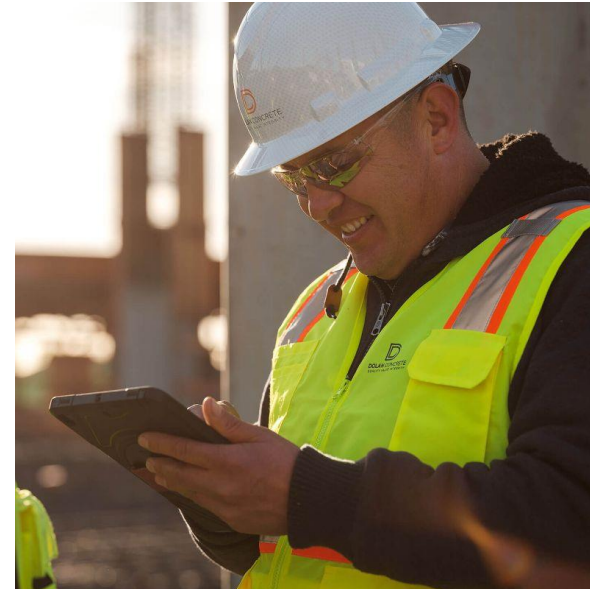
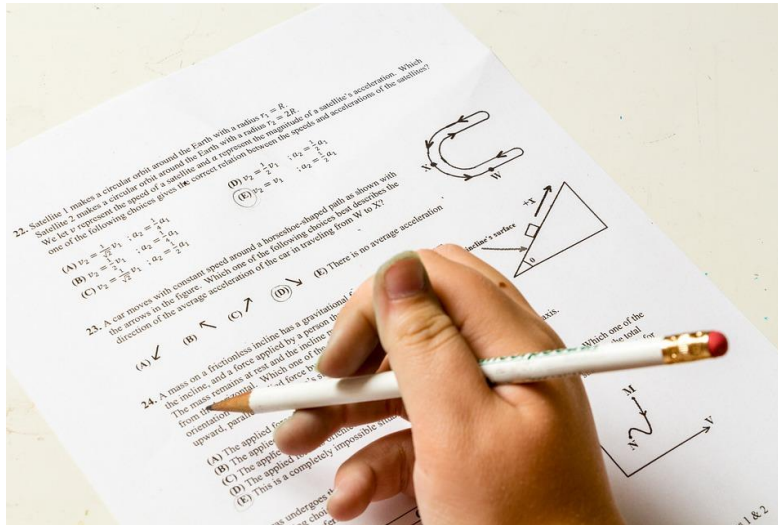

Introduction to Managing Risk in Mining: Energy-Based Hazard Recognition

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Pre-Test Hazard Recognition (Hot Spot Activity)



Can you spot the hazards?



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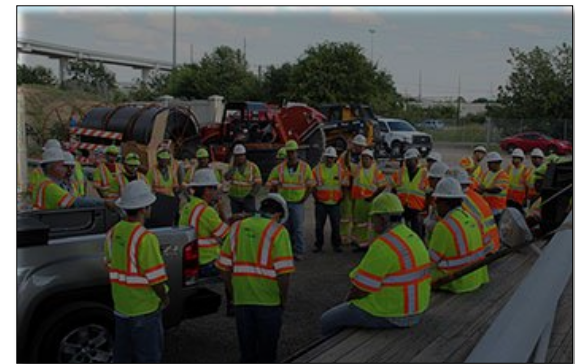


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MINING IS A SAFETY-SENSITIVE INDUSTRY

- 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

Shared Responsibility



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

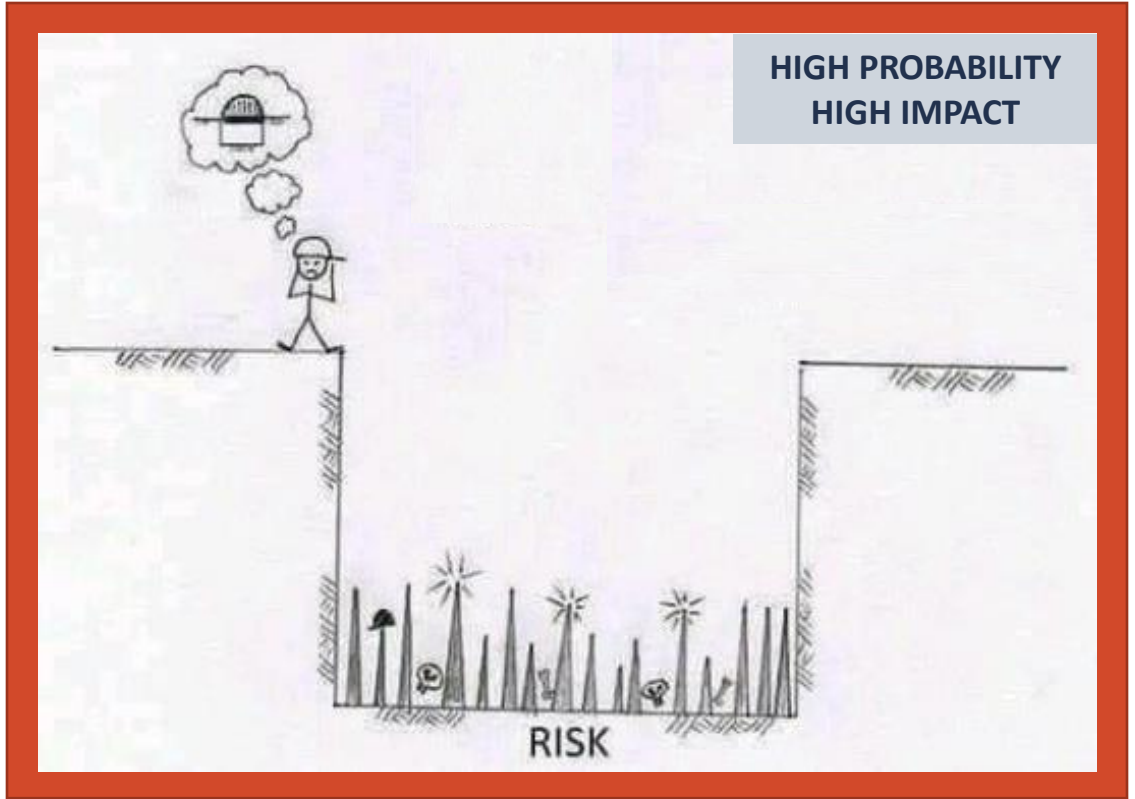
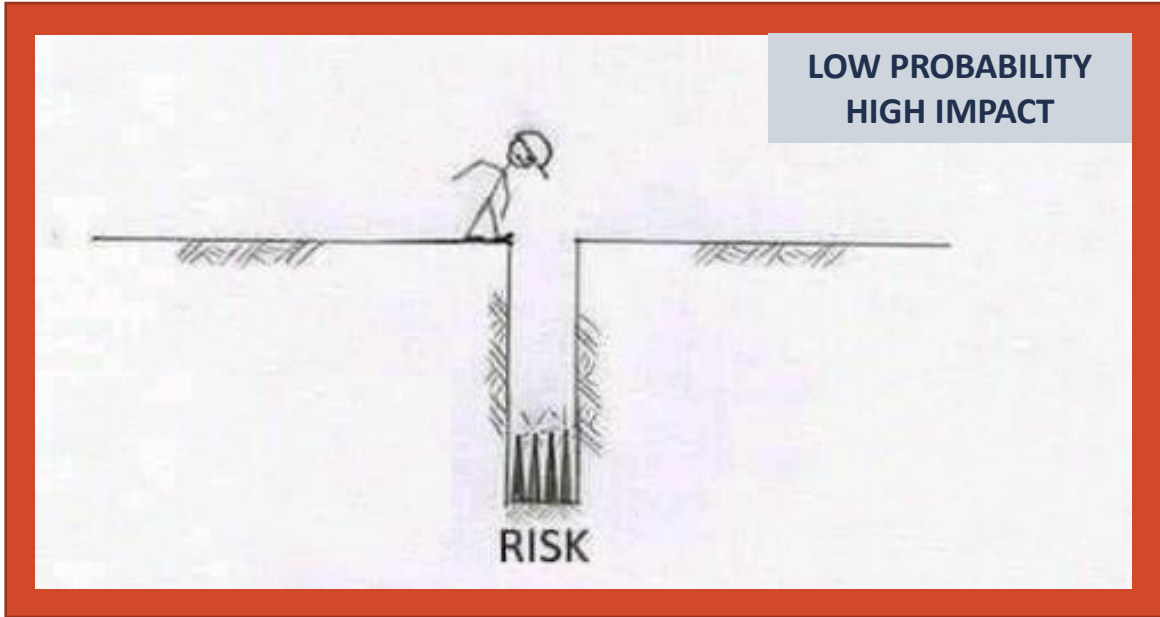
Risk analysis is a proactive process of eliminating or reducing the threat of hazards

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

LIKLIHOOD

Almost Certain	Manage	Take Action	Take Action
Quite Possible	Monitor	Manage	Take Action
Not Very Likely	Monitor	Monitor	Manage
	LOW	MEDIUM	HIGH

CONSEQUENCE



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



DEFINITIONS

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

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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



Field Level Risk Assessment (FLRA)

STOP & Correct

Resume Work → Control Risks → Identify Hazards → Assess Risks

Supervisor: _____ **Date:** _____
Job/Location: _____ **Task Location:** _____
Work to Be Done: _____ **Company/Contractor:** _____

Permit Identified Hazards

- Working at heights permit
- Hazards identified on Safe Work Permit
- Hazards identified on Hot Work Permit
- Hazards identified on Critical Lift Permit

Working at Heights

- Harness required/Tie-off identified
- Others working above/below
- Area below barricaded/off
- Falls from height
- Objects falling from work area
- AWP/EWP
- Elevated work platform ground conditions
- Scaffold inspected and tagged
- Ladder tied off
- Personal baskets inspected and approved
- Hoisting tools (come-a-longs) inspected
- Hoisting tools sized for job
- Barricades, tags and signs in place

Ergonomic Hazards

- Awkward body position
- Lift too heavy/awkward to lift
- Walk area not clear/level
- Repetitive motion
- Prolonged twisting/bending position

Work Environment Hazards

- Parts of body in line of fire
- Slips or trips possible
- Limited access/egress
- Foreign bodies in eyes
- Exposure to electrical hazards
- Lock-out procedure
- Lighting levels too low
- Position of hands - pinch points
- Exposure to heat/cold
- Exposure to steam
- Exposure to noise
- Exposure to chemical
- Exposure to dust

Emergency

- Emergency meeting point
- Evacuation routes
- Evacuation location

Rigging Hazards

- Slings and rigging in good condition
- Signaller identified (vest/gloves)
- Load weight identified
- Lifting overhead/live equipment
- Overhead power line
- Equipment inspected
- Barricades, tags and signs in place
- Holes covered, secured and identified

Personal Limitations

- Procedure not available for task
- No training for tools to be used
- First time performing this task
- Distractions in area
- Confusing instructions
- MSDS reviewed

Equipment Hazards

- Operating power equipment
- Tools adequately guarded
- Working with grinders
- Circular saws
- Chain saws
- Power activated tools
- Cutting torches
- Hand tools (knives, saws)
- Jackleg/stoper drills

Other

- GFCI required
- Fire extinguisher
- Fire hose
- Fire watch/safety stand by person
- Spotter/signal person

At the third column, writing in the plans to eliminate the hazards. It is important that all the hazards have plans to eliminate them conditions change.

At the task(s). Here is a list of possible hazards to help you identify them. Put a mark beside all that apply and list them on the other

Case Version: October 2018

THYSSEN MINING EMPLOYEE DAILY TIME CARD

Employee Name: _____ Date: _____
 Occupation: _____ Shift: _____
 Workplace 1: _____ Time: _____
 Workplace 2: _____ Time: _____
 Workplace 3: _____ Time: _____

Y	N	NA	WP 1	WP 2	WP 3
Are hot work permits in place?					
Are Lock-out / Tag-out / Try-out in place?					
Is ventilation/control in good order?					
Is dust wet down?					
Is scaling required?					
Are proper scaling bars available?					
Is B.O. ground support out off?					
Is more ground support needed?					
Are Air/Water in proper order?					
Are chock blocks available & in use?					
Is proper PPE in use?					
Is fall protection in use and inspected?					
Are proper signs, barricades, & covers in place?					
Are out, lifts, & loadings properly marked?					
No explosives present?					
Are lockers in good condition?					
Have you been properly task trained for your assigned jobs & equipment?					
5-Point Safety System Check. Circle Y or N.					
Are entrance & egress in proper condition?	Y	N			
Are workplace & equipment in proper condition?	Y	N			
Is work being done safely & according to standards?	Y	N			
Do an Act of Safety?					
Can & will I continue to work safely?	Y	N			
Any incidents to report? Injury / PD / NM	Y	N			

Supervisor: _____
 Superintendent: _____

THYSSEN MINING EMPLOYEE DAILY SAFETY CARD

Date: _____ Shift: _____
 Employee Name: _____
 Occupation: _____
 Workplace 1: _____ Time: _____
 Workplace 2: _____ Time: _____
 Workplace 3: _____ Time: _____

Equip 1	Equip 2	Equip 3
Hydraulic Power Pac Hours (Jumbo Left Drifter Hours)		
Hydraulic Power Pac Hours (Jumbo Right Drifter Hours)		
Rims, Lug Nuts, & Tires (Before Start Up)		
Walk Around (Before Start Up)		
Transmission Oil Level		
Engine Oil Level		
Diesel Fuel Level		
Hydraulic Oil Level		
Fire Extinguisher / Fire Suppression		
Content Levels		
Oil Leaks		
Belts & Guards		
Operator Compartment (Before Start Up)		
Parking Brake		
Controls		
Housekeeping		
Grease All Fittings		
Brakes		
Operation / Adjustment		
Emergency		
Platform Brake Test		
Gauges, Lights, & Horn		
Downtime Hours During Shift		
Equipment Status End of Shift (OK or BO)		

Master Mechanic: _____
 Signature: _____

Hazard Recognition is One of the First Steps in Risk Management

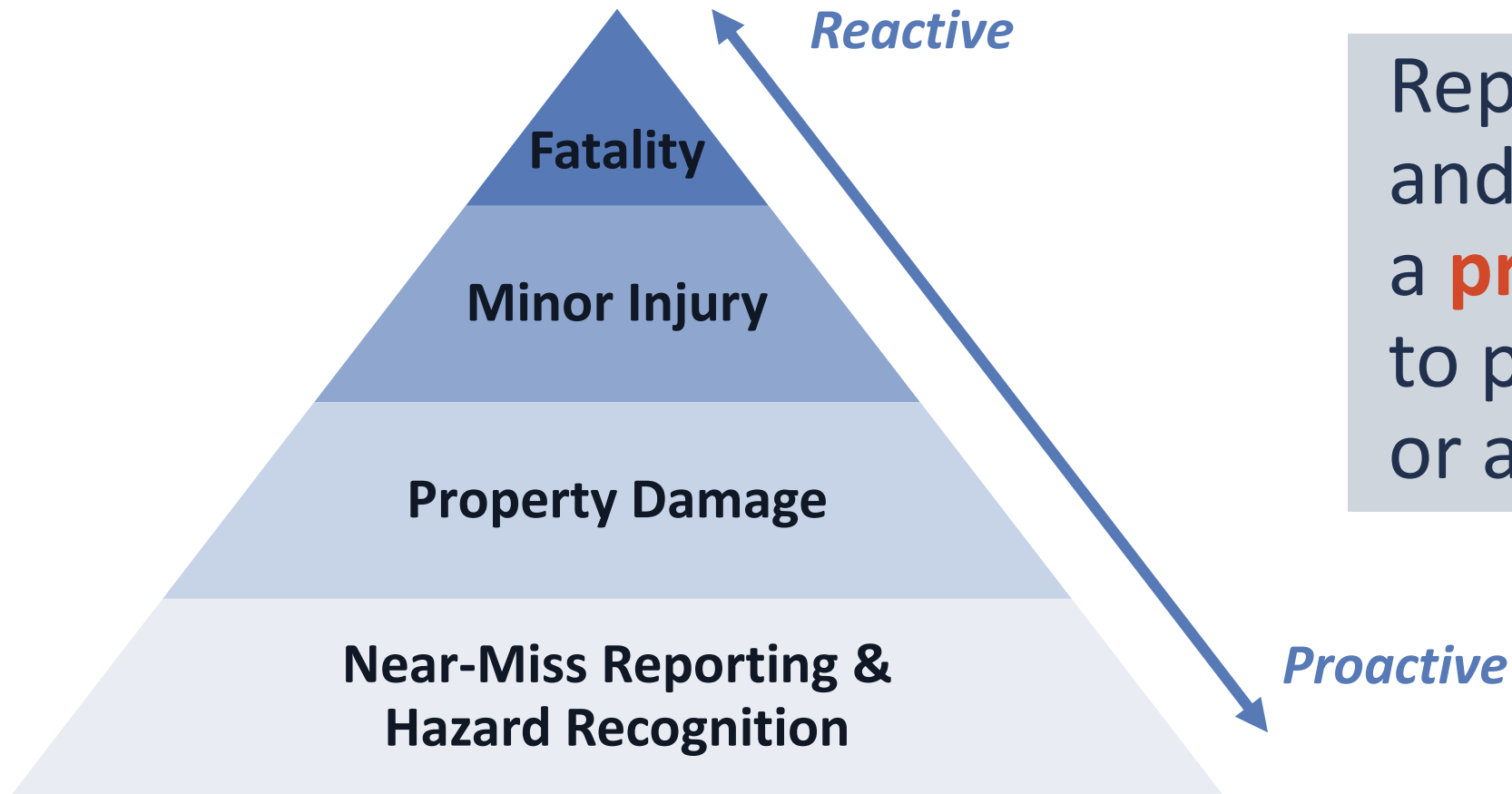


Key Questions to Guide a Field-level Risk Assessment (FLRA):

- What is the task I am doing?
- What could go wrong?
 - What would the consequences be?
 - How likely is it to happen?
- What can and will I do about it?
- How might changes affect other processes?



Near Miss & Hazard Reporting



Reporting hazards and near misses is a **proactive** way to prevent injuries or a fatality

Hierarchy of Controls

A tool to determine how to implement feasible and effective **controls** to reduce risk



Let's Practice!

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What are the main hazards here?

What can be done to control the risk?



HOC APPLIED: *LOUD* Processing Machine

Hierarchy of Controls MOST EFFECTIVE ↓ LEAST EFFECTIVE		ELIMINATION Physically remove the hazard	Replace the machine with a quieter one that does the same thing
		SUBSTITUTION Replace the hazard	Adjust the machine or install a muffling device to reduce noise level
		ENGINEERING CONTROLS Isolate people from the hazard	Install a sound-reduction curtain around machine
		ADMINISTRATIVE CONTROLS Change the way people work	Limit amount of time near machine
		PERSONAL PROTECTIVE EQUIPMENT (PPE) Protect the worker with PPE	Wear earplugs while in vicinity

Hazard Recognition Research & Tools

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HAZARD RECOGNITION RESEARCH FINDINGS



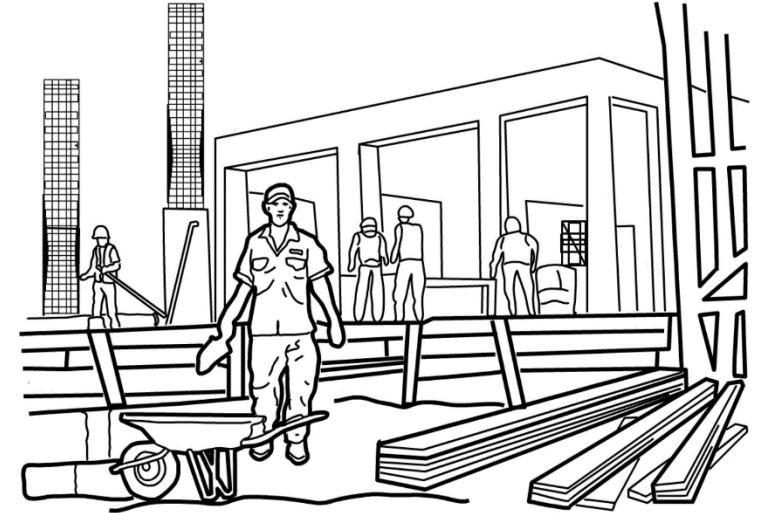
45%

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

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Count the Fs

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

3

4

5

6



Count the Fs

TWO OF THE MOST POWERFUL OF ALL HUMAN
FEARS ARE THE FEAR OF FAILURE AND THE
FEAR OF SUCCESS.

6

7

8

9













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

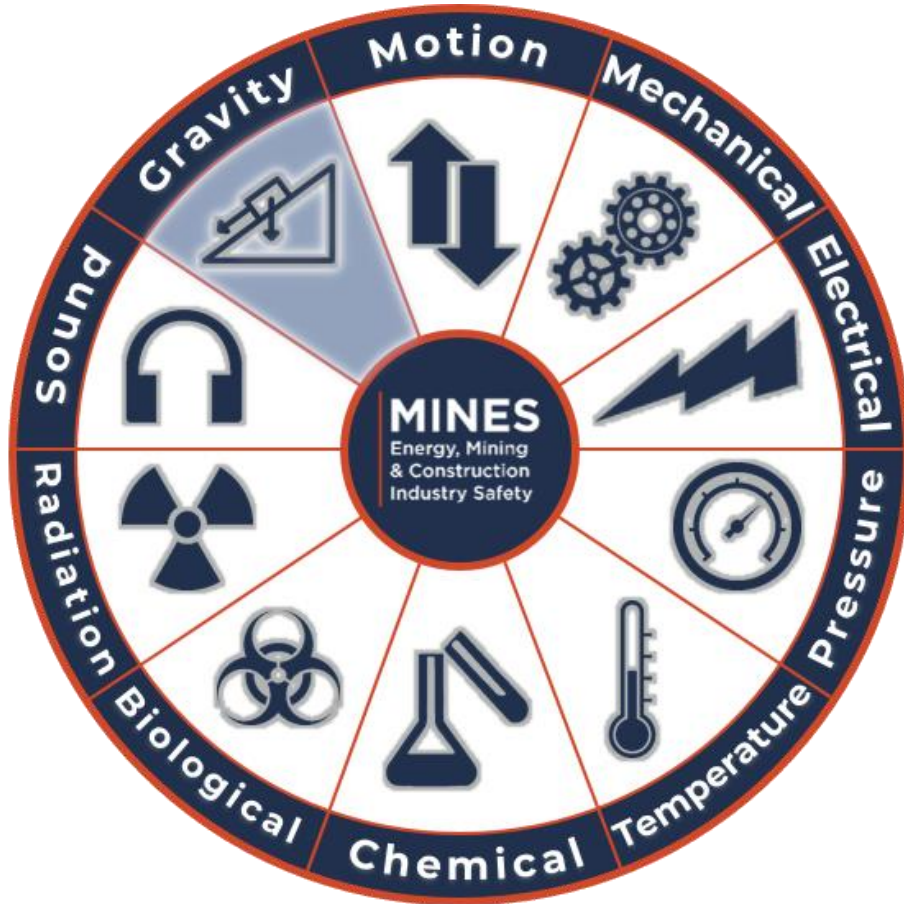
ENERGY WHEEL HAZARD IDENTIFICATION

	Energy Category	Definition	Examples
	Gravity	Force caused by the attraction of mass to earth	Uneven work surface, work at height, unsure materials, overhead support structures
	Motion	Change in the physical position or location of objects or substances.	Traffic, mobile equipment, projectiles, dust particles
	Mechanical	Working parts of a machine or assembly, including rotation, vibration, tension, or compression	Auger, cable, chain fall, angle grinder, gears, pulleys
	Electrical	Presence of electrical charge or current	Wires, power lines, power tools, extension cords, transformer, relay
	Sound	Audible vibration caused by the contact of two or more objects	Heavy machinery, pile driving, power tools, nail gun
	Pressure	Liquid or gas compressed or under vacuum	Pneumatic tire, piping system, tank, hydraulic lines
	Temperature	Intensity of heat in an object or substance	Fiction, engines, sudden pressure change, steam
	Chemical	Toxic objects or substances that pose health risks	Solvents, engine exhaust, silica, wood dust, liquid concrete
	Radiation	Objects or substances that emit electromagnetic waves or subatomic particles	Welding, sun exposure, x-ray testing, radioactive waste
	Biological	Living organisms or viruses	Bees, snakes, alligators, bears, restrooms



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GRAVITY



Force caused by the attraction of mass to the Earth

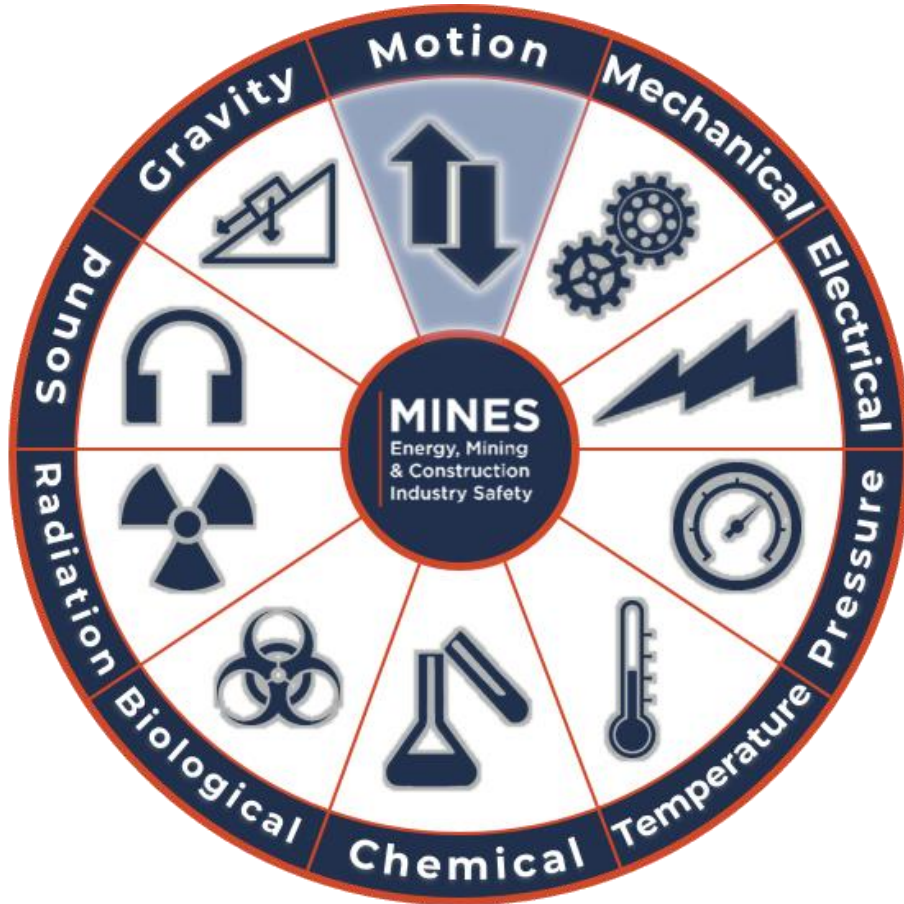
EXAMPLES: falling object, collapsing roof or trench, equipment tipping over, a body tripping or falling

GRAVITY



HAZARD: Equipment tipping over berm

MOTION



Change in the physical position or location of objects or substances

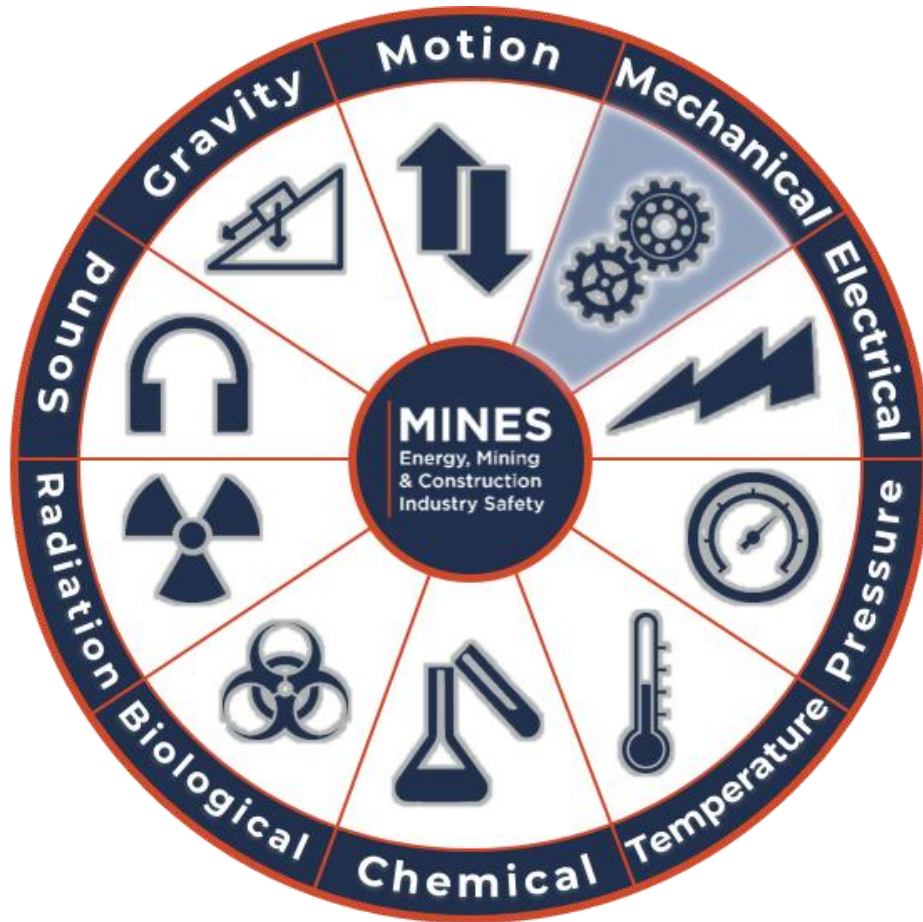
EXAMPLES: vehicle, vessel or equipment movement, flowing water, wind and body positioning when lifting, straining or bending

MOTION



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

MECHANICAL

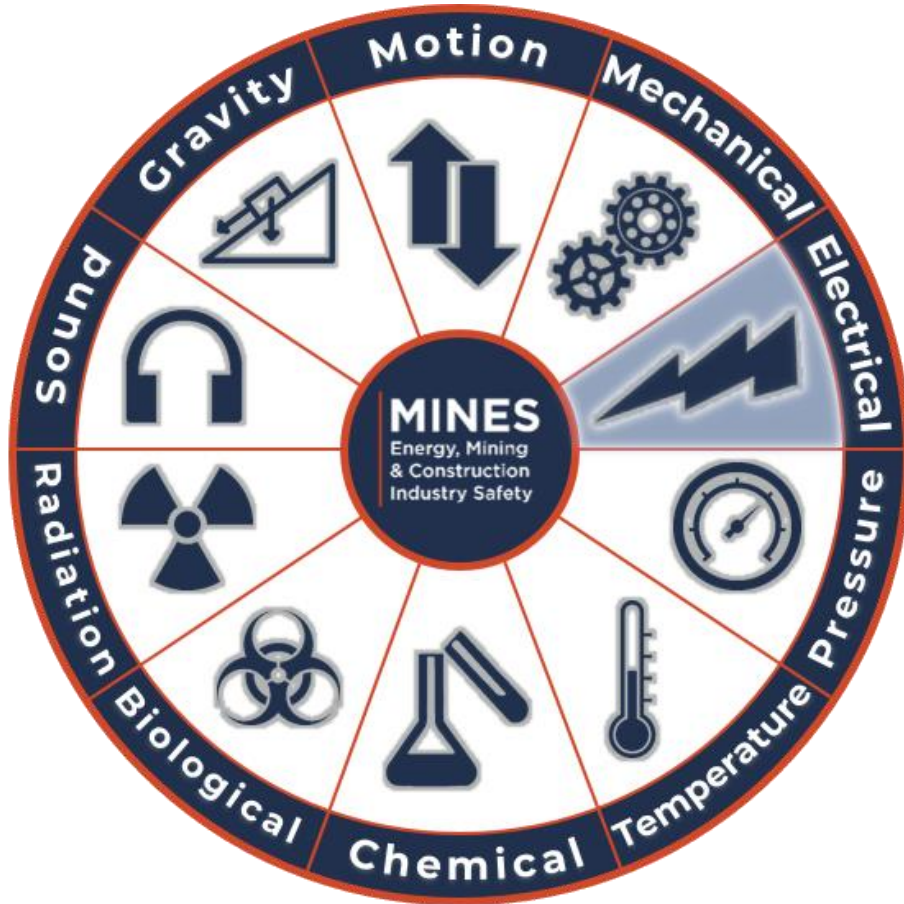


HAZARD: Wheels not chocked

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ELECTRICAL



The presence of electrical charge or current

EXAMPLES: power lines, transformers, static charges, lightning, energized equipment, wiring and batteries

ELECTRICAL

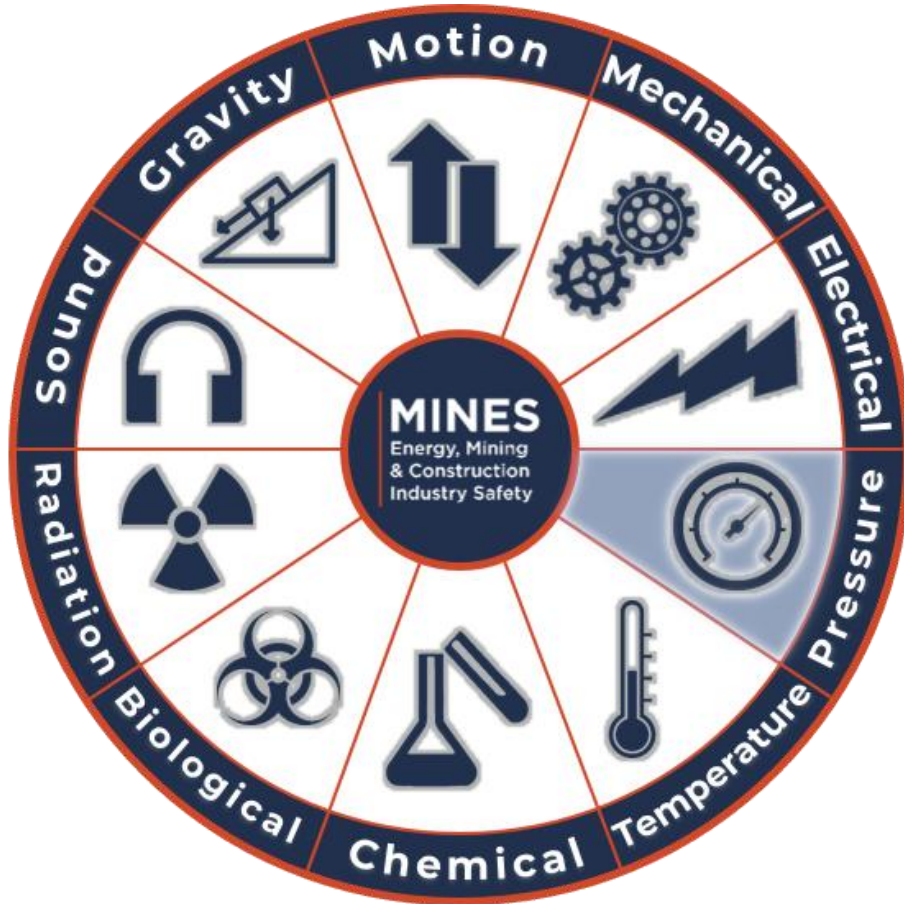


HAZARD: Striking underground utilities during excavation

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PRESSURE



Liquid or gas compressed or under vacuum

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

PRESSURE

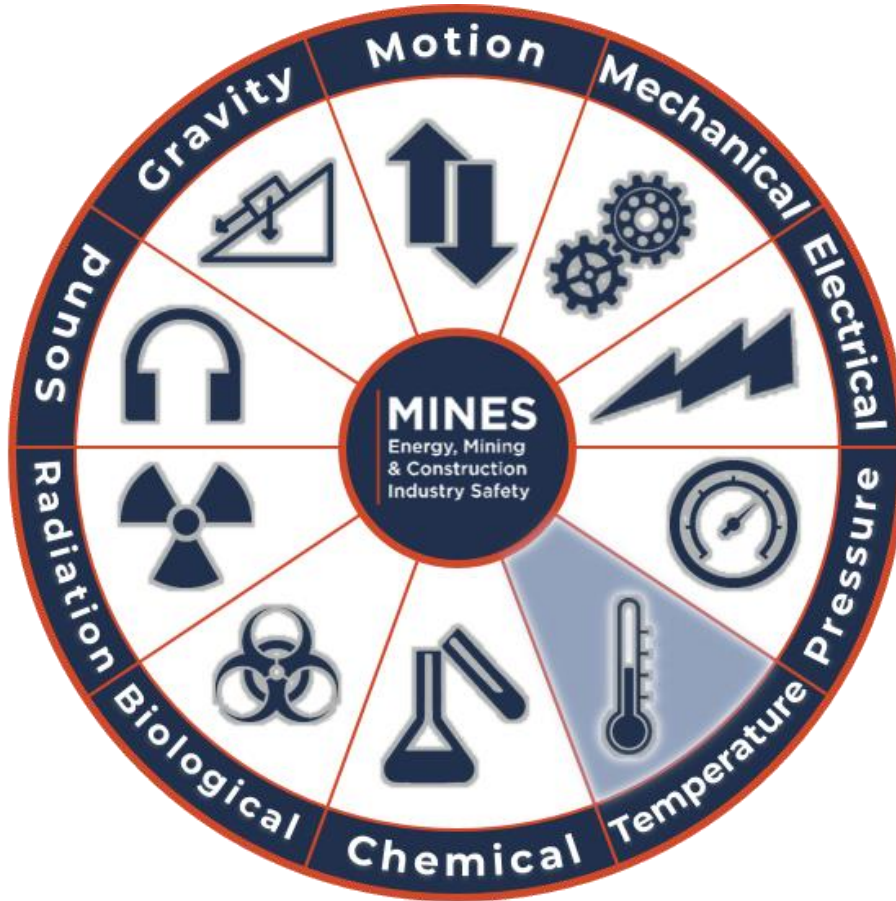


HAZARD: Release of hydraulic fluid during maintenance task

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TEMPERATURE



Intensity of heat or cold in an object or substance

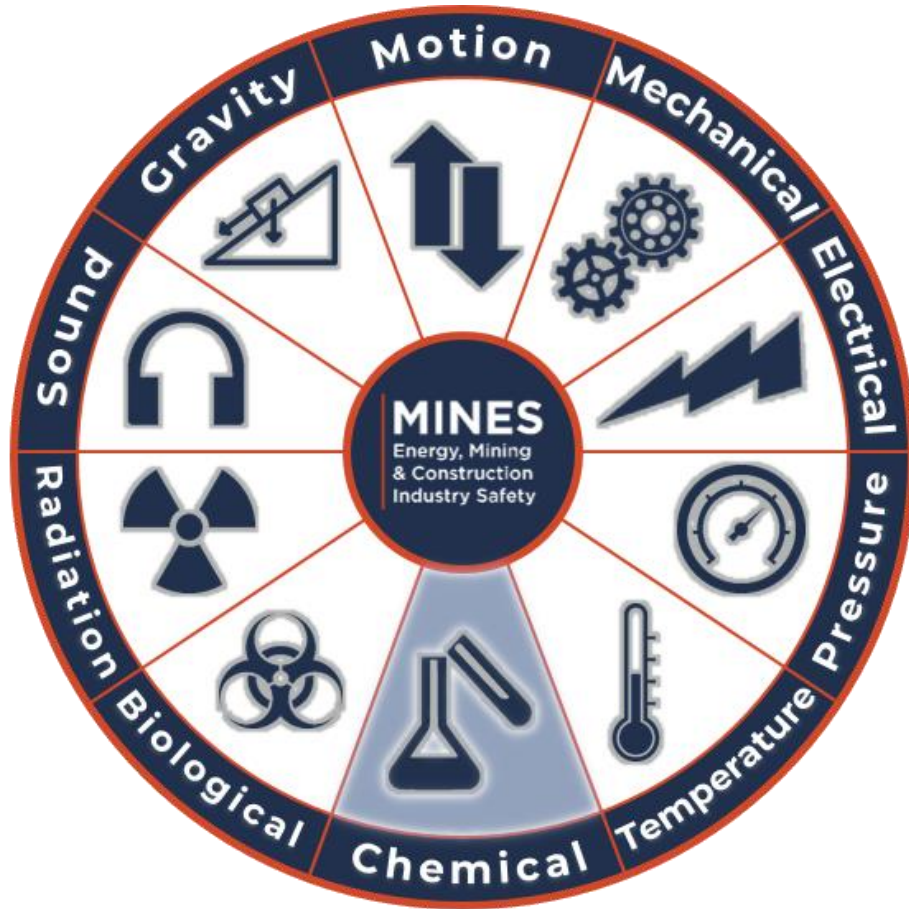
EXAMPLES: open flame ignition sources hot or cold surfaces, liquids or gases, steam, friction, and general environmental or weather conditions

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

CHEMICAL

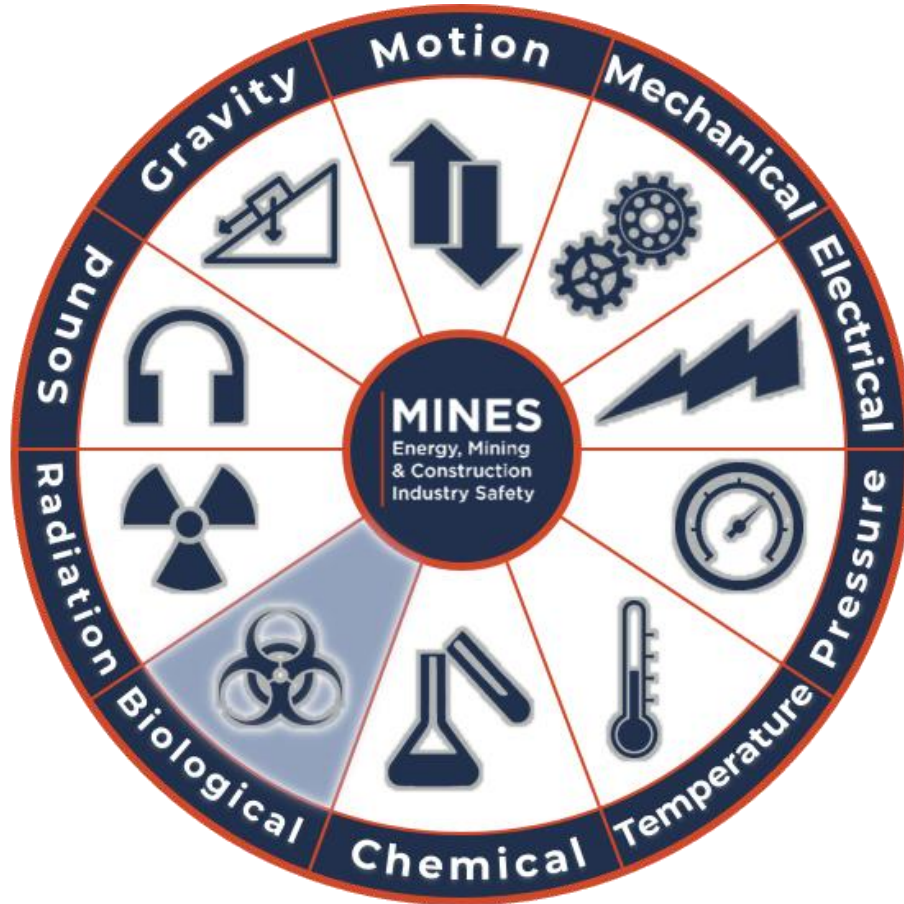


HAZARD: Welding fumes

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BIOLOGICAL



Living organisms or viruses

EXAMPLES: animals, bacteria, viruses, insects, blood-borne pathogens, improperly handled food and contaminated water

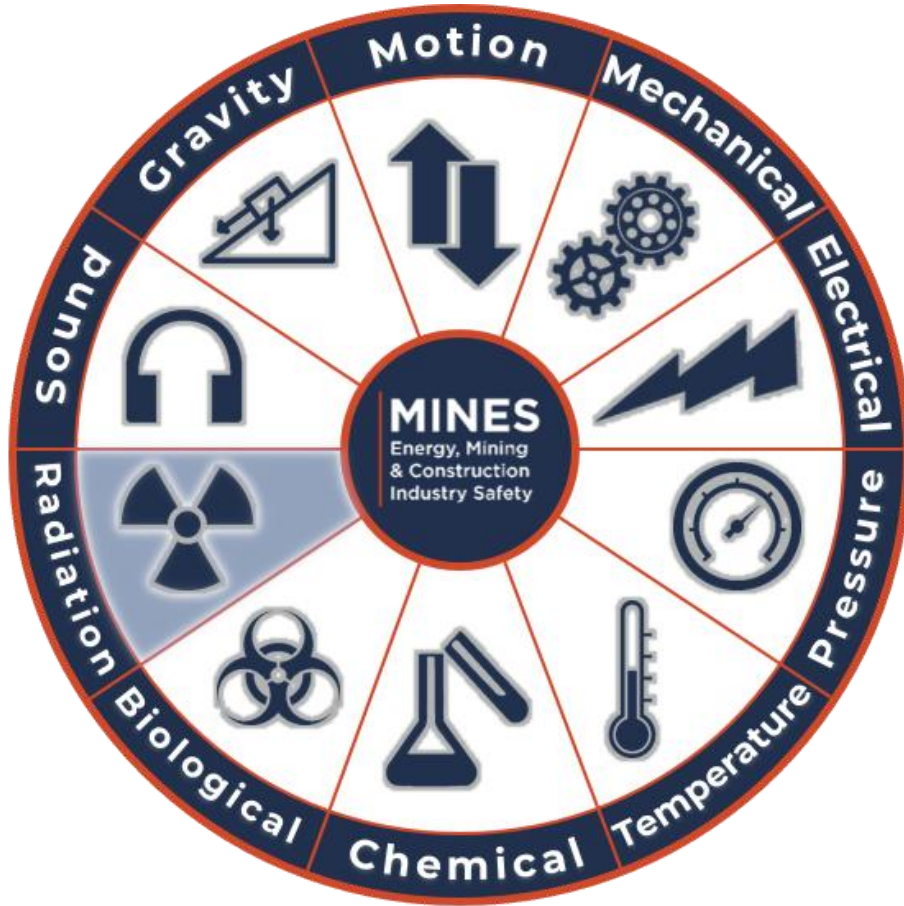
BIOLOGICAL



HAZARD: Rattlesnakes on the jobsite



RADIATION



Objects or substances that emit electromagnetic waves or subatomic particles

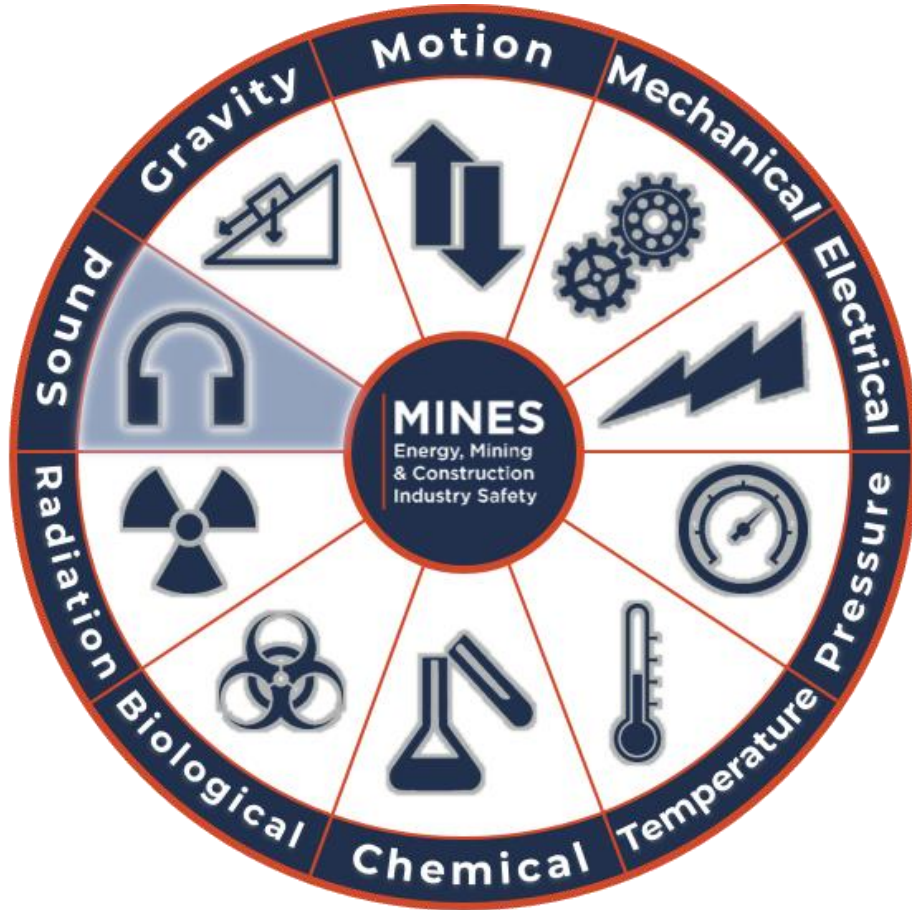
EXAMPLES: lightning issues, welding arcs, solar rays, microwaves, lasers, X-rays and NORM scale

RADIATION



HAZARD: Exposure to radon in underground mines

SOUND



Audible vibration caused by the contact of two or more objects

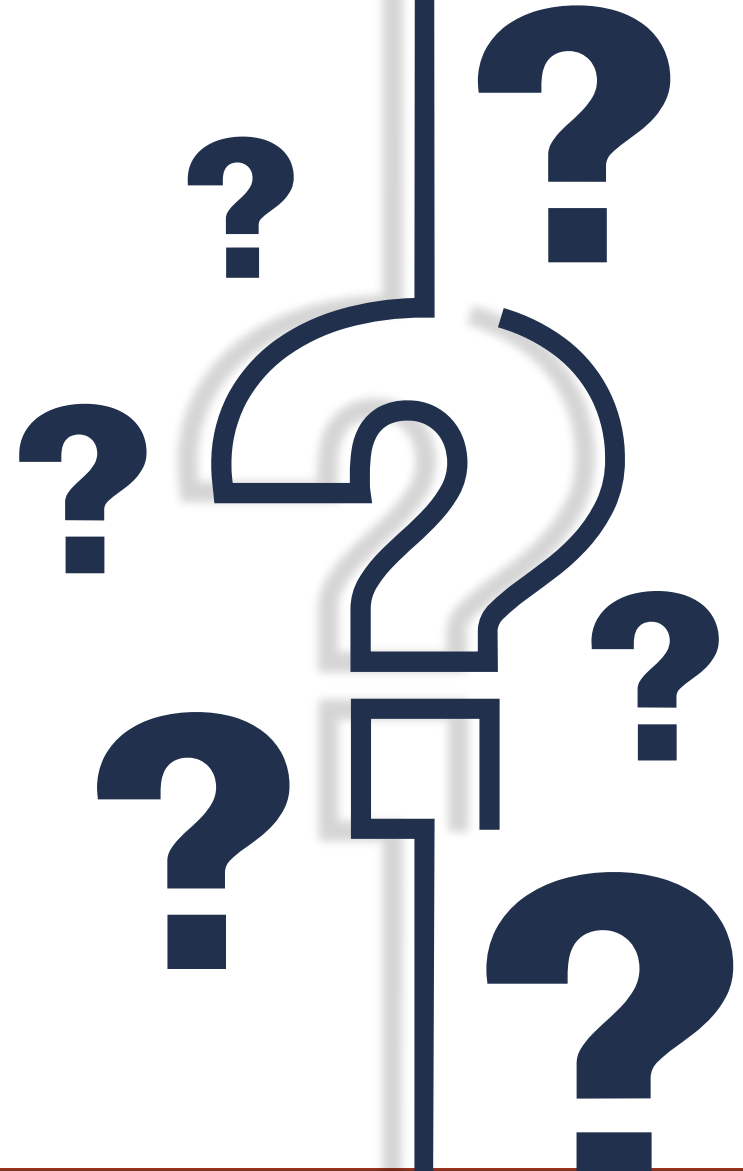
EXAMPLES: equipment noise, impact noise, vibration, high-pressure release and the impact of noise to communication

SOUND



HAZARD: Amplified sound during confined space entry

Questions?



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Post-Test Hazard Recognition (Hot Spot Activity)



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