ENERGY SAFETY CANADA



# Line of Fire Prevention: Tools, Resources & Practical Applications

**Recognize the Risk. Control the Exposure. Prevent the Incident.**

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# Objectives

In this session, you will learn how to:

1. **Spot** common Line of Fire hazards in everyday work
2. **Use** Energy Safety Canada's updated Line of Fire tools and resources
3. **Improve** how hazards and risks are identified before work begins
4. **Bring** Line of Fire prevention into work planning and crew discussions
5. **Apply** prevention strategies across different worksites, equipment and tasks



# Why Line of Fire Prevention Matters

Line of Fire incidents remain a significant contributor to serious injuries and fatalities (SIFs) across industry.

INCIDENTS CAN INVOLVE

- Moving equipment
- Shifting loads
- Unexpected pressure releases
- Dropped objects
- Stored energy

### Routine work

Workers can be exposed to uncontrolled energy during routine work activities.

### Familiar tasks

Familiarity with a task does not eliminate exposure to high-energy hazards.

### Small changes

A seemingly minor change in work conditions can create an unexpected hazard.

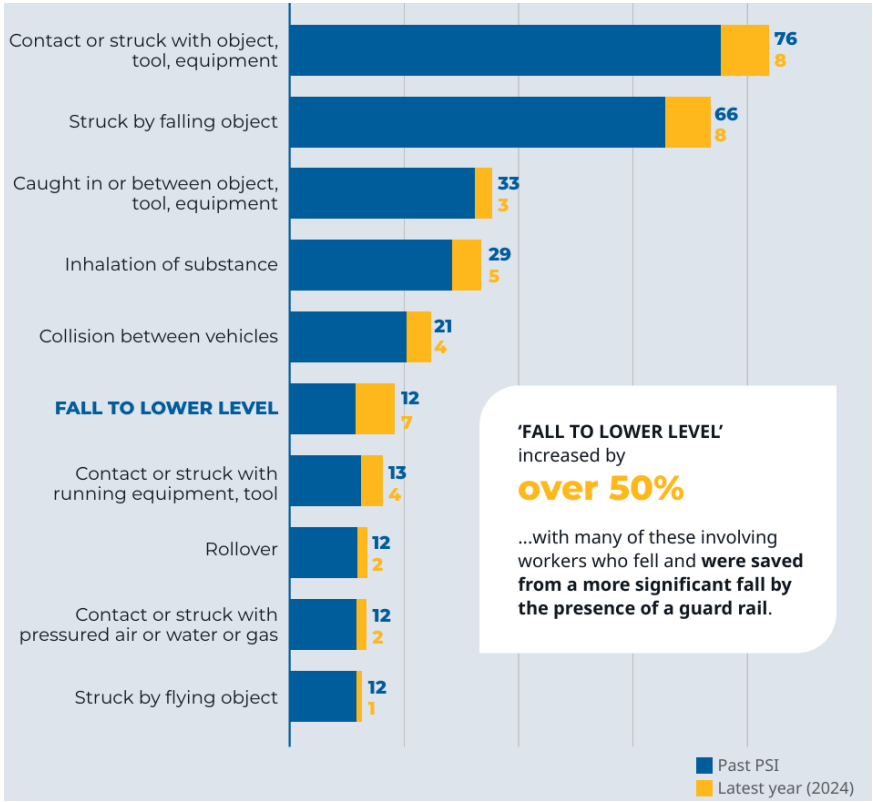
### Before work begins

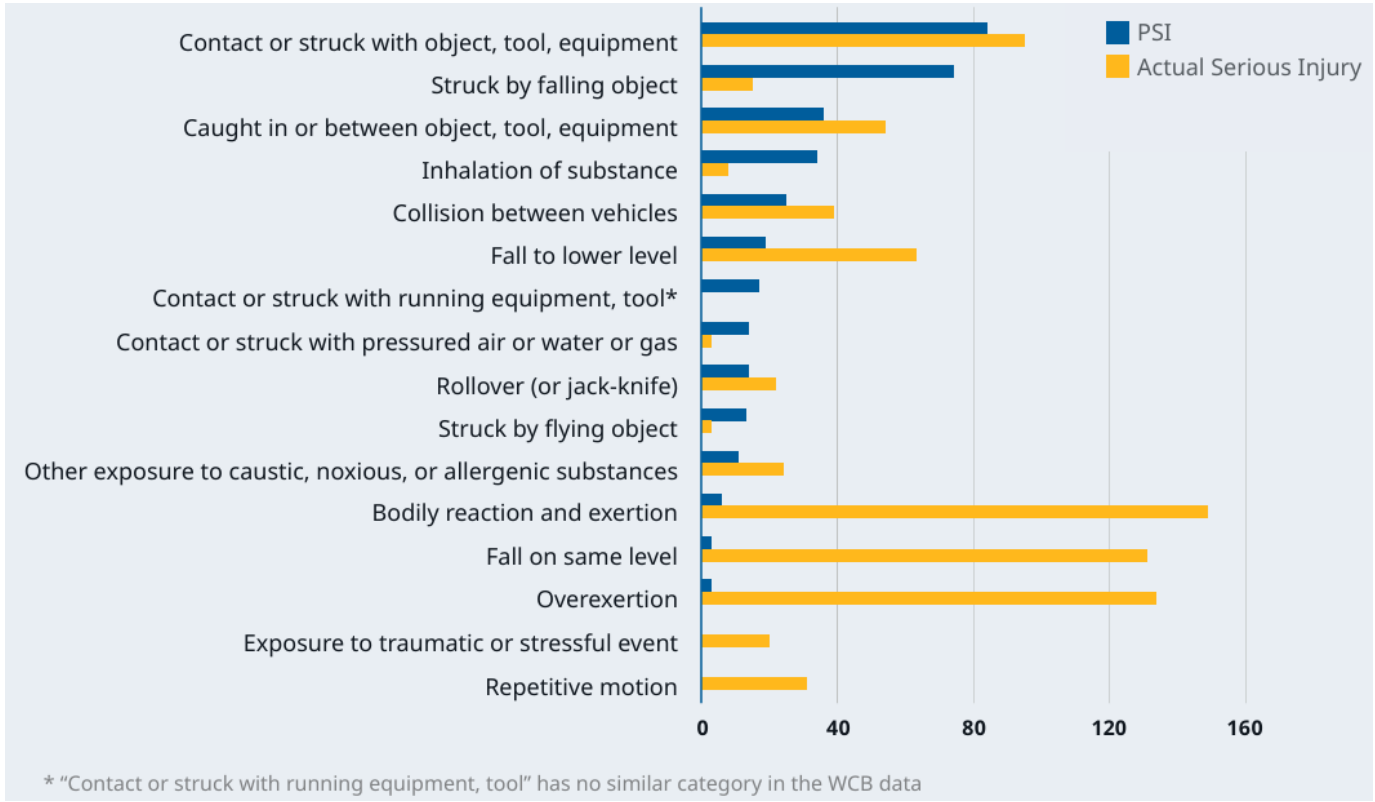
Recognizing and controlling exposure before work begins is essential to preventing SIFs.

**Key message:** The objective is not simply to identify hazards. It is to prevent workers from being exposed to uncontrolled energy.

# Industry Data

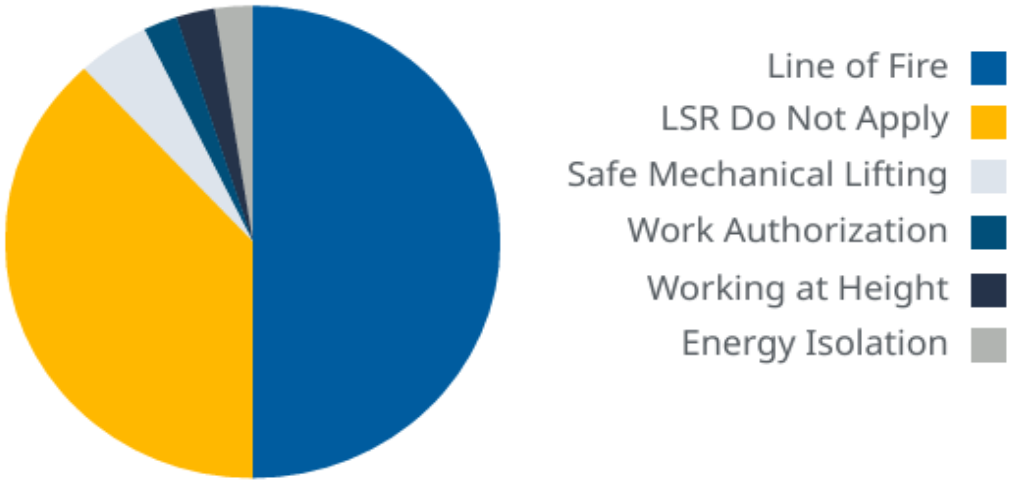
What we see from the Industry Data

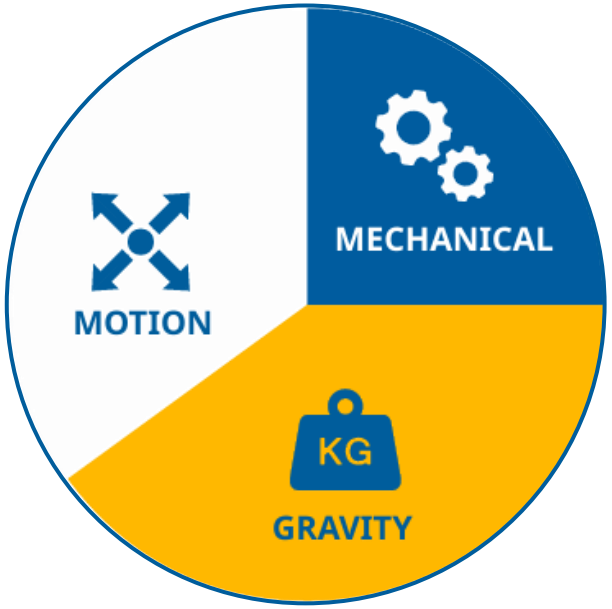


# Industry Data

What we see from the Industry Data



# Understanding the Line of Fire

WHAT IT IS

A worker is in the Line of Fire when positioned where they could be struck, crushed, caught, trapped or otherwise harmed by the uncontrolled movement or release of energy.

**Key message:** Where you position yourself relative to energy sources can determine whether you are exposed to serious harm.

THREE CATEGORIES



## Stored energy hazards

Energy release hazards include explosions, electrical shocks or pressurized material releases. Worker comes in contact with stored energy.




## Striking hazards

Struck-by hazards include flying, falling or dropped objects, vehicles and equipment. Worker is struck by or strikes against an object.



## Crushing hazards

Caught-in or between hazards include being pinned by machinery, trapped between objects or caught in collapsing structures.

# Life Saving Rule – Line of Fire

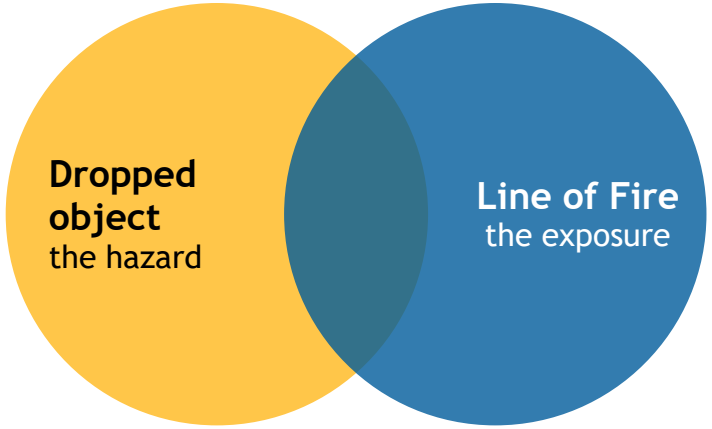


Keep yourself and others out of the Line of Fire

## WHAT IT MEANS

1. I position myself to avoid:
   - Moving objects
   - Vehicles
   - Pressure releases
   - Dropped objects
2. I establish and obey barriers and exclusion zones.
3. I take action to secure loose objects and report potential dropped objects.

# Intersect Between Dropped Object & LoF




**Serious injuries happen when both exist at the same time.**

**Dropped object** describes what happens: an object falls, drops, or is released from height or from equipment.

**Line of Fire** describes who is at risk: a person is positioned where the object, energy, or movement can strike them.

**When a dropped object intersects with a person's position, it becomes a line-of-fire exposure.** Many dropped-object incidents create a line-of-fire hazard, but not all line-of-fire hazards involve dropped objects.

## EXAMPLES

A tool dropped from scaffolding with no one below

→ **Dropped object without LoF exposure**

A wrench dropped from height striking a worker below

→ **Dropped object and LoF event**

A swinging load, recoil, or pressurized release striking someone

→ **LoF event without a dropped object**

# Recognizing Energy Sources and Exposure

What energy sources could put workers in the Line of Fire?

### Gravity
Falling objects, suspended loads, shifting materials

### Mechanical
Rotating equipment, moving machinery, pinch points

### Pressure
Hose failure, pressurized releases, stored pressure

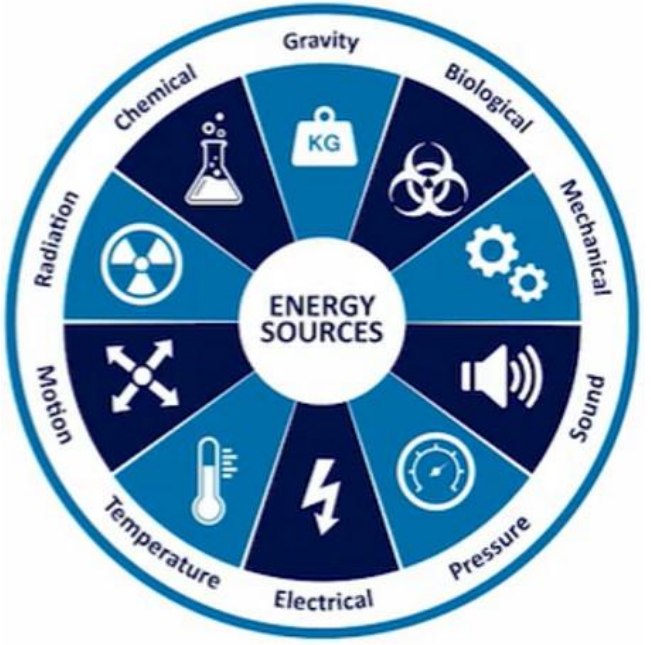
### Tension
Snapped cables, tensioned lines, spring-back

### Electrical
Electrical contact, arcing, unexpected energization

### Chemical
Unexpected releases, sprays and uncontrolled discharges

### Motion
Moving vehicles, mobile equipment and moving components

### Thermal
Hot fluids, steam and uncontrolled heat releases




High energy vs low energy

# Common LOF Exposures in Everyday Work

Line of Fire exposures are present in routine activities across different worksites.

| EVERYDAY ACTIVITY | POTENTIAL EXPOSURE |
|---|---|
| Lifting and hoisting | Suspended or swinging loads, dropped objects |
| Vehicle operations | Reversing vehicles, blind spots, struck-by hazards |
| Equipment maintenance | Unexpected movement, rotating components, pinch points |
| Pressure testing | Hose failure, pressure release, flying components |
| Material handling | Shifting loads, falling materials, caught-between hazards |
| Working at heights | Dropped tools, equipment and materials |
| Hose and cable handling | Whipping, recoil and tension release |

## Not just high-risk work

Line of Fire hazards are not confined to high-risk or unusual activities. They can develop during familiar, repetitive work.

# How do workers become exposed?

Understanding the exposure pathway. A Line of Fire incident can develop when three conditions come together:

| Energy source | Exposure pathway | Worker exposure |
|---|---|---|
| Something has the potential to move, fall, release, rotate, shift or otherwise transfer energy. | The energy or moving object has a pathway to reach a worker. | A worker is positioned within that pathway or affected area. |

## COMMON CONTRIBUTING FACTORS

| | | |
|---|---|---|
| Standing between moving equipment and a fixed object | Placing hands or fingers in pinch points | Standing underneath suspended loads |
| Working within the potential recoil path of tensioned equipment | Being positioned near pressurized equipment or connections | Assuming equipment is stationary, isolated or depressurized without verification |

# Identifying LOF Hazards before work begins

Move beyond simply identifying the task. Think about what could go wrong.

### A PRACTICAL HAZARD IDENTIFICATION SEQUENCE

**1 Identify the energy**

What energy sources are present?

**2 Anticipate the event**

What could move, fall, release or fail?

**3 Identify exposure**

Who or what could be in the pathway?

**4 Assess the consequences**

What is the worst credible outcome?

**5 Establish safeguards**

What will prevent or minimize exposure?

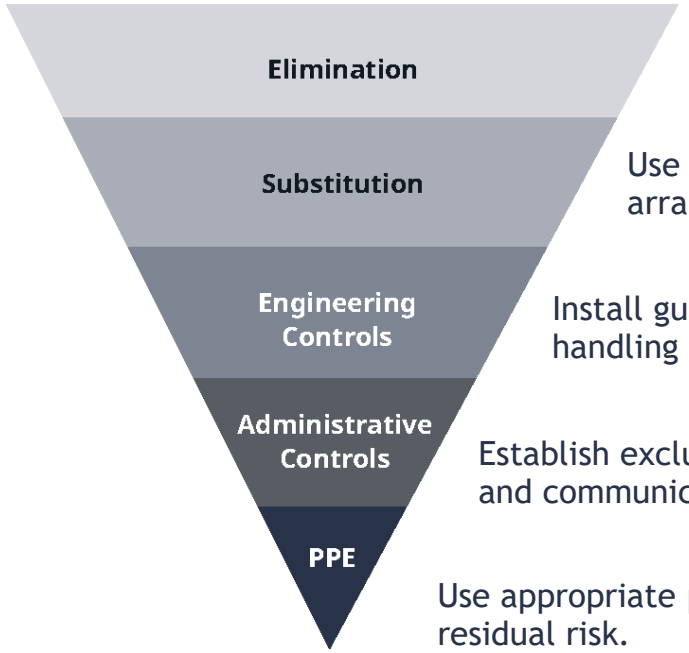
**6 Verify controls**

Are the safeguards in place and effective?

**Key message:** Focus hazard identification on potential energy-related consequences, not just completing a checklist.

# Selecting effective prevention strategies

Apply the hierarchy of controls to prevent Line of Fire exposure.




Remove the need for a worker to enter the exposure zone.

Use a safer method, tool or equipment arrangement.

Install guarding, barriers, restraints or mechanical handling systems.

Establish exclusion zones, procedures, sequencing and communication protocols.

Use appropriate protective equipment to reduce residual risk.

**EXAMPLES OF EFFECTIVE SAFEGUARDS**

- Establish and maintain exclusion zones around lifting operations.
- Use mechanical devices to move materials instead of manual positioning.
- Isolate and verify hazardous energy before maintenance.
- Depressurize and verify systems before disconnecting hoses or equipment.
- Use physical barriers to separate pedestrians from mobile equipment.
- Secure tools and materials when working at heights.

# Introducing ESC's updated LOF Program

A practical, customizable program to help organizations identify, control and learn from high-energy hazards.

### WHO CAN BENEFIT?

- Company leaders and executives
- Health and safety professionals
- Supervisors and frontline leaders
- Workers and contractors
- Small, medium and large organizations
- Companies seeking to establish or improve their existing safety management systems

### THE PROGRAM GIVES YOU A STRUCTURED APPROACH TO

1. Recognize and control high-energy hazards
2. Understand the distinction between high-energy and low-energy activities
3. Establish appropriate safeguards before work begins
4. Improve worker and leadership awareness
5. Strengthen implementation of Line of Fire prevention practices
6. Learn from close calls and near misses to prevent future incidents

# Navigating ESC's LOF Tools and Resources

What resources are available, and how can organizations use them?

### LOF Program Guideline

Understand program expectations, concepts and requirements.

2025

### Implementation Procedure

Guide organizational preparation, rollout and review.

2020

### LOF Concept Document

Build a common understanding of Line of Fire hazards and concepts.

2025

### Activity Packages

Facilitate hazard-specific learning and worker engagement.

2025

### Tools and Support Resources

Support program implementation and ongoing activities.

### Inspection Sheets

Support worksite inspections and hazard identification.

### Case for Change

Communicate the need for the program and gain leadership support.

2025

**Use it, adapt it and build it into everyday work — not simply download and file it.**

# Line of Fire Activity Packages

Updated version leveraging on IOGP Resources

| | TOPIC | SOURCES OF HAZARDS |
|---|---|---|
| 1 | Moving Vehicles/Mobile Equipment | Trucks, loaders, excavators, forklifts, graders, light-duty vehicles in work zones, cranes, telehandlers, and specialized equipment |
| 2 | Mechanical Lifting/Hoisting | Use of cranes, hoists, winches, forklifts, and other mechanical devices to raise, lower, or move loads |
| 3 | Working at Height (Falls and Dropped Objects) | Work above ground or floor level, use of ladders, scaffolds, platforms, or elevated work areas, tasks where tools, materials, or equipment could fall |
| 4 | Tensioned Lines/Spring Loaded Devices/Stored Energy | Tensioned or loaded lines, springs and spring-loaded mechanisms, hydraulic or pneumatic pressure, gravity-stored energy, mechanical and rotational energy |
| 5 | Objects with Uncontrollable Roll, Slide, or Fall Potential | All work activities where materials, tools, equipment, or components may become unstable due to gravity, vibration, slope, wind, movement, or poor securing |

# Line of Fire Activity Packages

Updated version leveraging on IOGP Resources

| | TOPIC | SOURCES OF HAZARDS |
|---|---|---|
| 6 | Pressurized or Vacuum Systems/Equipment | Pressure vessels, boilers, and separators; pipelines, hoses, tubing, and manifolds; compressed gas cylinders (air, nitrogen, hydrogen, propane, etc.); hydraulic and pneumatic systems; steam systems; vacuum tanks, vessels, and piping; process equipment under pressure or vacuum during operation or testing |
| 7 | Machinery & Tools | Powered and non-powered tools, fixed and mobile machinery, portable equipment (hand tools, power tools), maintenance, inspection, setup, and operation tasks |
| 8 | Electrical Equipment/Exposure | Fixed and portable electrical equipment, temporary power systems, energized systems and components, work conducted by qualified and non-qualified workers, all operational, construction, and maintenance activities where electrical exposure exists |
| 9 | Projectiles/Explosion/Jet Fire | Projectiles – ruptured pipes or pressure vessels; Explosion – gas leaks in confined or enclosed spaces; Jet Fire – high-pressure gas or liquid hydrocarbon leaks |
| 10 | Natural Environmental Events/Extreme Weather | Rapidly change site conditions without warning; degrade visibility, traction, stability, and communication |

# The New Products
























# Integrating LOF Prevention into work planning

Make Line of Fire prevention part of how work gets planned and executed.

### SIX QUESTIONS TO STRENGTHEN PRE-JOB DISCUSSIONS

1. What energy sources are involved in this work?
2. What could move, fall, shift or release unexpectedly?
3. Where could someone be in the Line of Fire?
4. What controls will prevent exposure?
5. Have we verified that the controls are effective?
6. What changes would require us to stop and reassess?

### BUILD IT INTO EXISTING PROCESSES

- Job Safety Analysis (JSA) / Job Hazard Assessment (JHA)
- Field-Level Hazard Assessments (FLHAs)
- Pre-job meetings and toolbox talks
- Permit-to-work processes
- Energy isolation and verification
- Equipment inspections and worksite walkarounds
- SIMOPS planning and coordination
- Supervisor field observations and verification

# Practical Scenario 1: Lifting and Hoisting Operations

SCENARIO 1

## Moving a suspended load at an active worksite

A crew is using a crane to lift and position equipment. Workers are nearby preparing the receiving area while another worker attempts to guide the load into position.



**DISCUSS**

1. Identify the potential LOF exposures.
2. What are potential prevention strategies?

# Practical Scenario 1: Lifting and Hoisting Operations

SCENARIO 1

## Potential Line of Fire exposures

- Suspended or swinging loads.
- Dropped or shifting materials.
- Workers positioned beneath or beside the load.
- Pinch points between the load and fixed structures.
- Unexpected movement during load positioning.
- Workers entering the lifting exclusion zone.

SCENARIO 1

## Potential prevention strategies

- Establish and communicate exclusion zones.
- Keep workers clear of suspended loads.
- Use appropriate taglines and load-control methods where suitable.
- Confirm rigging integrity and load stability.
- Assign competent lifting personnel and clearly defined roles.
- Coordinate lifting activities with other work groups.
- Stop the lift if conditions or communication become unsafe.

# Practical Scenario 2: Pressure, Equipment and Simultaneous Operations

SCENARIO 2

## Maintenance and pressure testing activities occurring simultaneously

A maintenance crew is working on equipment adjacent to an area where another crew is conducting pressure testing. Workers are moving equipment and handling hoses while the pressure test is underway.



**DISCUSS**

1. Identify the potential LOF exposures.
2. What are potential prevention strategies?

# Practical Scenario 2: Pressure, Equipment and Simultaneous Operations

SCENARIO 2

## Potential Line of Fire exposures

- Unexpected release of stored pressure.
- Hose failure or uncontrolled hose movement.
- Flying components or connections.
- Unexpected equipment energization or movement.
- Workers entering the pressure-testing exposure zone.
- Conflicting activities and inadequate communication between crews.

SCENARIO 2

## Potential prevention strategies

- Identify and verify energy isolation requirements.
- Establish pressure-testing exclusion zones.
- Verify pressure ratings, connections and equipment integrity.
- Keep personnel clear of potential release pathways.
- Coordinate work activities and establish clear communication protocols.
- Assess interactions between simultaneous operations.
- Stop, reassess and reauthorize work when conditions change.

# Building a Strong Line of Fire Prevention Culture

Effective prevention requires more than procedures and training. It requires consistent engagement and ownership.

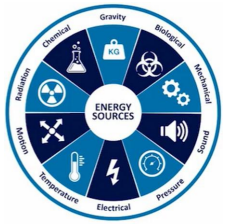
### WHAT ORGANIZATIONS CAN DO

- Establish leadership commitment and accountability.
- Ensure workers understand high-energy hazards and potential consequences.
- Encourage workers to identify and communicate exposure concerns.
- Make Line of Fire a regular topic in toolbox talks and pre-job discussions.
- Conduct field-level verification of critical safeguards.
- Learn from near misses, incidents and everyday work experiences.
- Share lessons across crews, contractors and worksites.
- Regularly review and improve the program.

| AWARENESS | | ACTION |
|---|---|---|
| **Recognize the hazard** | › | Identify energy sources and exposure pathways |
| **Understand the risk** | › | Assess potential consequences |
| **Know the controls** | › | Implement effective safeguards |
| **Communicate concerns** | › | Stop and reassess when conditions change |
| **Learn from experience** | › | Improve prevention practices |

**Everyone has a role. Leadership enables prevention, supervisors reinforce it, and workers apply it.**

# Key Takeaways and Call to Action




## Recognize the risk. Control the exposure. Prevent the incident.

### Recognize

Identify Line of Fire hazards in routine and non-routine work.

### Understand

Look beyond the task to identify energy sources and potential consequences.

### Control

Apply effective safeguards that prevent worker exposure.

### Integrate

Make Line of Fire prevention part of work planning, hazard assessments and crew discussions.

### Sustain

Use ESC's updated tools and resources to strengthen organizational practices and continuous improvement.

### YOUR NEXT STEPS

1. Visit ESC's Line of Fire Program webpage.
2. Download and review the updated program resources.
3. Identify one or two priority activities in your organization where Line of Fire prevention can be strengthened.
4. Introduce the resources into your next toolbox talk or pre-job meeting.
5. Encourage workers and supervisors to identify and share opportunities for improvement.

**One final question:** What is one thing you will do differently tomorrow to prevent someone from being in the Line of Fire?

# Thank you!

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