The outlook is changing now

The Future of Your Discipline

Mining Engineering

Digging Your Future: Is a career in mining engineering right for you?

by Travis C. Daub

The deep coalmines of West Virginia might seem a world away from the bustling offices of a big city engineering firm, but they are more connected than they might first appear. Before miners can delve into the earth's surface to extract raw materials, it takes top mining engineers to coordinate all of the challenges this process presents.

If your idea of a nine-to-five job involves moving mountains (literally) and getting a bit dusty, then a career in mining engineering might be the field for you. Engineers in the field of mining engineering provide manufacturers around the world with raw materials for the products they make. They are also responsible for the safety of mining crews and are accountable for the protection of the earth's resources. However, the field is surprisingly quite small. So small, in fact, that most professors of mining programs know each other by name. This tight knit community has an upside-they're eager to invite promising, young engineers to join their ranks.

The field of mining took a hit in the 1980s due to low prices for minerals and a lingering recession. But now mining engineering is seeing a comeback unlike anything the industry has seen in 15 years.

If you're unsure what path your engineering career should take, read on to learn more about this exciting field that's looking for exceptional young engineers just like yourself.

Moving On Up

In the United States, there are only a handful of mining engineering programs. There are 13 total, which is down from 20 programs in the 1980s. Many schools like Michigan Tech, University of Idaho and Texas A & M have either closed their programs or have integrated them into other engineering programs.

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Career Information

Mining and Geological Engineers, Including Mining Safety Engineers

Nature of the Work

[About this section] [To Top]

Mining and geological engineers find, extract, and prepare coal, metals, and minerals for use by manufacturing industries and utilities. They design open pit and underground mines, often using computers; supervise the construction of mine shafts and tunnels in underground operations; and devise methods for transporting minerals to processing plants. Mining engineers are responsible for the safe, economical, and environmentally sound operation of mines. Some mining engineers work with geologists and metallurgical engineers to locate and appraise new ore deposits. Others develop new mining equipment or direct mineral processing operations to separate minerals from the dirt, rock, and other materials with which they are mixed. Mining engineers frequently specialize in the mining of one mineral or metal, such as coal or gold. With increased emphasis on protecting the environment, many mining engineers work to solve problems related to land reclamation and water and air pollution.

Mining safety engineers use their knowledge of mine design and practices to ensure the safety of workers and to comply with State and Federal safety regulations. They inspect walls and roof surfaces, test air samples, and examine mining equipment for compliance with safety practices.

Employment

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Mining and geological engineers, including mining safety engineers, held about 5,200 jobs in 2002. While about 4 out of 10 mining engineers worked in the mining industry, over one-third worked in professional, scientific, and technical services firms, mostly providing consulting and other services to the mining industry. Most of the rest worked in State or Federal government.

Mining engineers often are employed at the location of natural deposits, often near small communities, and sometimes outside the United States. Those in research and development, management, consulting, or sales, however, often are located in metropolitan areas.

Despite a projected decline in employment, very good employment opportunities are expected in this small occupation. A significant number of mining engineers currently employed are approaching retirement age, which should create some job openings over the 2002-12 period. In addition, relatively few schools offer mining engineering programs, and the small number of graduates is not expected to increase.

Favorable job opportunities also may be available worldwide as mining operations around the world recruit graduates of U.S. mining engineering programs. As a result, some graduates should expect to travel frequently, or even live abroad.

Employment of mining and geological engineers, including mining safety engineers, is projected to decline through 2012. Most of the industries in which mining engineers are concentrated—such as coal, metal, and copper mining—are expected to experience declines in employment.

Earnings [About this section] [More salary/earnings info] [To Top]

Median annual earnings of mining and geological engineers, including mining safety engineers, were $61,770 in 2002. The middle 50 percent earned between $48,250 and $77,160. The lowest 10 percent earned less than $36,720, and the highest 10 percent earned more than $93,660.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in mining and mineral engineering (including geological) received starting offers averaging $44,326 a year.

America's most dangerous jobs

Survey: Loggers and fisherman still take the most risk; roofers record sharp increase in fatalities.

August 29, 2005: 11:08 AM EDT

By Les Christie, CNN/Money staff writer

NEW YORK (CNN/Money) - There's a memorial in Gloucester, Massachusetts that stands at the city's harbor edge. It's a fisherman leaning into the wind and peering out to the open sea as if searching for a safe route home -- or perhaps a lost companion.

More in jobs

- Big jobs that pay badly
- 3 career moves to make now

A semicircle of bronze tablets containing the names of more than 10,000 Gloucestermen lost in fishing accidents over the years lies at his feet, a monument to one of America's most dangerous occupations.

In some occupations, danger comes with job. That's seen in the latest national census of fatal occupational injuries from the Bureau of Labor Statistics, released Friday.

The good news is that 2004 was one of the safest years on record -- only 5,703 fatal injuries occurred on the job. Still, that was up slightly from the year before when 5,575 died, and there were categories of fatal injuries that had risen more substantially.

Hispanic workers, for example, died at a rate 11 percent higher than 2004. Older worker deaths were up 10 percent.

Fatal injuries from being struck by objects jumped 12 percent...that is now the third most common fatal event, surpassing homicide on the job, which dropped 9 percent to 551. That continued a steep decline from a peak of 1,080 on-the-job murders in 1994.

Highway accidents on the job were the No. 1 killer -- 1,374 died last year, 21 more than the year before.

By occupation

Nearly half of all fatal work injuries occurred among workers who drive or move material around for a living. Truck drivers, forklift operators, trash collectors, and cabbies are all part of this group.

Construction workers had 9 percent more fatalities. Of these, roofers recorded 94 deaths, a sharp increase from the 55 they incurred the year before.

The highest rates of fatal injuries -- the most per worker employed -- occurred among loggers, pilots, and fishermen.

Loggers recorded 85 fatalities in 2004, a rate of 92.4 deaths for every 100,000 workers, more than 22 times the rate among all workers. Loggers deal with tremendous weights when they fell trees and it's not always possible to know exactly where a tree will fall or when. Too, they often work on steep hillsides, in poor weather, and in a hurry.

We're off the list ...

The 10 most dangerous jobs by fatality rate are:

Rank	Occupation	Death rate/100,000	Total deaths
1	Logging workers	92.4	85
2	Aircraft pilots	92.4	109
3	Fishers and fishing workers	86.4	38
4	Structural iron and steel workers	47.0	31
5	Refuse and recyclable material collectors	43.2	35
6	Farmers and ranchers	37.5	307
7	Roofers	34.9	94
8	Electrical power line installers/repairers	30.0	36
9	Driver/sales workers and truck drivers	27.6	905
10	Taxi drivers and chauffeurs	24.2	6

Recruitment of U.S. Mining Engineers

Recruitment is Robust

- All sectors of U.S. industry:
  - Aggregates
  - Coal
  - Industrial minerals
  - Metal
  - Machinery
  - Consulting
  - Explosives

Recruitment is Robust

- Major and minor companies
- Domestic and global companies
- The number of recruiters increased from 8 two years ago in fall semester to 37 this year
- Many more use our alumni network

Recruitment is Robust

- Head hunter firms use our alumni network
- Global companies making a strong thrust
- Students prepare to attract recruiters' interest (experience, leadership, can-do attitude)

Recruitment is Robust

- Several surveys indicate U.S. demand for graduates is about 300 per year
- Global survey indicated about 500 per year
- U.S. produced 86 graduates in academic year 2003-2004

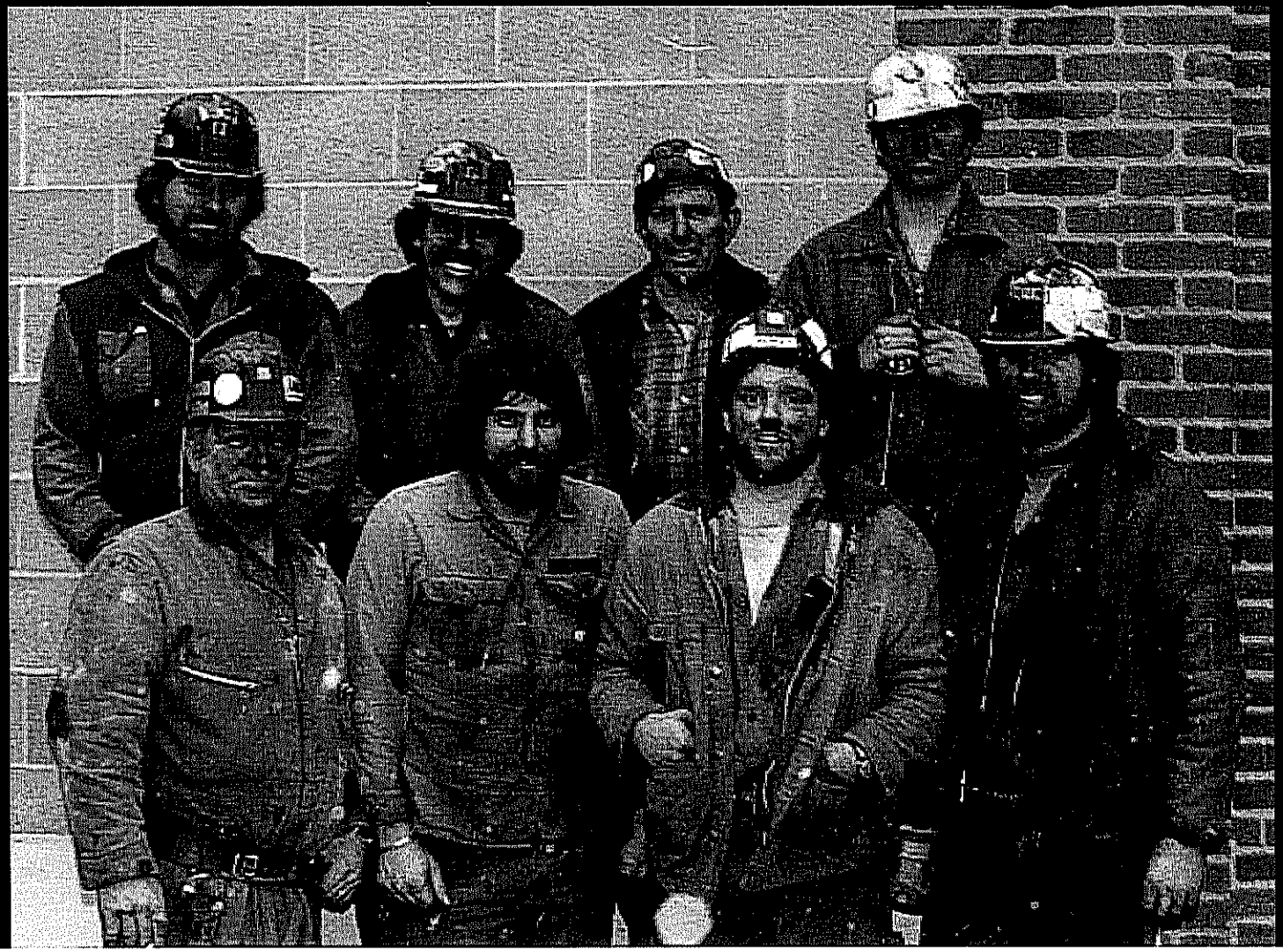
Recruitment is Robust

- Some uncertainty in demand estimate because of pace of retirements coupled with substantial industry growth
- Hopefully supply can be increased
- Some initiatives exist in attempt to increase funding => growth

How Address Influx of New Miners/Professionals?

- Companies creating training centers
- Government efforts by MSHA and NIOSH, including States Grants program
- Federally funded Center to assist

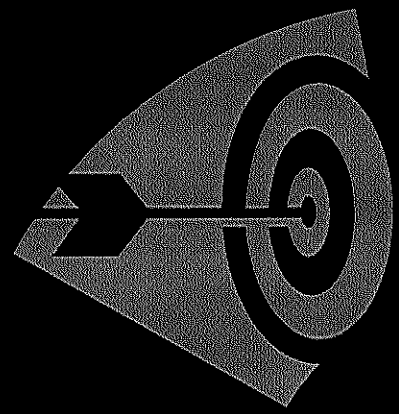
Western Mining Safety and Health Training and Translation Center



Western Mining Safety and Health Training and Translation Center

- ★ Grant: $4.02 million over 5 years; ~ $1 million Sep 1, 2004 – Aug 31, 2005
- ★ Consortium of 4 universities including CSM, Montana Tech, Utah, and UMR
- ★ 15 education projects; 1 translation project
- ★ Administrative and planning core

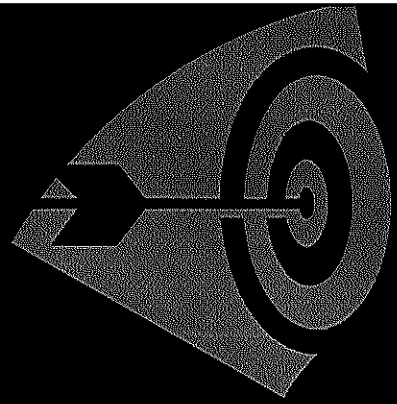
Western U.S. Mining Safety and Health Training and Translation Center



Aims and Objectives

Primary specific aim ➡ reduce injuries to miners through an integrated program of training intervention and translational research

Objectives

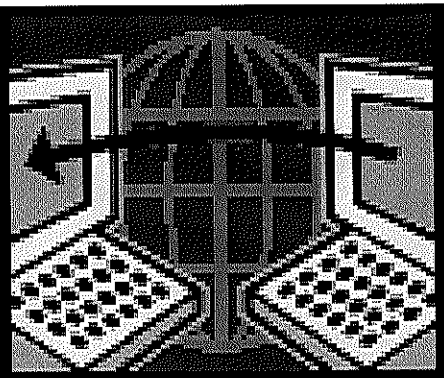


Develop and implement a broadly collaborative western U.S. program that does the following:

1. Identify training needs of miners today and in the near future;

2. Address prioritized mine safety and health issues;

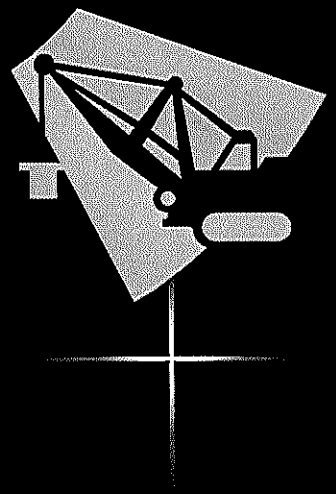
Objectives



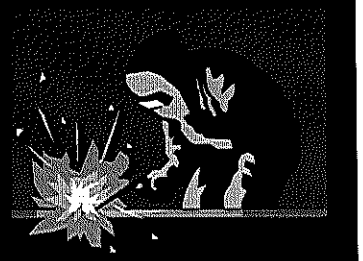
3. Provide extra qualified instructors/faculty to help train Western miners in focus areas;

4. Evaluate effectiveness and impact of program on helping to reduce injuries to miners;

5. Support Limited translational projects



Other Significant Features



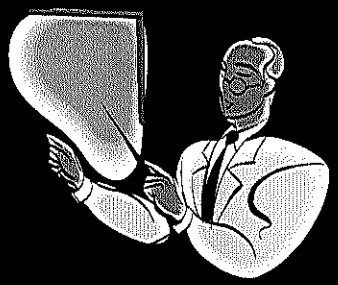
- Help address developing gap in experience
  - ✓ Capturing the expert knowledge ...
  - ✓ And situation-based judgments
  - ✓ Focus on most persistently hazardous jobs

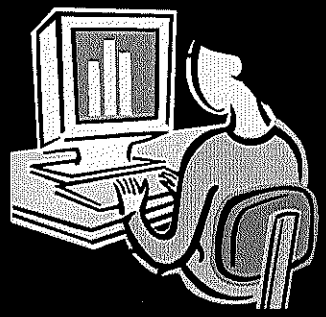
Other Significant Features

- To ensure effectiveness ⇨ use NIOSH critical elements of training recommendations
- To measure effectiveness ⇨ use set of well defined, measurable outcomes focused on learning
- Focus: Knowledge in training scenarios requiring expert skills and judgments

Other Significant Features

- Follow-up analyses => determine impact on mine site and regional accident and injury experiences

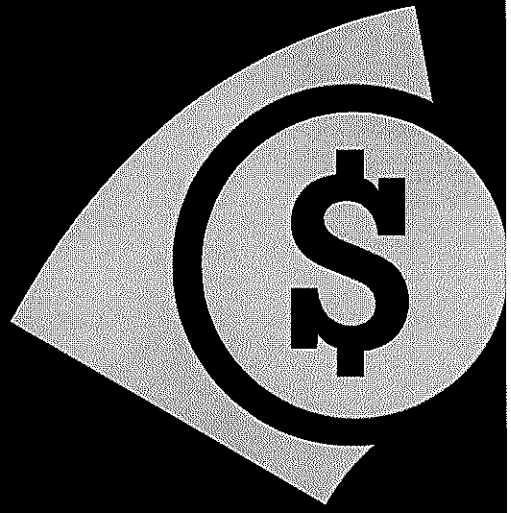




Western U.S. Mining Safety and Health Training and Translation Center

Distribution of Funds among Partners Year 1

- ★ UMR - $269,936 (27.04%)
- ★ CSM - $416,961 (41.77%)
- ★ Montana Tech - $205,463 (20.58%)
- ★ Utah - $105,792 (10.60%)



Note: $998,152 total

Western U.S. Mining Safety and Health Training and Translation Center

Education Projects

- ★ Evaluation and Control of Diesel Particulate Matter in Western Metal/Nonmetal Mines – Tien, Grayson, UMR
- ★ Surface Mine Haulage Safety – McGuire, CSM
- ★ Mine Rescue Training – Fuller, CSM
- ★ Basic Mine Ventilation – Pierce, CSM
- ★ First Responder at Mine Sites Training – Ferriter, CSM
- ★ Explosives and Blasting Safety – Fischer, CSM

Western U.S. Mining Safety and Health Training and Translation Center

Education Projects

- ★ Highwall Safety and Stability – Ferriter, CSM
- ★ Introduction to Industrial Hygiene and Dust Control – Dmytriw, CSM
- ★ Fundamentals of Noise – Dmytriw, CSM
- ★ Inspection of Embankment Dams – Dmytriw, CSM
- ★ Ground Control (Underground Operations) – Ferriter, CSM
- ★ Mine Radiation, Home Radon – Beckman, CSM

Western U.S. Mining Safety and Health Training and Translation Center

Education Projects

- ★ Hazard Identification and Risk Assessment for Small Mines in Western United States – Calizaya and Nelson, Utah
- ★ Jackleg Drilling and Bolting Injury Reduction – Patton, Hart, Cronoble, Jensen; Montana Tech
- ★ Material-Handling Injury Reduction in Western Metal/Nonmetal Mines – Patton, Montana Tech

Western U.S. Mining Safety and Health Training and Translation Center

Translation Project

★ Virtual Reality-Based Training of Underground Mining Roof Bolters – Grayson, Apel, Hilgers, Hall; UMR

Start with jackleg drillers

Procedures for Education Projects
(NIOSH Critical Elements of Training)

- ★ Assessment of Training Needs
- ★ Establishing Training Objectives
- ★ Specifying Training Content and Delivery Method
- ★ Accounting for Individual Differences

Procedures for Education Projects
(NIOSH Critical Elements of Training)

- ★ Specifying Learning Conditions
- ★ Evaluation of Prototype/Training
- ★ Revision of Training
- ★ Outcomes Assessment

Evaluation of Training and Impacts

Students

- ★ Pre-tests and post-tests
- ★ Performance-based tests (where appropriate)
- ★ Student evaluations of teaching
- ★ Survey of achievement of educational objectives

Evaluation of Training Impacts

Behavior

- ★ Follow-up surveys with operators
  - ➡ assess achievement of educational objectives; assess achievement of desired outcomes

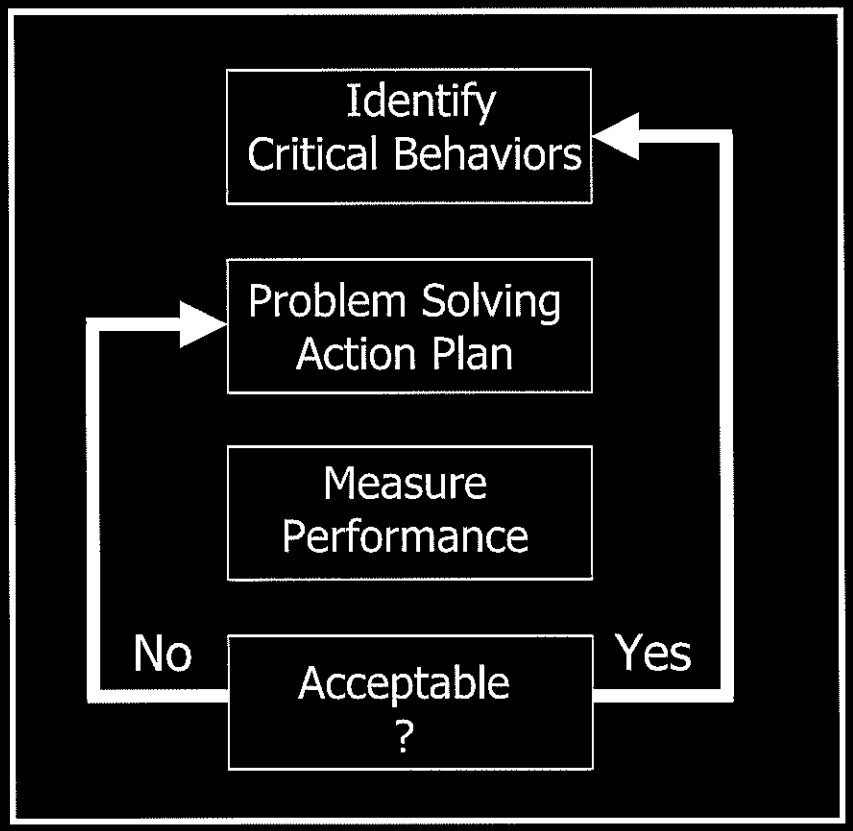
- ★ Follow-up surveys with miners
  - ➡ assess achievement of educational objectives; assess achievement of desired outcomes

Evaluation of Training Impacts – Behavior

- ★ Follow-up safety observations
  - Coordinated with mines
  - Observation and Evaluation of Critical Behaviors after Training Process

Evaluation of Training Impacts on Behavior

Figure 1. The Continuous Improvement Safety Process



* Critical behaviors may be identified by analysis of relevant incident reports, interview of miners, observation of miners at work, and by review of work practices, job safety analyses, procedure manuals, etc.

Work Plan - Administrative

Administrative & Planning Core

- ★ Year 1 – Set up subcontractor agreements
- ★ Year 1 – Implement initial training/translation projects
- ★ Year 1 – Establish External Advisory Committee
- ★ Annually – Hold External Advisory Committee meetings twice per year

External Advisory Committee Make-Up

- 3 mining industry VP-H&S
- 2 labor representatives
- 2 MSHA
- 2 NIOSH
- 1 States Grants representative

Role of External Advisory Committee

- ★ Working with Center/stakeholders, reassess the needs for Western training
- ★ Recommend needs-based appropriate mix of training offerings,
- ★ Recommend details on training projects to better meet those needs

Role of External Advisory Committee

- ★ Evaluate program effectiveness and impact on mining safety and health
- ★ Analyze new research results and technological developments once per year => ID new projects to move health and safety research results to implementation

Role of External Advisory Committee

- ★ Target new training/translational projects to address high priority issues => solicitation for pilot project proposals
- ★ Evaluate and select pilot projects for funding
- ★ Give advice on growing Center to self sufficiency

Western Mining Safety and Health Training and Translation Center

http://campus.umr.edu/shtc

Existing Clearinghouse

www.MIRMgate.com

MIRMgate
Minerals Industry Risk Management Gateway

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Browse by Hazard

Browse by Task

Browse by Subject

Welcome to the MIRMgate

"Welcome to the Minerals Industry Risk Management gateway (MIRMgate). This site will connect you with carefully selected good practice information to help reduce risks in mining, minerals processing, and quarrying operations. The site is intended to specifically assist with the risk assessment process but has also been designed to be searched by hazard, task or subject. This site will be continuously modified as new and better resources are identified. MIRMgate reflects the Australian minerals industry's desire to work together for a sustainable future."

Professor Jim Joy
Director, Minerals Industry Safety & Health Centre (MISHC)

UMR
UNIVERSITY OF MISSOURI-ROLLA

Western Mining Training Translation Center

Western Mining Safety & Health Training and Translation Center

Want more information?

Please use the menu below to browse the Center's website at your convenience. It will provide some detailed information about training offerings, other projects, collaborators, the External Advisory Committee (under affiliations) and other activities.

INFO	COLLABORATORS	APPROVED PROJECT	AFFILIATIONS	H&S LINKS

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Harvey "Pete" Knudsen
Montana Tech of University of Montana
Dean, School of Mines & Engineering
Professor and Head, Mining Engineering
Mining Engineering MG 104B
Butte, MT 59701
Phone: (406) 496-4395

Western Mining Safety & Health Training Center

Training Materials Search

The following search engine may be used to find training materials that may be relevant for your use. You should enter key words, e.g., 'haulage' or 'materials handling', and click search. The engine will return the results, which will have links to the desired materials.

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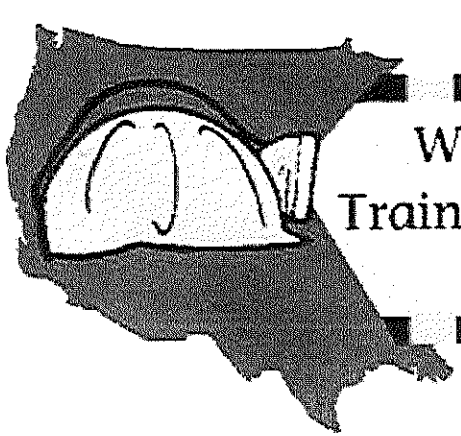
SHTC - Training Materials List

Evaluation and Control of Diesel Particulate Matter in Western Metal and Nonmetal Mines

Material Handling Safety

Mine Safety and Health Asministration (MSHA) - Job Task Analysis

Strategies For Improving Training For Miners



Western Mining Safety & Health Training Center

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2. SHTC - Training **Materials** List
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UMR Training Project

Evaluation and Control of Diesel Particulate Matter in Western Metal/Nonmetal Mines

Training Objectives

1. To develop a good understanding of the nature of DPM, its long-term health effects at uncontrolled exposures. and how it is generated.

2. To develop understanding of how it is analytically determined.

3. To develop understanding of how the DPM regulations evolved, and when compliance decisions must be made for the current and 2006 standards.

4. To develop understanding of specific provisions of the new rules, how they will likely be enforced, and how they will be phased in.

Training Objectives

5. To develop skill in estimating DPM concentrations under different control scenarios using the MSHA DPM Estimator.

6. To develop understanding of how DPM will be sampled in mines and how samples will be analyzed for compliance purposes.

7. To develop an in-depth understanding of options for control of DPM emissions and the trade-offs involved.

8. To develop understanding of the importance of using best maintenance practices and what they are.

Outline of Presentation: 7 Parts
Part I

- What is DPM?
- What is the fuss about health effects?
- What have been the exposures to it in mining?
- How is it determined analytically?

Outline of Presentation: 7 Parts
Part II

- What happened in rulemaking?
- Where does it stand now?

Outline of Presentation: 7 Parts
Part III

- What are the new rules?
- How will they be enforced?
- How are they phased in?

Outline of Presentation: 7 Parts
Part IV

- How can DPM concentrations be estimated assuming different control technologies will be used?