Introduction to Managing Risk in Mining: Energy-Based Hazard Recognition
Pre-Test
Hazard Recognition
(Hot Spot Activity)
Can you spot the hazards?
MINING IS A SAFETY-SENSITIVE INDUSTRY

• Working conditions require vigilant attention to personal safety
HAZARDS CAN LEAD TO SERIOUS INJURY AND FATALITIES (SIFs)

Most common sources of SIFs in mining

- Powered haulage
- Machinery
- Slip/fall of a person
- Fall/sliding material
- Fall of face, rib, or highwall
A POSITIVE SAFETY CULTURE IS KEY

A positive safety culture requires:

• A safe physical working environment
• Effective health and safety management system
• Safe behaviors
WHO IS RESPONSIBLE FOR YOUR SAFETY?

- **Employers** must provide a safe working environment
- A **personal commitment** to safety is required to prevent serious injury or fatality
WHY DO YOU WORK SAFE?

• Provide for family and plan for the future
• Allows for lifestyle choices (hobbies, home, vacations, etc.)
• Utilize knowledge and expertise
• Feelings of pride and accomplishment
• Memories often drive behavior...so not to relive the past
Understanding Risk & Hazards
## DEFINITIONS

### RISK

A risk is the chance or probability that you will be harmed or injured if exposed to a hazard.

### RISK ANALYSIS

Risk analysis is a proactive process of eliminating or reducing the threat of hazards.

- Applies to all work processes, whether routine, non-routine, and when changes occur.

<table>
<thead>
<tr>
<th>LIKELIHOOD</th>
<th>Almost Certain</th>
<th>Quite Possible</th>
<th>Not Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manage</td>
<td>Monitor</td>
<td>Monitor</td>
</tr>
<tr>
<td></td>
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<td>Manage</td>
</tr>
</tbody>
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<table>
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<tr>
<th>CONSEQUENCE</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
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</table>

**Legend:**
- **LOW** - Low Risk
- **MEDIUM** - Medium Risk
- **HIGH** - High Risk

**Actions:**
- **Manage**
- **Monitor**
- **Take Action**
LOW PROBABILITY
LOW IMPACT

RISK

LOW PROBABILITY
HIGH IMPACT

RISK

HIGH PROBABILITY
LOW IMPACT

RISK

HIGH PROBABILITY
HIGH IMPACT

RISK

MINES | Energy, Mining & Construction
Industry Safety
DEFINITIONS

EXPOSURE

Exposure is when you are at a risk from a hazard. Three forms include:

• Physical exposure
• Environment exposure
• Potential exposure

HAZARD

A hazard is any source of potential damage, harm or adverse effects on something or someone under certain conditions.
HAZARD RECOGNITION

Hazard recognition is an initial step in the systematic observation of unsafe conditions, negative behaviors and weaknesses that could lead to injuries and illnesses on-the-job.
Tools to Support Safe Work
Field-Level Risk Assessment (FLRA)

- Daily Safety Cards and Workplace Inspections, Pre- and Post-Job Briefs, Task Observations
- Energy-Based Hazard Identification Tool
- Hierarchy of Controls
Hazard Recognition is One of the First Steps in Risk Management
Key Questions to Guide a Field-level Risk Assessment (FLRA):

• What is the task I am doing?
• What could go wrong?
  o What would the consequences be?
  o How likely is it to happen?
• What can and will I do about it?
• How might changes affect other processes?
Reporting hazards and near misses is a proactive way to prevent injuries or a fatality.
A tool to determine how to implement feasible and effective controls to reduce risk.

Hierarchy of Controls

<table>
<thead>
<tr>
<th>Level</th>
<th>Control</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>ELIMINATION</td>
<td>Physically remove the hazard</td>
</tr>
<tr>
<td>2</td>
<td>SUBSTITUTION</td>
<td>Replace the hazard</td>
</tr>
<tr>
<td>3</td>
<td>ENGINEERING CONTROLS</td>
<td>Isolate people from the hazard</td>
</tr>
<tr>
<td>4</td>
<td>ADMINISTRATIVE CONTROLS</td>
<td>Change the way people work</td>
</tr>
<tr>
<td>5</td>
<td>PERSONAL PROTECTIVE EQUIPMENT</td>
<td>Protect the worker with PPE</td>
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Let’s Practice!
What are the main hazards here?

What can be done to control the risk?
<table>
<thead>
<tr>
<th>Hierarchy of Controls</th>
<th>ELIMINATION</th>
<th>PHYSICALLY REMOVE THE HAZARD</th>
<th>Replace the machine with a quieter one that does the same thing</th>
</tr>
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<tr>
<td>MOST EFFECTIVE</td>
<td>SUBSTITUTION</td>
<td>REPLACE THE HAZARD</td>
<td>Adjust the machine or install a muffling device to reduce noise level</td>
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<td>MOST EFFECTIVE</td>
<td>ENGINEERING CONTROLS</td>
<td>ISOLATE PEOPLE FROM THE HAZARD</td>
<td>Install a sound-reduction curtain around machine</td>
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<td>MOST EFFECTIVE</td>
<td>ADMINISTRATIVE CONTROLS</td>
<td>CHANGE THE WAY PEOPLE WORK</td>
<td>Limit amount of time near machine</td>
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<td>LEAST EFFECTIVE</td>
<td>PERSONAL PROTECTIVE EQUIPMENT (PPE)</td>
<td>PROTECT THE WORKER WITH PPE</td>
<td>Wear earplugs while in vicinity</td>
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**MINES** Energy, Mining & Construction Industry Safety
Hazard Recognition
Research & Tools
HAZARD RECOGNITION RESEARCH FINDINGS

45% of hazards are identified

35% of hazards are missed because of cognitive “blind spots”

20% of hazards are missed because they are not reasonably identified before work starts

Hallowell, 2020
FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS.

Count the Fs

3 4 5 6 ✓
TWO OF THE MOST POWERFUL OF ALL HUMAN FEARS ARE THE FEAR OF FAILURE AND THE FEAR OF SUCCESS.
How can we improve our ability to recognize hazards?

Using **tools** to train our brain to stay alert and look for the visible and hidden hazards on a worksite.
Energy-Based Hazard Recognition
### ENERGY WHEEL HAZARD IDENTIFICATION

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<tr>
<th>Energy Category</th>
<th>Definition</th>
<th>Examples</th>
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<td>Gravity</td>
<td>Force caused by the attraction of mass to earth</td>
<td>Uneven work surface, work at height, unsure materials, overhead support structures</td>
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<td>Motion</td>
<td>Change in the physical position or location of objects or substances.</td>
<td>Traffic, mobile equipment, projectiles, dust particles</td>
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<td>Mechanical</td>
<td>Working parts of a machine or assembly, including rotation, vibration, tension, or compression</td>
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<td>Presence of electrical charge or current</td>
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<td>Sound</td>
<td>Audible vibration caused by the contact of two or more objects</td>
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<td>Liquid or gas compressed or under vacuum</td>
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<td>Intensity of heat in an object or substance</td>
<td>Fiction, engines, sudden pressure change, steam</td>
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<td>Toxic objects or substances that pose health risks</td>
<td>Solvents, engine exhaust, silica, wood dust, liquid concrete</td>
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<td>Radiation</td>
<td>Objects or substances that emit electromagnetic waves or subatomic particles</td>
<td>Welding, sun exposure, x-ray testing, radioactive waste</td>
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<td>Living organisms or viruses</td>
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GRAVITY

Force caused by the attraction of mass to the Earth

EXAMPLES: falling object, collapsing roof or trench, equipment tipping over, a body tripping or falling
HAZARD: Equipment tipping over berm
MOTION

Change in the physical position or location of objects or substances

**EXAMPLES:** vehicle, vessel or equipment movement, flowing water, wind and body positioning when lifting, straining or bending
HAZARD: Repetitive motion during maintenance work
MECHANICAL

Working parts of a machine or assembly, including rotation, vibration, tension, or compression

EXAMPLES: rotating equipment, compressed springs, drive belts, conveyors and motors
HAZARD: Wheels not chocked
The presence of electrical charge or current

**EXAMPLES:** power lines, transformers, static charges, lightning, energized equipment, wiring and batteries
HAZARD: Striking underground utilities during excavation
PRESSURE

Liquid or gas compressed or under vacuum

EXAMPLES: pressure piping, compressed cylinders, control lines, vessels, tanks, hoses and pneumatic and hydraulic equipment
PRESSURE

HAZARD: Release of hydraulic fluid during maintenance task
TEMPERATURE

Intensity of heat or cold in an object or substance

EXAMPLES: open flame ignition sources hot or cold surfaces, liquids or gases, steam, friction, and general environmental or weather conditions
TEMPERATURE

HAZARD: Hot saw blade
CHEMICAL

Toxic objects or substances that pose health risks

EXAMPLES: flammable vapors, reactive hazards, carcinogens, corrosives, combustibles, O₂-deficient atmospheres, welding fumes and dusts
HAZARD: Welding fumes
BIOLOGICAL

Living organisms or viruses

EXAMPLES: animals, bacteria, viruses, insects, blood-borne pathogens, improperly handled food and contaminated water
HAZARD: Rattlesnakes on the jobsite
RADIATION

Objects or substances that emit electromagnetic waves or subatomic particles

EXAMPLES: lighting issues, welding arcs, solar rays, microwaves, lasers, X-rays and NORM scale
HAZARD: Exposure to radon in underground mines
SOUND

Audible vibration caused by the contact of two or more objects

EXAMPLES: equipment noise, impact noise, vibration, high-pressure release and the impact of noise to communication
HAZARD: Amplified sound during confined space entry
Questions?
Post-Test
Hazard Recognition
(Hot Spot Activity)