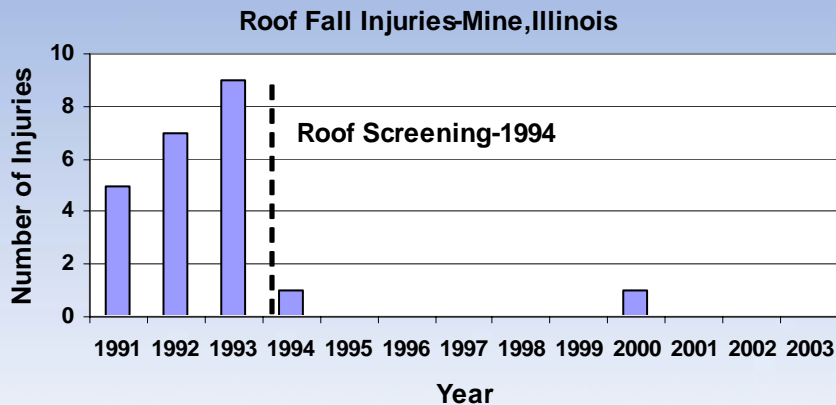
Cause



Prevention



Effectiveness

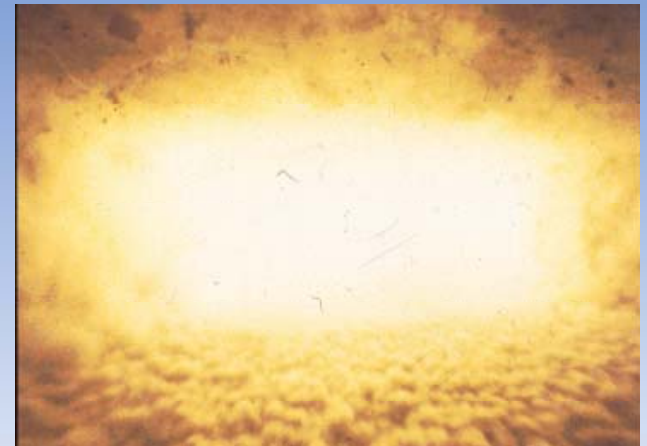
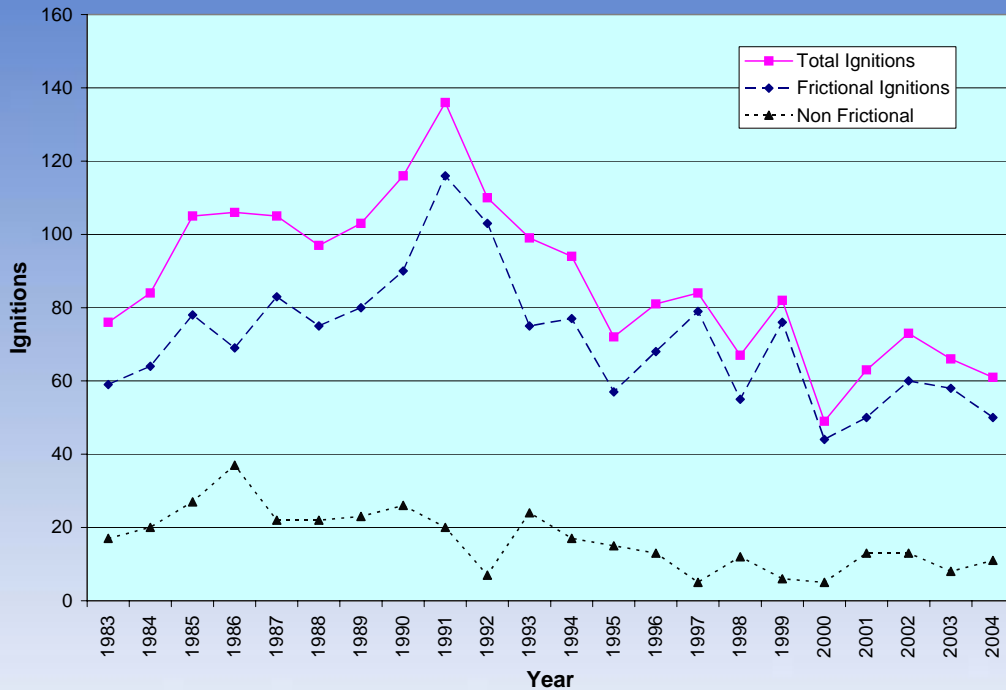


Barriers



Explosions

- Prevention and suppression of gas and dust explosions



Mine Rescue and Response

Realistic Training
Simulations



Evaluate Technologies



Communication Products and Approaches



Seminars

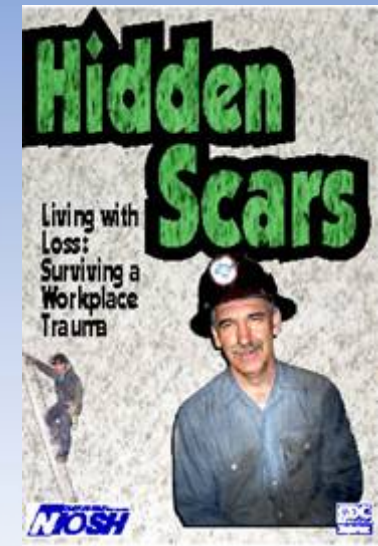
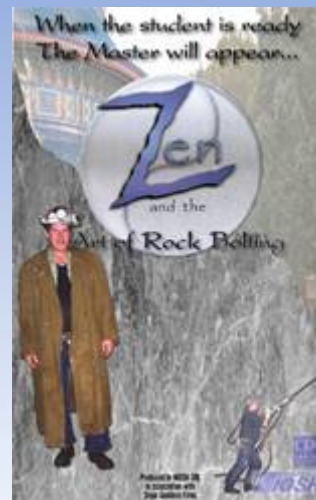
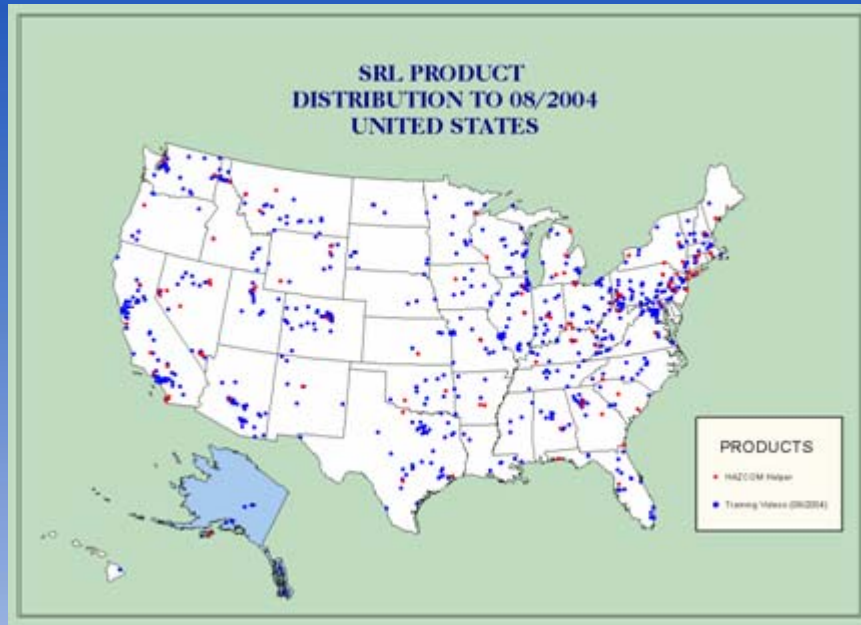
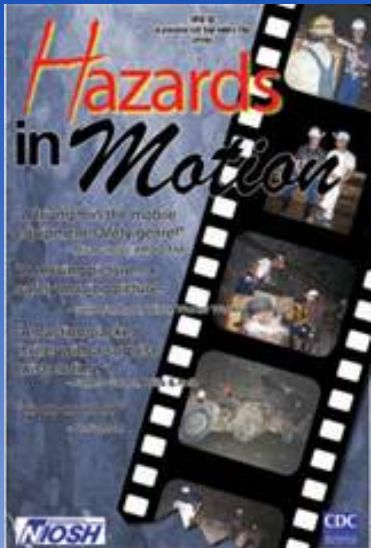


Workshops

Publications



Development and Evaluation of Effective Safety Training



Training...achieving behavioral outcomes

Mine Emergency Response Training



Command center training

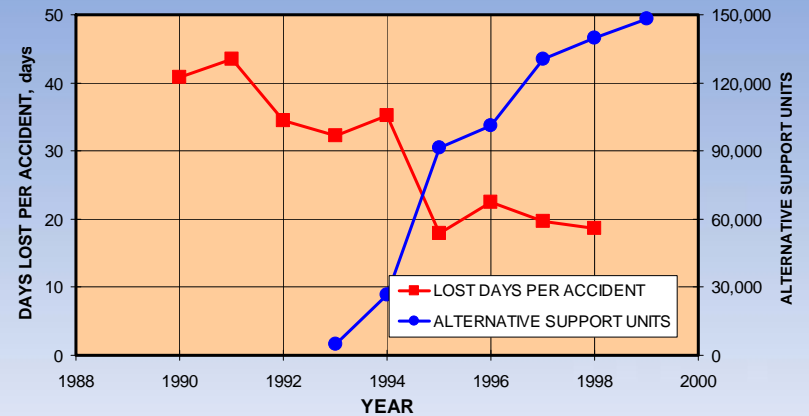
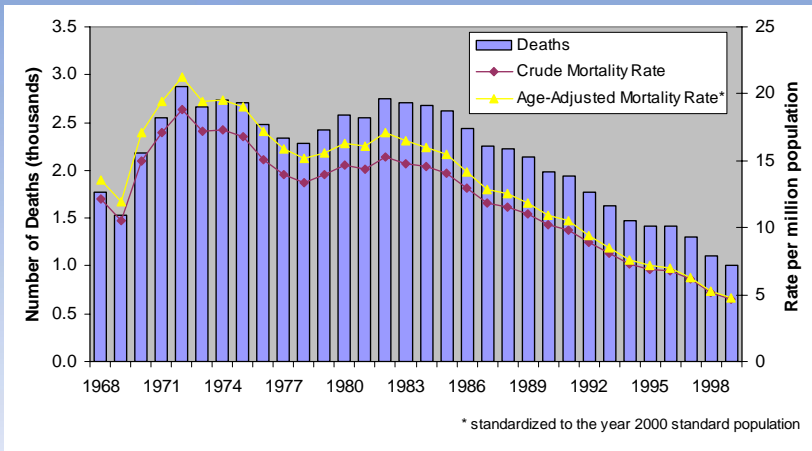
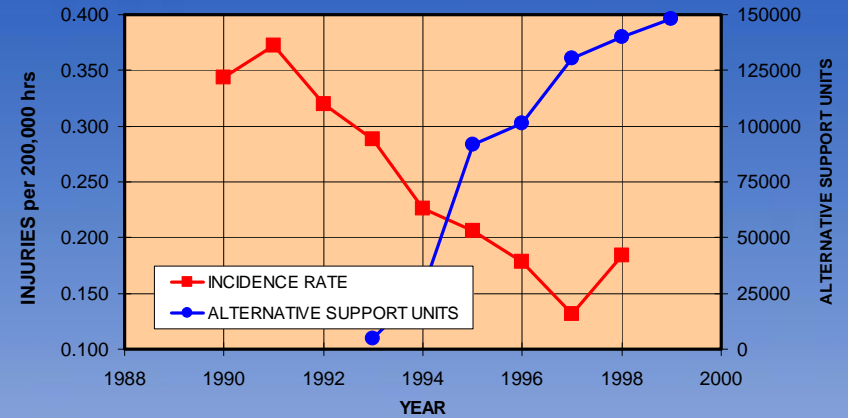
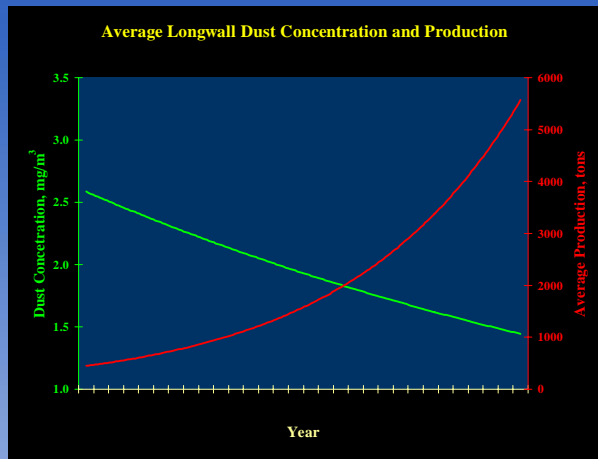


Emergency communications training

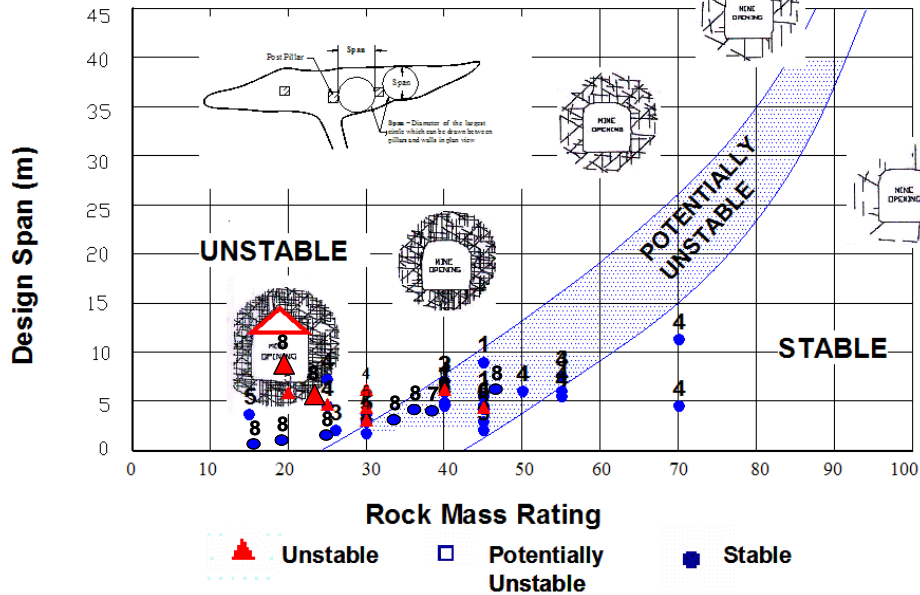


Utilized by responders to the Quecreek Mine inundation, 2002

Impact – Output to Outcome



NEVADA WEAK ROCK MASS SPAN DESIGN CURVE (34 OBS)



Ground Control Design Curve

Geotechnical parameters for determining entry geometry

Coated Flight Conveyor System

60% reduction in sound power levels





Clothes Cleaning Process

Cooperative Research Effort with UNIMIN Corp.



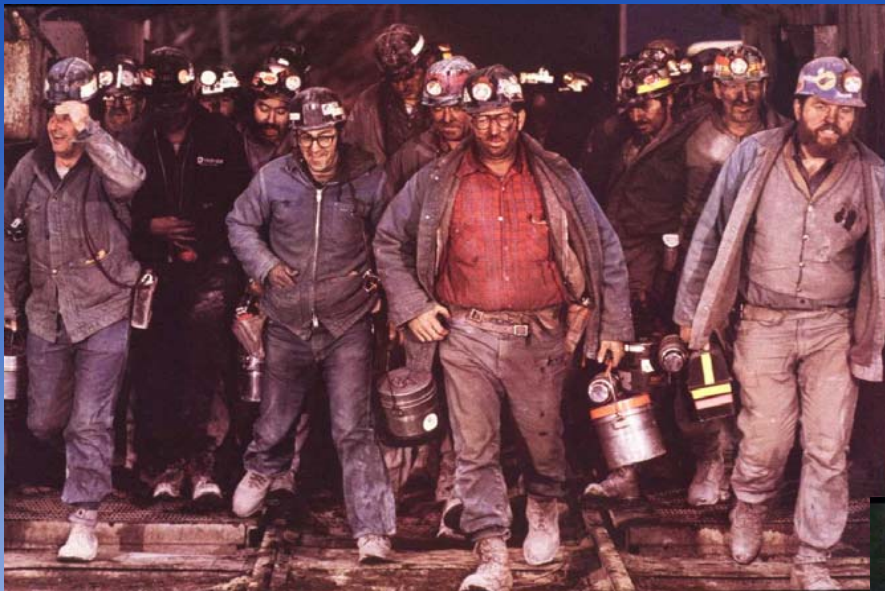
Enclosed Cab Dust Control



Evaluate retrofit cab filtration/pressurization systems and optimize performance



Performance Outcomes



Never forgetting it's about the health and safety of the mineworker !

