ME571/Geol571 Geology and Economics of Strategic and Critical Minerals

Safety

Sources: Colorado Mine Safety and Training Program. Molycorp Inc., MSHA, OSHA
Should you be committed to Safety?

100 % of the time?

On an average day in America...
5,937 Americans die!

24,384 Americans suffer disabling injuries from accidents

4,932 Americans are injured in work related accidents

OF THESE…

82 are injured in mining accidents

438 are injured in agricultural accidents

521 are injured in construction accidents

822 are injured in manufacturing accidents
On an average day…

1 American is injured by lightening
35 are injured by fireworks
68 are injured playing golf
104 are injured while shaving
153 are injured using lawn mowers
307 are injured in the bathtub or shower
56,061 Americans drive a car after drinking alcohol
On an average day…

133 Americans will die in an automobile accident of which 71 will be related to alcohol consumption

30 will die in falls

13 will die from fires and burns

11 will die from poisoning

10 will die from suffocation from ingested objects

5 will die from firearms accidents

2 will die from asphyxiating gases or vapors
On an average day…

30 Americans will die from work related accidents

The question is:

Should you be committed to Safety 100% of the time?
"IT'S BETTER TO BE CAREFUL A HUNDRED TIMES THAN TO GET KILLED ONCE."

MARK TWAIN
Mandatory Health and Safety Standards

- MSHA
- OSHA
- NIOSH
- State agencies
Can anyone answer the question: Why do we have mining regulations?
A Brief History Lesson

Some miners believe that all regulations are written in **Blood**.

Underground mining disasters involving multiple fatalities have been the fuel, igniting legislation, that governs how we mine today.
FIGURE 4. Number of deaths and fatality rates* in mining coal and metal/nonmetallic (M/NM) minerals, by 5-year interval — United States, 1911–1997

*Per 100,000 workers.
†Data are for 1996 and 1997.
# NIOSH Fatal Occupational Injury Cost Fact Sheet: Mining

Number, rate, and costs of fatal occupational injuries in the U.S. mining industry by selected characteristics, 1992–2002

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of fatalities</th>
<th>Fatality rate (per 100,000 workers)</th>
<th>Total costs (2003 dollars)</th>
<th>Mean costs (thousands)</th>
<th>Median costs (thousands)</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All incidents</td>
<td>1,721</td>
<td>26.0</td>
<td>$1,788</td>
<td>$1,039</td>
<td>$1,064</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Male</td>
<td>1,700</td>
<td>29.9</td>
<td>1,768</td>
<td>1,040</td>
<td>1,066</td>
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<tr>
<td>Female</td>
<td>21</td>
<td>2.2</td>
<td>20</td>
<td>942</td>
<td>962</td>
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<tr>
<td>Race of decedent:</td>
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<tr>
<td>White</td>
<td>1,594</td>
<td>25.7</td>
<td>1,657</td>
<td>1,039</td>
<td>1,065</td>
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<tr>
<td>Black</td>
<td>62</td>
<td>22.1</td>
<td>66</td>
<td>1,070</td>
<td>1,063</td>
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<tr>
<td>Other*</td>
<td>65</td>
<td>45.8</td>
<td>65</td>
<td>999</td>
<td>1,003</td>
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<td>Age of decedent:</td>
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<td></td>
<td></td>
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<tr>
<td>16–19</td>
<td>33</td>
<td>37.8</td>
<td>30</td>
<td>905</td>
<td>959</td>
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<tr>
<td>20–24</td>
<td>156</td>
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<td>1,055</td>
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<td>500</td>
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<td>983</td>
<td>978</td>
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<td>55–64</td>
<td>155</td>
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<td>86</td>
<td>556</td>
<td>563</td>
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<tr>
<td>65+</td>
<td>60</td>
<td>54.6</td>
<td>5</td>
<td>89</td>
<td>70</td>
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</table>
Mine fatalities in 2006

• 72 as of 12/31/06
• 47 in coal mines (12/31/06)
• 25 in metal/nonmetal mines (12/31/06)
Mine fatalities in 2007

- 5 as of 1/30/07
- 3 in coal mines (1/30/07)
- 2 in metal/nonmetal mines (1/30/07)
COMPARISON OF YEAR-TO-DATE AND TOTAL FATALITIES FOR M/NM & COAL

FATALITIES

<table>
<thead>
<tr>
<th>Year</th>
<th>M/NM</th>
<th>COAL</th>
<th>M/NM</th>
<th>COAL</th>
<th>M/NM</th>
<th>COAL</th>
<th>M/NM</th>
<th>COAL</th>
<th>M/NM</th>
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<td>24</td>
<td>5</td>
<td>42</td>
<td>27</td>
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<td>10</td>
<td>26</td>
<td>30</td>
<td>27</td>
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<td>2003</td>
<td>22</td>
<td>8</td>
<td>30</td>
<td>27</td>
<td>18</td>
<td>9</td>
<td>18</td>
<td>10</td>
<td>13</td>
<td>9</td>
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<tr>
<td>2004</td>
<td>22</td>
<td>8</td>
<td>27</td>
<td>18</td>
<td>18</td>
<td>9</td>
<td>18</td>
<td>10</td>
<td>13</td>
<td>9</td>
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<tr>
<td>2005</td>
<td>22</td>
<td>6</td>
<td>35</td>
<td>13</td>
<td>22</td>
<td>16</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>16</td>
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<tr>
<td>2006</td>
<td>20</td>
<td>10</td>
<td>37</td>
<td>37</td>
<td>20</td>
<td>20</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
</tbody>
</table>

Legend:
- 8/30
- YEAR END
Metal and Nonmetal
Fatal Accident Review
CY 2005
MNM Fatals

Contractors
7

Mine Employees
18
MNM Fatalities by Commodity

- Sand & Gravel, 32%
- Crushed Stone, 36%
- Dimension Stone, 8%
- Iron Ore, 8%
- Other*, 16%

* Trona, Lime, Platinum, Pumice, Phosphate, Iron Ore, Sandstone, Potash, Copper
MNM Fatalities by Classification

- Machinery, 16%
- Falling Material, 20%
- Fall of Person, 12%
- Electrical, 20%
- Powered Haulage, 28%
- Fall of Highwall, 4%
MNM Fatalities by Mine Size

- 100+ Employees, 28%
- 5-10 Employees, 8%
- 20-50 Employees, 24%
- 10-20 Employees, 20%
- 50-100 Employees, 4%
- 1-5 Employees, 8%

Total: 100%
MNM Fatalities by Age

- 40-50, 24%
- 50-60, 20%
- 60+, 16%
- 19-25, 24%
- 25-40, 16%
MNM Fatalities by Mining Experience

- 30+ Years: 20%
- 20-30 Years: 15%
- 15-20 Years: 16%
- 10-15 Years: 32%
- 5-10 Years: 12%
- 0-1 Year: 16%
- 2-5 Years: 16%

- 15-30 Years: 4%
MNM Fatalities by Activity

Other *, 16%
Production, 28%
Maintenance, 56%
MNM Fatalities by Occupation

- Laborer/Utility, 36%
- Repairman/Technician, 20%
- Mobile Equipment Operator, 20%
- Supervisor, 12%
- Machinery/Plant Operator, 12%
Root Causes

- Risk Assessment, 16
- Inadequate Procedures, 23
- Training, 6
- PPE, 15
- No Inspection, 5
- LO/TO, 4

Note: Fatalities may have several root causes.
Root Causes

- No Risk Assessment Conducted
- No/Inadequate Policy or Procedures
- Did not use Personal Protective Equipment
- Lack of Pre-operation Checks
- Equipment not Maintained
- Training Inadequate
- Failure to Conduct Examinations
MNM Fatalities – 1995-2006

- 1995: 53
- 1997: 61
- 1999: 51
- 2001: 47
- 2003: 42
- 2005: 35
- 2006: 25
Stop
Isolate each step in a task and identify past and potential accidents, injuries, and violations.

Measure
Evaluate the risks associated with the task and barriers that have allowed hazards to cause injuries.

Act
Implement controls to minimize or eliminate any hazards that make the risk unacceptable.

Review
Conduct frequent work site visits to observe work practices and audit accidents, injuries, and violations to identify root causes.

Train
Develop a human factor-based action plan and then involve and train the miners.

The majority of fatal accidents have these common root causes

• Failure to identify hazards
• Failure to manage risks

SLAM Risks the SMART Way!

Miners:
Stop Think through the task
Look Identify the hazards for each job step
Analyze Determine if you have the proper knowledge, training, and tools
Manage Remove or control hazards and use proper equipment

Mine Operators:
Stop Isolate each step in a task and identify past and potential accidents, injuries, and violations.
Measure Evaluate the risks associated with the task and barriers that have allowed hazards to cause injuries.
Act Implement controls to minimize or eliminate any hazards that make the risk unacceptable.
Review Conduct frequent work site visits to observe work practices and audit accidents, injuries, and violations to identify root causes.
Train Develop a human factor-based action plan and then involve and train the miners.

Make the RIGHT Decision!
New procedures in New Mexico

• Landmark mine safety legislation was signed by Governor Richardson in March 2006
  – House Bill 687 and Senate Bill 628
• Mine Inspector has established the Mine Accident Emergency Operations Center
  – (866) 761-6039
  – New Mexico Tech
• Requires mines to prepare and file emergency notification plans and that establish a process for notifying the State when mine accidents occur
New procedures in New Mexico

• Mine operators to report accidents to the State within 30 minutes of the event
• Underground mines to provide communications equipment and additional breathing apparatus to underground miners
Safety Belts

“Always operate within design or environmental limits”

“Always operate in a safe and controlled condition”

“Always ensure safety devices are in place and functioning”

“Always follow safe work practices and procedures”
Tenets of Operation
Slogans

“DO IT SAFELY OR NOT AT ALL”

“THERE IS ALWAYS TIME TO DO IT RIGHT”
Information found in Material Safety Data Sheets (MSDS)

An MSDS provides detailed information about a specific product, such as:

1. Identity
2. Hazardous Ingredients List
3. Physical Data and Hazards (i.e., appearance, odor, etc.)
4. Emergency/First Aid Procedures
5. Health Hazards (i.e., symptoms of overexposure)
6. Reactivity Data (i.e., conditions to avoid)
Information found in Material Safety Data Sheets (MSDS)

7. Fire & Explosive Information
8. Spill or Leak Response Procedures
9. Storage & Special Precautions (i.e., how to store, Personal Protective measures to use during handling)
10. Transportation Data - DOT regulations / Hazard class
11. Regulatory Information (i.e., EPA classifications, etc.)
NFPA Labels
(National Fire Protection Association)

Hazard Rankings
Ex. Diesel Fuel

Fire Hazard
0 = Minimum 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Health Hazard

Reactivity Hazards

Special Hazard
Traffic Patterns
What are the **KEYS** to good communication?

**FOCUS!**

**ATTENTION!**

**UNDERSTANDING!**
Ground control, highwalls, pits, stock piles and spoil banks

- Inspect your work area and be alert to any changes in the highwall or stock pile.
- Weather, local geology, size of material and rate of mining effect highwall and stock pile stability.
Water Hazards

• Working around water presents an additional hazard, drowning.
• Life jackets, fall protection and other precautions must be taken when working near water hazards.
Water Hazards

30 CFR Part 56.15020

Life jackets or belts shall be worn where there is a danger from falling into water
Electrical Hazards

• What electrical equipment do you have at your work place?
• Only qualified persons should perform electrical work.
• Lock-out/tag-out policy
• You must be aware of all sources of hazardous energy and know how to control them.
Personal Protective Equipment

Designed for human protection
Approved for specific applications
When something goes wrong, can be the difference between first aid and a medical emergency
Personal Protective Equipment

- Snug Fitting Clothing
- Hard Hat
- Safety Shoes
- Safety Glasses
- Hearing Protection
- Respirators
- Personal Fall Arrest Systems (PFAS)
- Welding PPE
- Any Others?
Personal Protective Equipment

- Any Others?
- Gloves? What will gloves protect?
Prevention of accidents

- Hand Tool Safety
- Fall Protection
- Confined Space
- Material Handling
- Equipment Guarding
- Working Around Machinery
MOST MINES HAVE A SITE HEALTH AND SAFETY PLAN (HASP)

To provide a safe and healthful work place

Plan on what to do in case something goes wrong!

Site specific