ARE YOU IN THE "LINE OF FIRE?"

Stored Energy and Control Activity Package

SETTING THE STANDARD IN OIL AND GAS SAFETY

ENERGY SAFETY CANADA

STORED ENERGY– ARE YOU IN THE "LINE OF FIRE?" INJURY REDUCTION CAMPAIGN

You are in the line of fire when you are at risk of coming into contact with a force your body cannot endure.

Stored energy awareness is:

Stored Energy
Contact with stored energy
Includes pressure releases

Striking Hazards
Struck by or striking against an object
Includes dropped objects

Crushing Hazards
Caught in, on or between an object
Includes hand injuries

WHAT IS STORED ENERGY?

"Pent up" energy that can be released unexpectedly.

Energy may be inherent to the type of energy, e.g. radiation or biological hazards. Other types are a function of a condition such as pressure with pressurized water or tension in a spring i.e. mechanical. Often, energy types will be present in combinations.

Consider what you can do to protect yourself and others from injuries that are caused by stored energy and energy releases.

STORED ENERGY

Gravity – Enables objects to fall, roofs to collapse and people to trip and fall.

Motion – The movement of vehicles, equipment or materials, water, wind or a person's body or part of body, such as arm.

Mechanical – Rotating equipment, drive belts, conveyers, motors or compressed springs.

Electrical – Power lines, transformers, generators, wiring, batteries, static charges and lightning.

Pressure – Piping, vessels, tanks, hoses compressed cylinders and pneumatic and hydraulic equipment.

STORED ENERGY

Temperature – Ignition sources, hot or cold surfaces or materials, steam, friction and weather.

Chemical – Flammable vapours and gases, combustibles, pyrophorics, toxic compounds, corrosives, oxygen-deficient atmospheres, welding fumes and dust.

Radiation – Lighting issues, solar rays, welding arcs, microwaves, lasers, x-rays and NORM.

Sound – Equipment noise, vibration, high-pressure release, and the impact of noise to communications.

Biological – Bacteria, viruses, fungi, parasites, insects, poisonous plants and animals.

HAZARD IDENTIFICATION AND CONTROL

There are many opportunities to identify hazards and control risks before starting work.

1. **Design Hazard Analysis:**
   - Identifies inherent process, operations and maintenance hazards at the design stage.
   - Actions taken to eliminate risks through engineering and administrative controls.
2. **HAZOP - Hazard Operability Study:**
   - Typically a project-specific analysis.
3. **Formal Hazard Assessment (Task Analysis):**
   - Analysis led by training coordinator, which leads to procedures and safe work plans.
4. **Planning Risk Assessment:**
   - Planners identify and assess hazards, then institutionalize plans to mitigate risks to acceptable levels.
5. **Supervisory – Work Assignment/Allocation.**
   - Supervisors confirm worker competency and suitability for work assignment and arrange final work preparation.
6. **Field Level Hazard Assessment:**
   - Final field check conducted by knowledgeable workers involved in a task, identify additional hazards and mechanisms to control risks.

OPPORTUNITIES TO IMPROVE HAZARD IDENTIFICATION AND CONTROL

Purpose: To focus on the two opportunities below to create awareness and to promote the development of tactics to overcome obstacles in hazard identification and control.

1. **How to identify potential hazards?**
   - What are sources of stored energy? How can they turn into things that can hurt us?

2. **What could get in the way of hazard identification?**
   - Familiarity
   - Complacency
   - Risk compensation
   - Peer pressure
   - Authoritative pressure
   - Cognitive failure
   - Operational discipline

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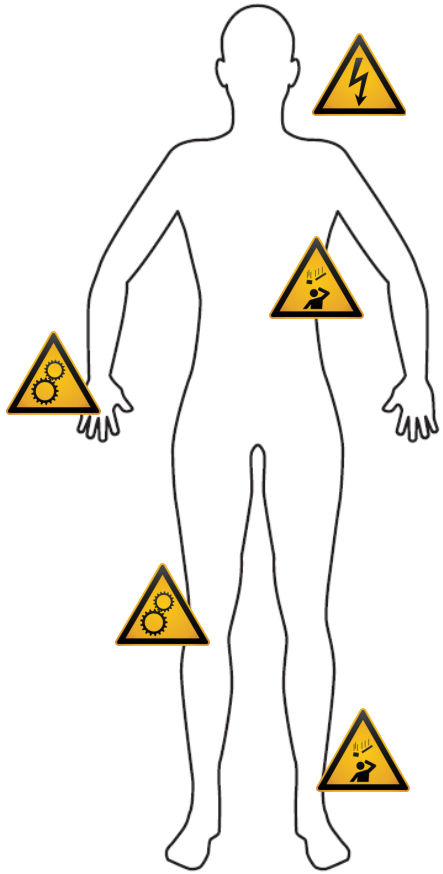
WHAT DO OUR INCIDENTS TELL US?

Where on a worker's body have our line of fire incidents impacted?

[insert your incidents on the body]

Parts of body such as:

- Head
- Eyes
- Ears
- Breathing zone
- Neck
- Chest
- Back
- Arms
- Hands
- Fingers
- Legs
- Feet



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FIELD LEVEL HAZARD IDENTIFICATION AND RISK CONTROL

When identifying hazards, you must consider the following hazard zones:

Near Ground - hazards in the immediate work area.

- Buried hazards
- Overhead hazards
- Airborne hazards
- Contents of process piping systems
- Energy sources

Mid Ground - hazards adjacent to the work area.

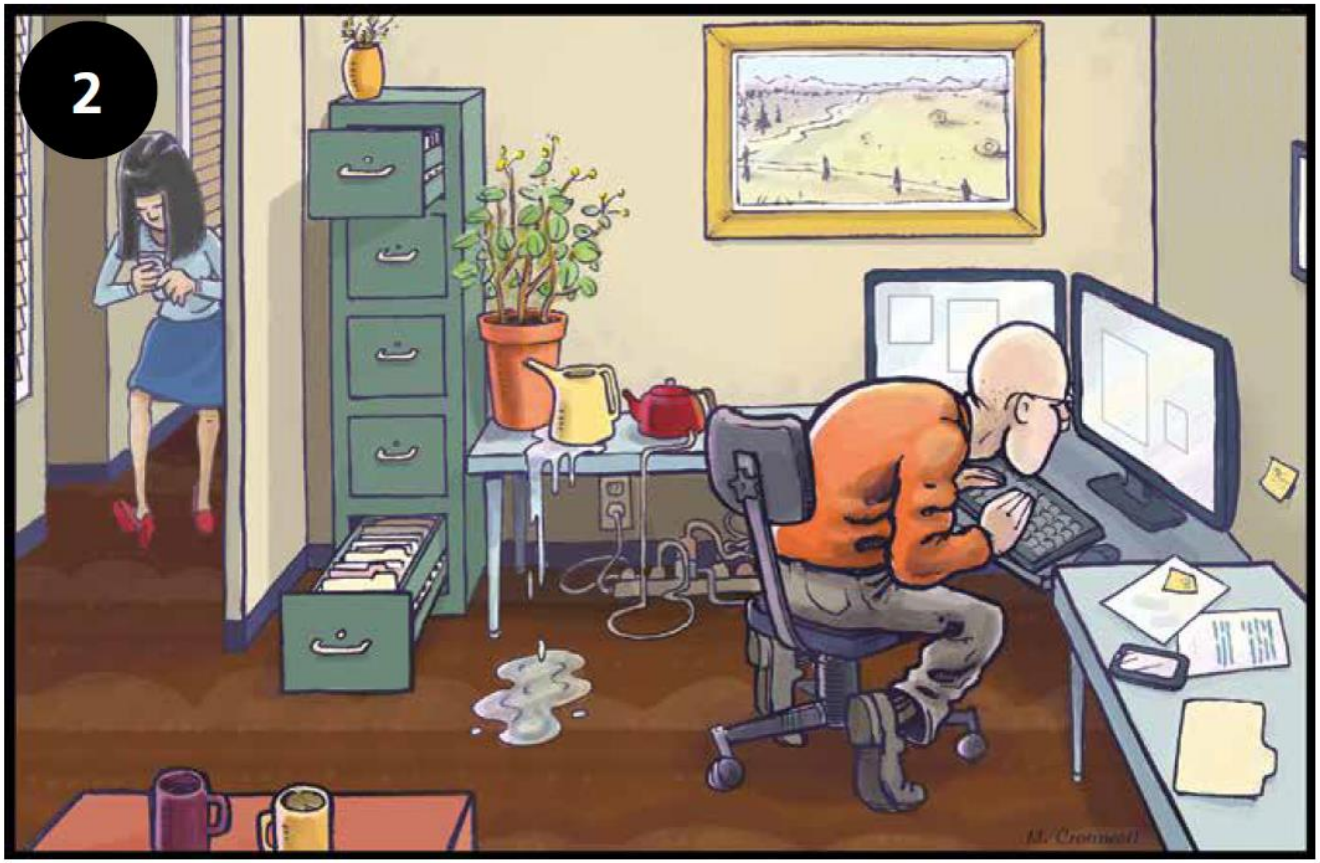
- Work activities that have the potential to impact the immediate work area.

Far Ground - hazards that have the potential to enter the work area (e.g. other workers, crews or conditions). Concurrent work or simultaneous operations.

- Hazards you may cause as a result of your work activity.

NEAR GROUND HAZARDS IN THE WORKPLACE

MID GROUND HAZARDS IN THE WORKPLACE



FAR GROUND HAZARDS IN THE WORKPLACE

WHAT GETS IN THE WAY OF HAZARD IDENTIFICATION?

Familiarity:

Have you been doing the same job forever like the beaver in the photo?….

Complacency:

From a paper presented by E.J. Smith in 1907

"When anyone asks me how I can best describe my experience of nearly 40 years at sea, I merely say uneventful. Of course there have been winter gales and storms and fog and alike, but in all my experience, I have never been in an accident of any sort worth speaking about.

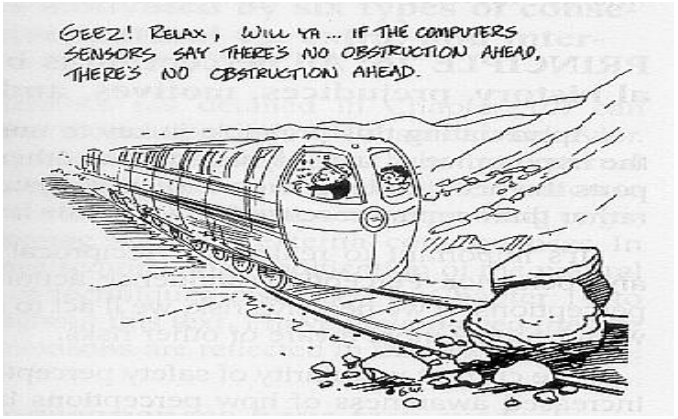
I have seen but one vessel in distress in all my years at sea… I never saw a wreck and have never been wrecked, nor was I ever in any predicament that threatened to end in disaster of any sort."

On April 14, 1912, the RMS Titanic sank and 1,500 lives were lost, one of which was its captain, E.J. Smith.

WHAT GETS IN THE WAY OF HAZARD IDENTIFICATION?

Risk Compensation:

Have you ever misunderstood the hazard like the train operator in the photo?...



Cognitive Failure:

Forgetting the process

- Ever walk into a room and forget why you went there?
- External and internal influences affect your ability to perform (or remember to do something).
- Ever witnessed an inattentive driver sense movement in the traffic and automatically press the accelerator, even though the light is still red?

FIT FOR DUTY

One of Energy Safety Canada's 10 Life Saving Rules is **Fit for Duty**.
This rule indicates:

Be in a state to perform work safely

- I will be physically and mentally in a state to perform my assigned duties
- I commit to not being under the influence of alcohol or drugs
- I will inform a supervisor immediately if I or a co-worker may be unfit for work

FIT FOR DUTY

FIT FOR DUTY - GROUP DISCUSSION

We can improve worker performance, but we will never eliminate human error.

The system of controls needs to be robust enough so when an error is made, there is capacity to prevent a serious injury or fatality.

Ask yourself, where in our operations are we one error away from a serious injury or fatality or put another way, where can we not fail safe?

WHAT GETS IN THE WAY OF HAZARD IDENTIFICATION?

Peer Pressure:

- Not reporting because no one else does.
- Taking short cuts.
- Maintaining the status quo.

Authority Pressure:

- The feeling that this job is just too important to have any delays.
- Inability to collaborate.
- Not understanding the purpose of the work.

ENERGY SAFETY CANADA

STRATEGY TO OVERCOME THESE ROADBLOCKS
EXAMPLES OF HOW TO DEMONSTRATE OPERATIONAL DISCIPLINE

Ineffective way:

1. Just there to be visible.
2. Talking “at” people.
3. Expecting a “dog and pony” show (an elaborate display to convince opinion).
4. Not being knowledgeable about the site and its risks before visiting.
5. Looking for the common problems, rather than the hard-to-find risks.

Effective way:

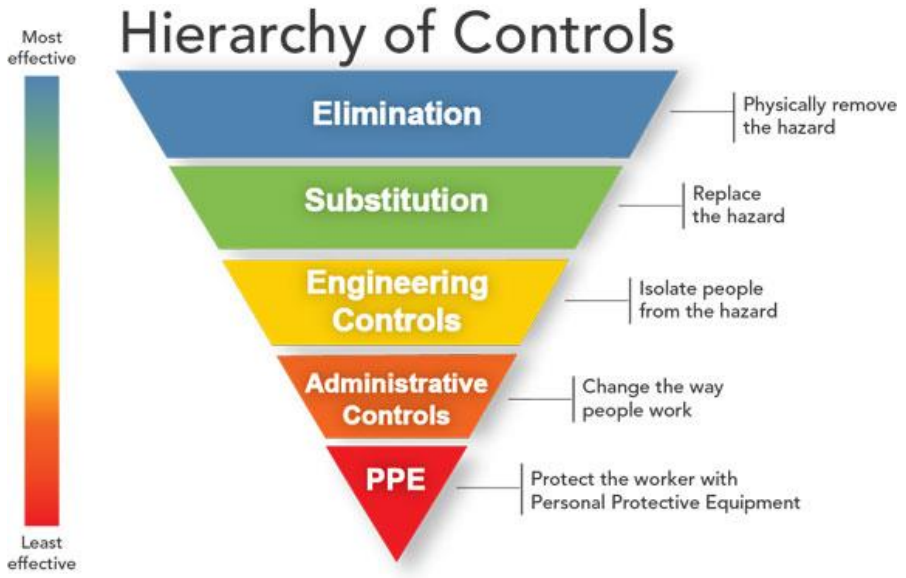
1. Ask employees questions about what they are doing and why.
2. Ask to see the procedures people are following and verify steps.
3. Review past audits or assessments before visiting and verify completion of corrective actions.
4. Conduct visits in other functional areas and expect the same from peers.
5. Work with leaders in other areas to identify best practices.

HAZARD CONTROLS (CORRECTIVE AND PREVENTATIVE ACTIONS)

Hierarchy of Controls

The types of controls used in order of preference (hierarchy) are:

1. Elimination or substitution
2. Engineering controls
3. Administrative controls
4. Personal protective equipment



* Image by NIOSH

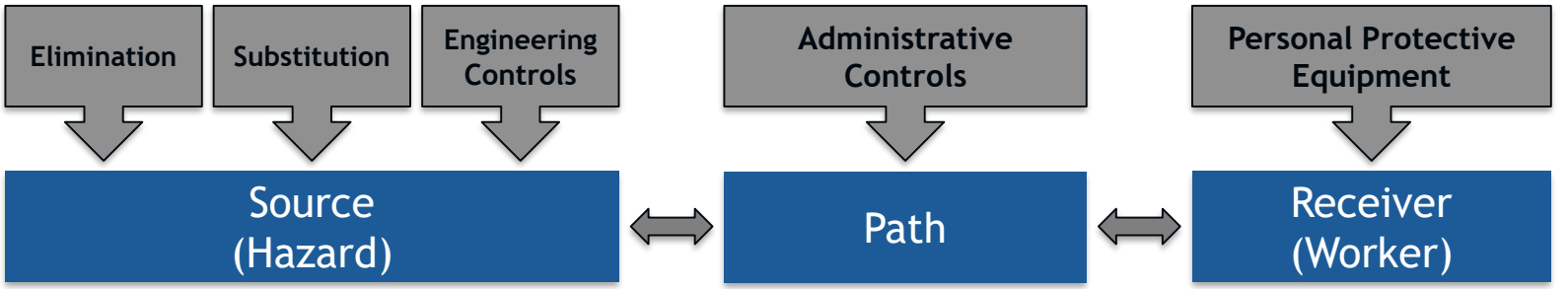
Control at the Source

Hazards should be controlled at their source, where the problem originates.
The closer a control is to the source of the hazard, the better. Hazards can be controlled:

- At the source (elimination, substitution, engineering)
- Along the path to the worker (administrative)
- At the worker (personal protective equipment) – last choice

Engineering controls can also be present along the path to the worker, e.g. **ventilation**

Administrative controls can also be present at the receiver (worker), e.g. **training and education**



HAZARD CONTROL: ENGINEERING CONTROLS

Engineering controls at the source can include:

Redesign

- For example, providing fail-safe interlocks on equipment, doors, valves, etc.

Isolation

- For example, negative pressure fume hood for laboratory use.

Automation

- The less workers have to handle or use the materials, the less potential there is for exposure to a hazard.

Engineering controls along the path to the worker can include:

Barriers

- For example, proper equipment guarding to protect workers from contact with moving parts.

Absorption

- For example, baffles that can block or absorb noise.

Dilution

- For example, general (dilution) ventilation systems might dilute the concentration of a hazardous gas with clean tempered air from the outside.

HAZARD CONTROL: ADMINISTRATIVE

Work procedures, supervision and training

Job rotation and other procedures

- For example, rotating workers through jobs requiring repetitive movements to prevent musculoskeletal injuries.

Housekeeping, repair and maintenance programs

Good hygiene practice

- For example, washing hands thoroughly after handling hazards and before breaks or eating.

HAZARD CONTROL: PERSONAL PROTECTIVE EQUIPMENT (PPE)

Used when other controls aren't possible and where additional protection is needed.

- Workers must be trained in the proper use, maintenance and storage of their PPE.
- Employers and workers must understand the limitations of PPE.
- Employers are expected to ensure workers wear PPE when it is required.

PPE is always the LAST line of defense for controlling hazards. Where possible, it should be used in combination with other control methods.

REMEMBER! The use of PPE does not eliminate the hazard.

HAZARD CONTROL: A COMBINATION OF CONTROLS

- Sometimes a hazard cannot be adequately controlled by a single type of control (engineering, administrative, or PPE). A combination of these methods may be required to effectively control the hazard.

- For example – the use of mechanical equipment may eliminate the need for manual lifting (engineering control) and appropriate procedures and training on the use of the equipment must be provided to the workers (administrative control).

DISCUSS YOUR RISK AND HAZARD ASSESSMENT PROGRAMS

- How have we incorporated line of fire in our program?
- Where does stored energy exist in our work sites (hazard hunts)?
- Where is there limited capacity in our system of controls for a failure?
- What level of operational discipline do we have?
  - Do we know what is safety critical?
- What are we doing today that will be tomorrow's next "Line of Fire" incident?
  - Discuss how we can be more proactive.