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Improving SAFETY with SIF

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SIF & PSIF Introduction

- What is a SIF or PSIF Incident?
  - Serious Injury or Fatality
    - An incident resulting in a change to the quality of life, or a loss of life.
  - Potentially Serious Injury or Fatality
    - A release of High Energy without a Direct Control in place, but where a serious injury or fatality does not occur.

"we were lucky…"

"boy that was close…"

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SIF & PSIF Definitions

- Serious Injuries &
- High Energy Hazards w/ SIF Potential (PSIF)

- Amputations
- LOC (Loss of Consciousness)
- Heat Exhaustion / Heat Stroke
- Electrical Arc Flash or Shock
- Equipment/Vehicle Rollover
- Falls from Heights
- Fires and Explosions
- Burns
- Broken Bones
- Torn Tendons/Ligaments
- Internal Organ Trauma
- Release of Stored Energy
- Loss of eye/vision

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SIF & PSIF Definitions

- High Energy Hazards
  - Hazards with the potential to cause SIF. Detailed via Icons.
- Direct Controls
  - Specific protections from High Energy Hazards.
- Exposure
  - Conditions where High Energy Hazards are present, AND where Direct Controls are NOT in place.
- Capacity
  - Release of High Energy, but where a Direct Control is in place and prevents a SIF incident.

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Why SIF & PSIF?

- Heinrich's Accident Triangle Theory
  - Minor incidents are a precursor to serious incidents and fatalities.
  - Prevention of minor incidents will eliminate serious incidents and fatalities.

  - SIF & PSIF events happen for different reasons than First Aid & Recordable events.

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WHY SIF & PSIF?

New studies suggesting that…

Reductions in:

Unsafe Acts, Near Misses & Minor Injuries

Does NOT reduce:

Serious Injury & Fatality events

SIF & PSIF events are STILL OCCURRING

- Benefits from using SIF & PSIF?
  - More Easily Identify High Energy Hazards using SIF Icons
  - Build Capacity through implementation of Direct Controls
  - Improve the Activity Planning
  - Improve Lessons Learned / Near Miss processes

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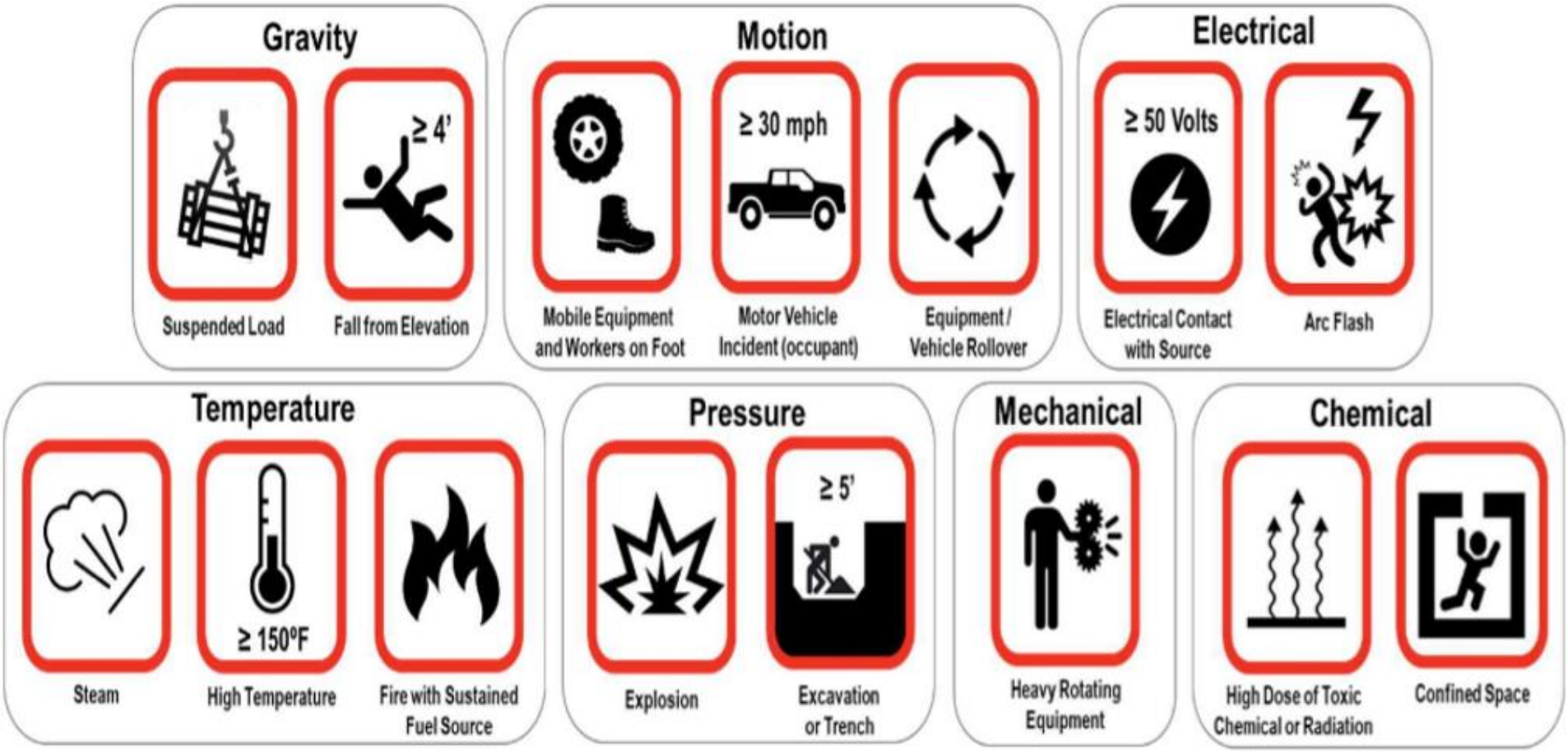
LAGGING & LEADING INDICATORS

- Lagging Indicators- measure output after event/incident
  - Near Miss Reporting & Investigations
  - Incident Tracking & Reporting
  - TRIR
  - DART
  - EMR

- Leading Indicators- measure input before event/incident
  - Good Catches
  - Last Minute Risk Assessments
  - Best Practices
  - CAPP Observations
  - PSIF Exposures

SIF Icons



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Suspended Loads

Type of Energy: Gravity

Loads requiring specialty equipment to lift them more than a foot off the ground.

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Fall from Elevation

Type of Energy: Gravity

A fall while working from an elevation greater than 4 feet.

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Mobile Equipment and Workers on Foot

Type of Energy: Motion
Equipment that is in motion near a worker who is on foot.

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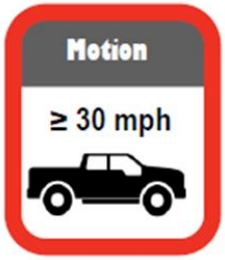
Motor Vehicle (occupant)



Type of Energy: Motion
Riding or driving in a motor vehicle going faster than 30 miles per hour.

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Equipment/Vehicle Roll Over

Type of Energy: Motion
Equipment or vehicles move when they weren't supposed to or in a way that wasn't planned.

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Electrical Contact with Source

Type of Energy: Electrical
Making contact with an electrical source of 50 or more volts.

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Arc Flash

Type of Energy: Electrical

Any arc flash – electrical current leaves its intended path and travels through the air from one conductor to another, or the ground.

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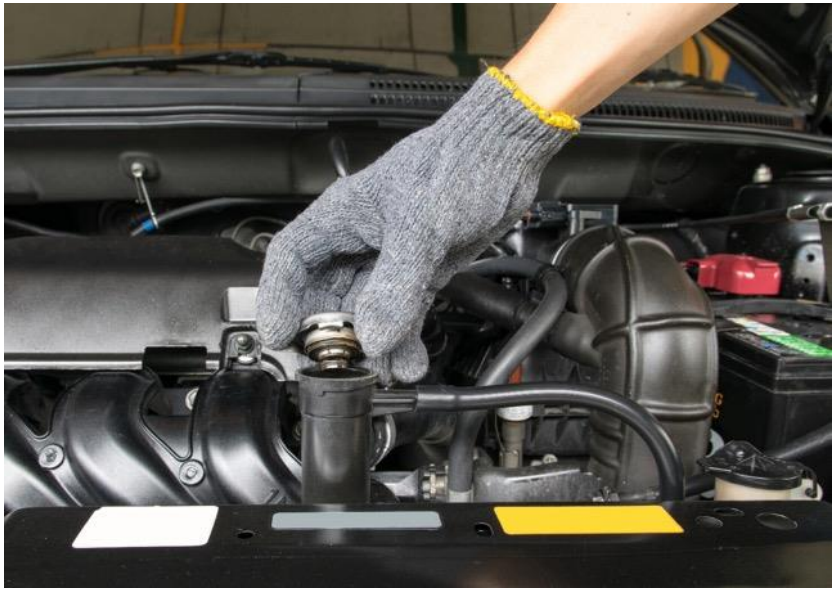
Steam

Type of Energy: Temperature
Any circumstance a person is exposed to steam that is released from being under pressure



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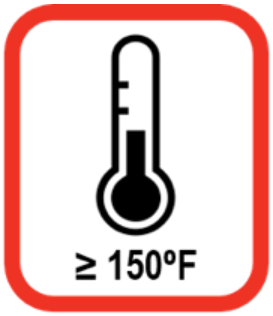
High Temperature



Type of Energy: Temperature
Exposure to temperatures of 150 degrees or hotter for more than two seconds.

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Fire with Sustained Fuel Source

Type of Energy: Temperature
A fire with an energy source that will allow it to burn for a long time.

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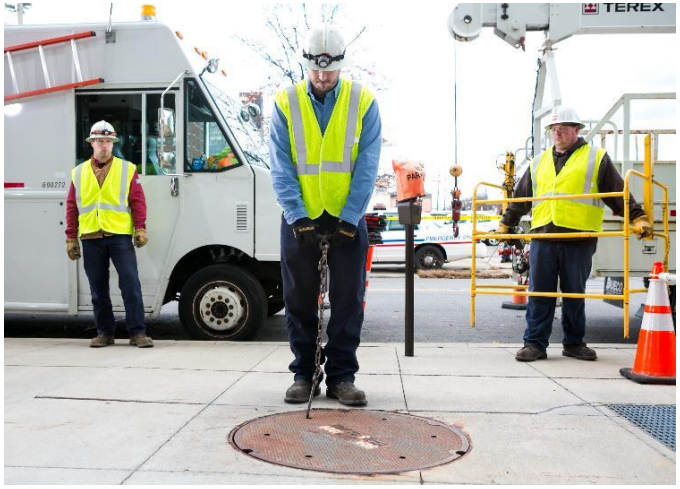
Explosion

Type of Energy: Pressure
A large amount of energy is quickly released in a concentrated area.



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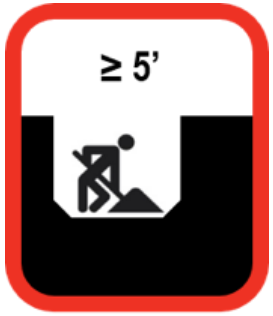
Excavation or Trench deeper than 5’



Type of Energy: Pressure

Exposure to unsupported soil in an excavation or trench that’s deeper than five feet.

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Rotating Equipment & Materials

Type of Energy: Mechanical
Rotating equipment that is more powerful than a hand tool or exceeds 100 rotations a minute.

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High Dose of Toxic Chemical or Radiation

Type of Energy: Chemical/Radiation
A person is exposed to a chemical or radiation above the acceptable exposure limits.

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Confined Space

Type of Energy: Chemical/Radiation
Danger related to atmospheric conditions that build up in confined spaces.

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Direct vs. In-Direct Controls

- Direct Controls:
  - Required for all High Energy sources identified (SIF Icons)
  - Specifically target the High Energy source
  - Effectively Mitigates the Exposure
  - Best Controls work even if there is unintentional human error
- In-Direct Controls:
  - do not specifically target the High Energy source
  - do not mitigate the exposure
  - do not work if there is unintentional human error
- Examples:
  - Warning messages
    - “use caution when…”
    - “be careful…”
    - “watch out for…”

      e.g. pinch points, slip/trip/fall hazards

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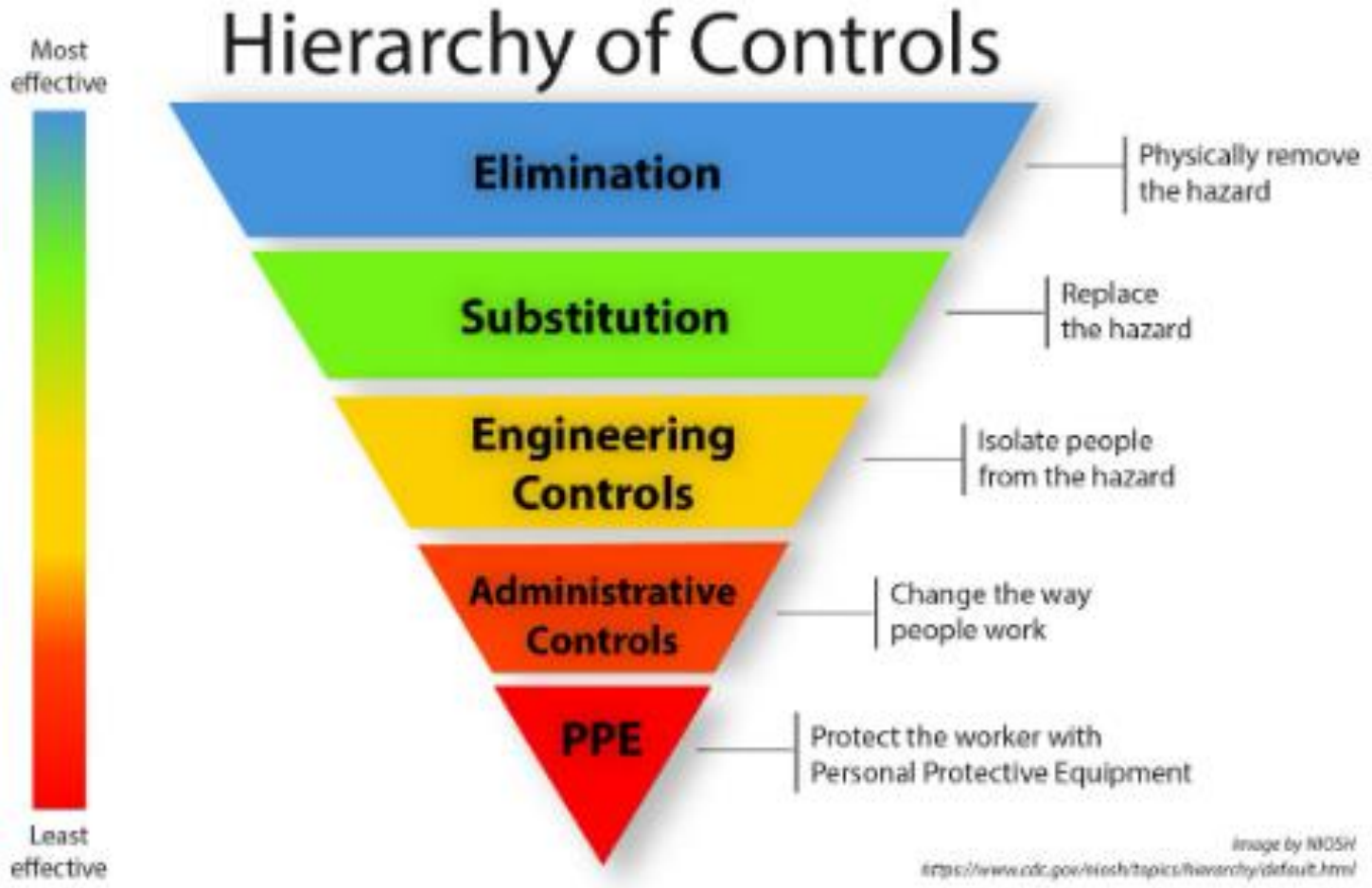
Direct Controls



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Direct Controls-examples

FALL HAZARD - example

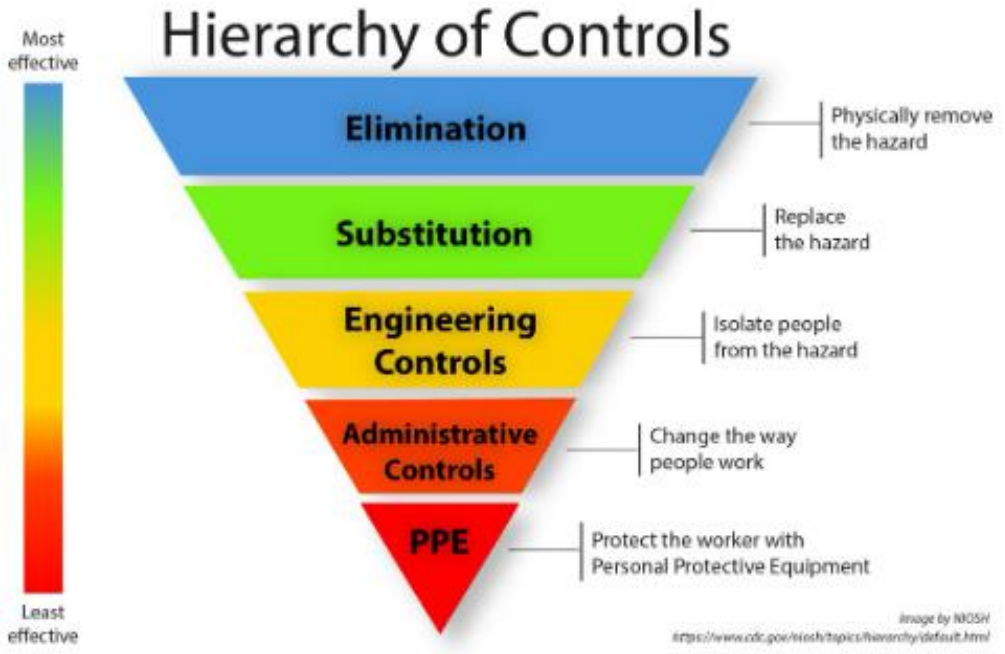
Pre-Work on the Ground

Lift vs. Ladder

Controlled Access Zone

Roof Monitor

Harness/Lanyards



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Direct Controls-examples

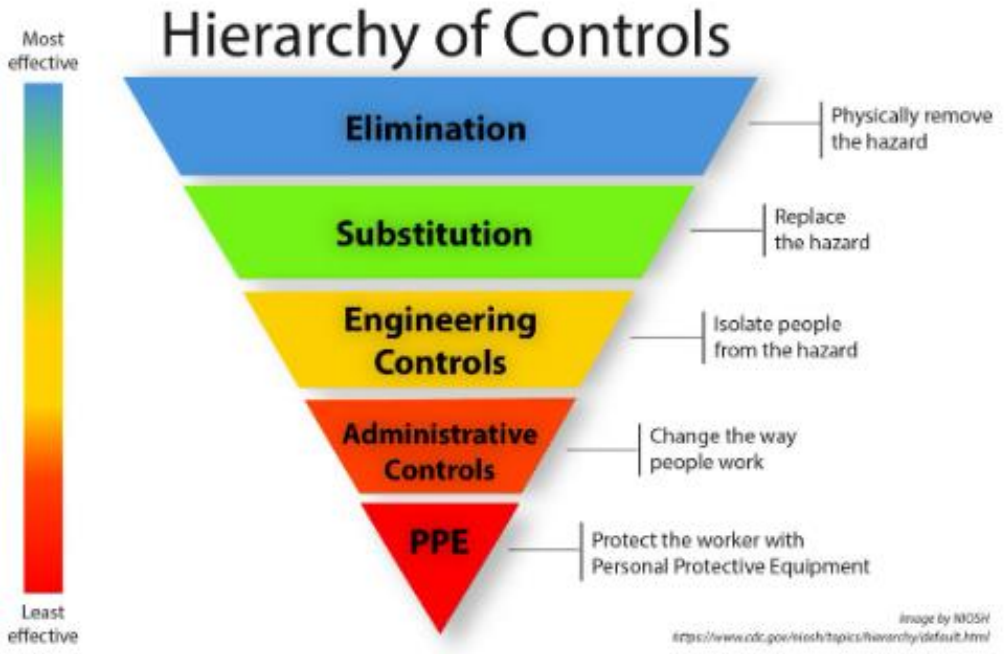
TRAFFIC HAZARD - example

Off Road Work
Jersey Barriers

TTC Zone (cones, barrels etc.)
Attenuator Trucks

No working on live side of tuck

Vests



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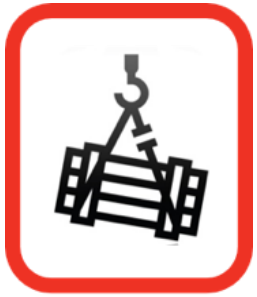
In-Direct Controls

Suspended Loads



Type of Energy: Gravity
Suspended Loads
List Direct Controls:

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Fall from Elevation

Type of Energy: Gravity
Fall from Elevation >4’
List Direct Controls:

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Mobile Equipment and Workers on Foot

Type of Energy: Motion
Mobile Equipment & Workers on Foot
List Direct Controls:

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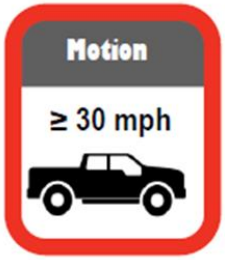
Motor Vehicle (occupant)



Type of Energy: Motion
Vehicle traveling >30mph
List Direct Controls:

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Equipment/Vehicle Roll Over

Type of Energy: Motion
Equipment/Vehicle Roll Over
List Direct Controls:

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Electrical Contact with Source

Type of Energy: Electrical
Contact with Source ≥50volts
List Direct Controls:

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Arc Flash

Type of Energy: Electrical
Arc Flash
List Direct Controls:

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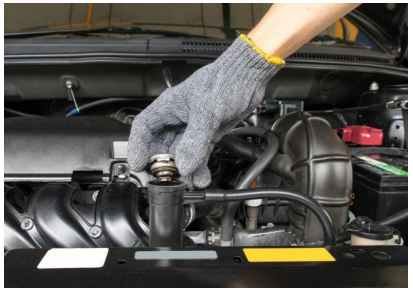
Steam

Type of Energy: Temperature
Exposure to steam released under pressure
List Direct Controls:



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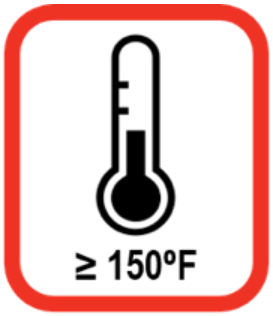
High Temperature



Type of Energy: Temperature
Temperature ≥150º for >2 seconds
List Direct Controls:

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Fire with Sustained Fuel Source

Type of Energy: Temperature
Exposure to fire with a sustained fuel source
List Direct Controls:

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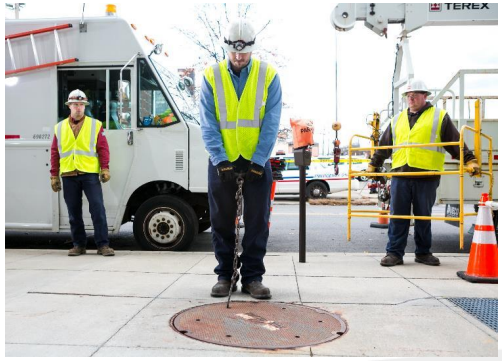
Explosion

Type of Energy: Pressure
High Energy Release in a concentrated area
List Direct Controls:



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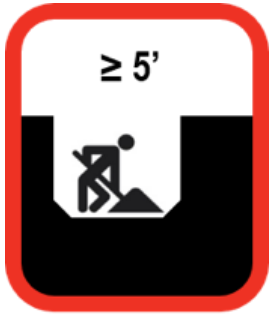
Excavation or Trench deeper than 5’



Type of Energy: Pressure
Controls:

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Rotating Equipment & Materials

Type of Energy: Mechanical
Rotating Equipment or Materials
List Direct Controls:

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High Dose of Toxic Chemical or Radiation

Type of Energy: Chemical/Radiation
List Direct Controls:

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Confined Space

Type of Energy: Chemical/Radiation/Mechanical
Confined or Enclosed Space
List Direct Controls:

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SIF Icon Practice

- **Identify SIF Exposures** using High Energy SIF Icons.

- **Determine Direct Controls** for each SIF icon used.

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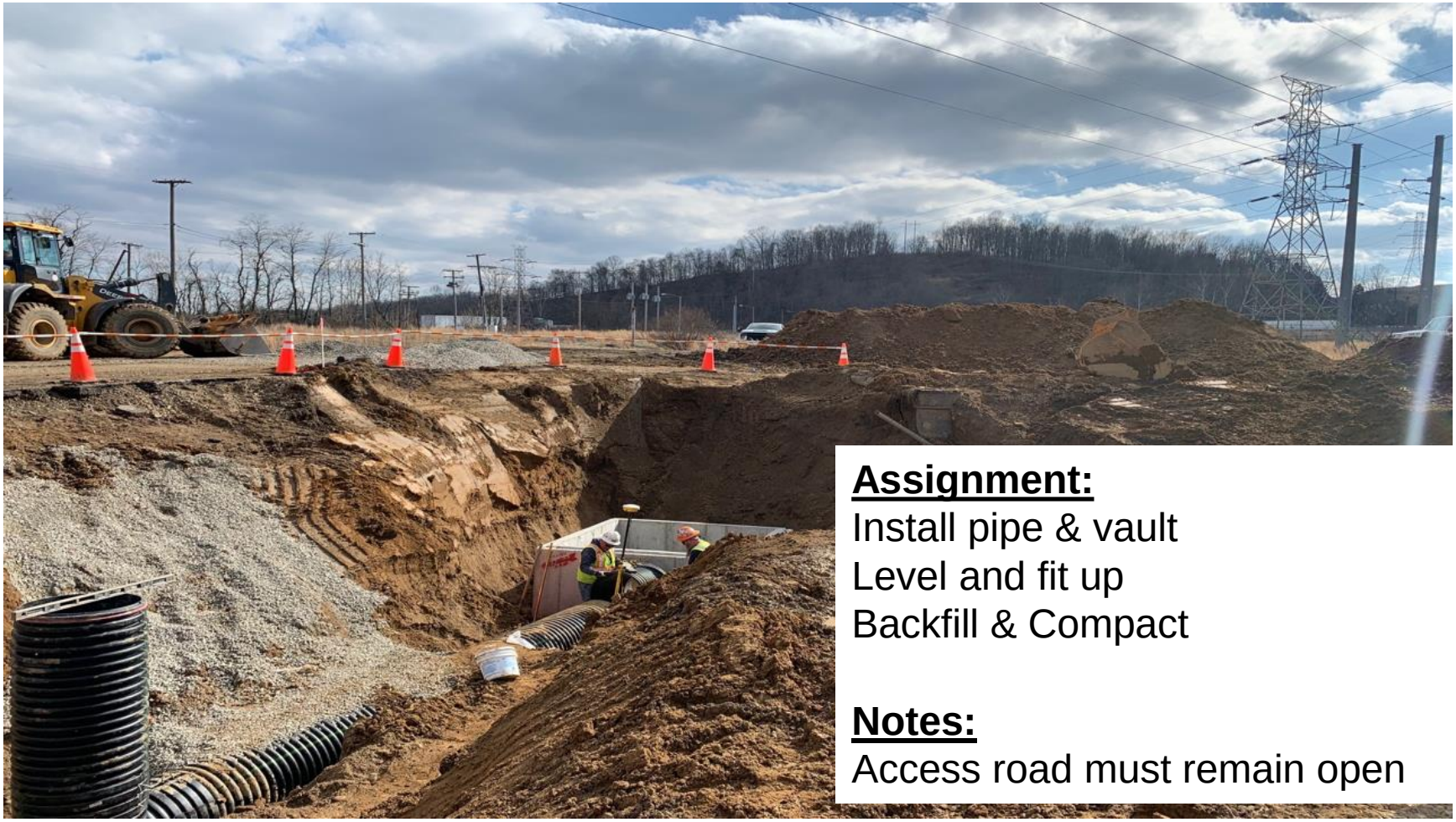
Example 1



Assignment:
Install pipe & vault
Level and fit up
Backfill & Compact

Notes:
Access road must remain open

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Example 1

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Example 2

Assignment:
Auger pole hole
Set pole
Backfill & Compact

Notes:
Suburban road 35mph
Distribution lines are energized at 19.9kV

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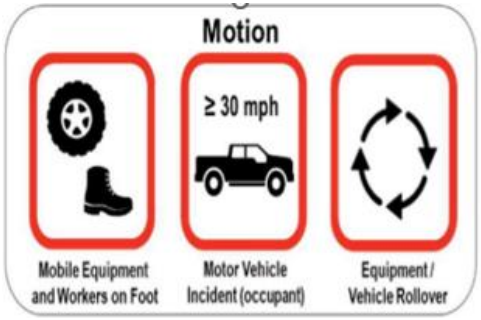
Example 2



Hazard: Fall from Elevation
Type of Energy: Gravity
A fall while working from an elevation great than 4 feet.

Hazard: Heavy Rotating Equipment
Type of Energy: Mechanical
All heavy rotating equipment beyond hand tools typically exceed the high-energy threshold

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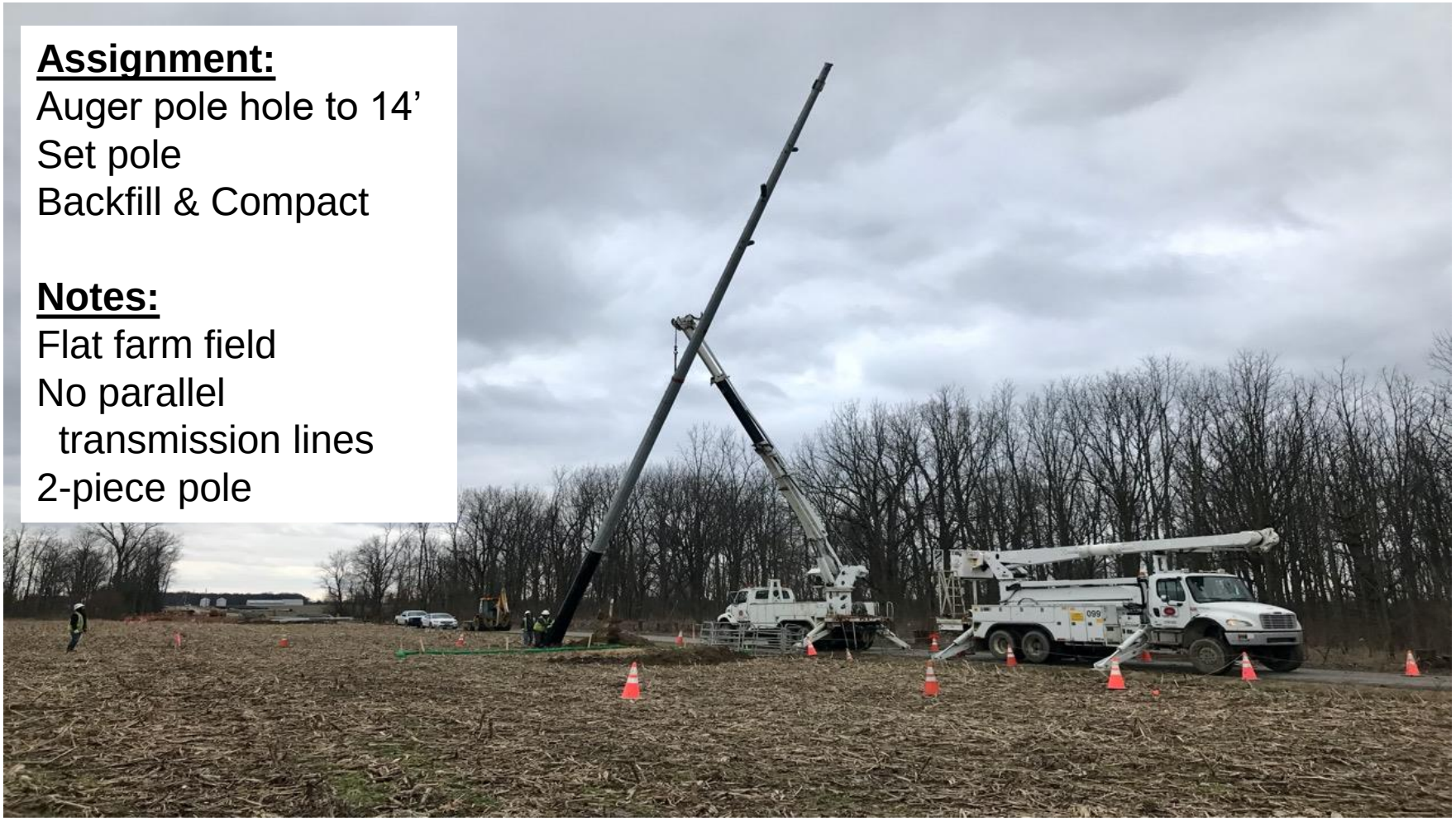
Example 3



Assignment:
Auger pole hole to 14’
Set pole
Backfill & Compact

Notes:
Flat farm field
No parallel
transmission lines
2-piece pole

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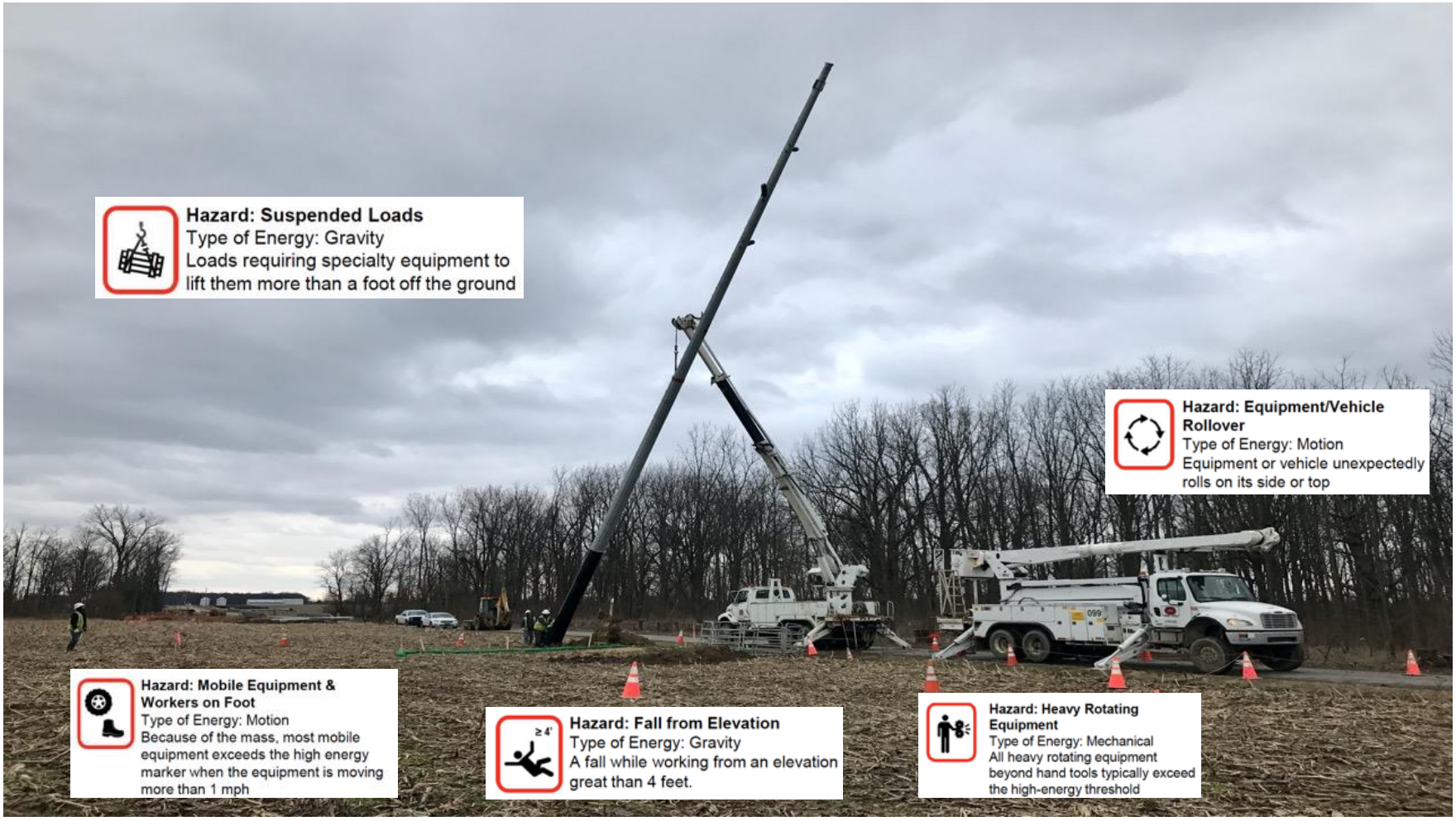
Example 3



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Example 3

Assignment:
Remove breakers from frame.

Notes:
Energized Substation

Bushings to stay on

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SIF Determination

- Was the event a SIF or PSIF?
  - Was High Energy Released?
  - Was there a Significant Injury or Fatality?
  - Was there Exposure?
  - Was a Direct Control in place?

- Using SIF Rates
  - SIF & PSIF per Reported Lessons Learned Incidents
    - Thru 9/8/22: 9 SIF/P-SIF of 74 Total LL = 12%
  - SIF & PSIF per Work Hour
    - Thru 9/8/22: 9 SIF/P-SIF in 264,581 hours = 6.80

SIF & PSIF Management

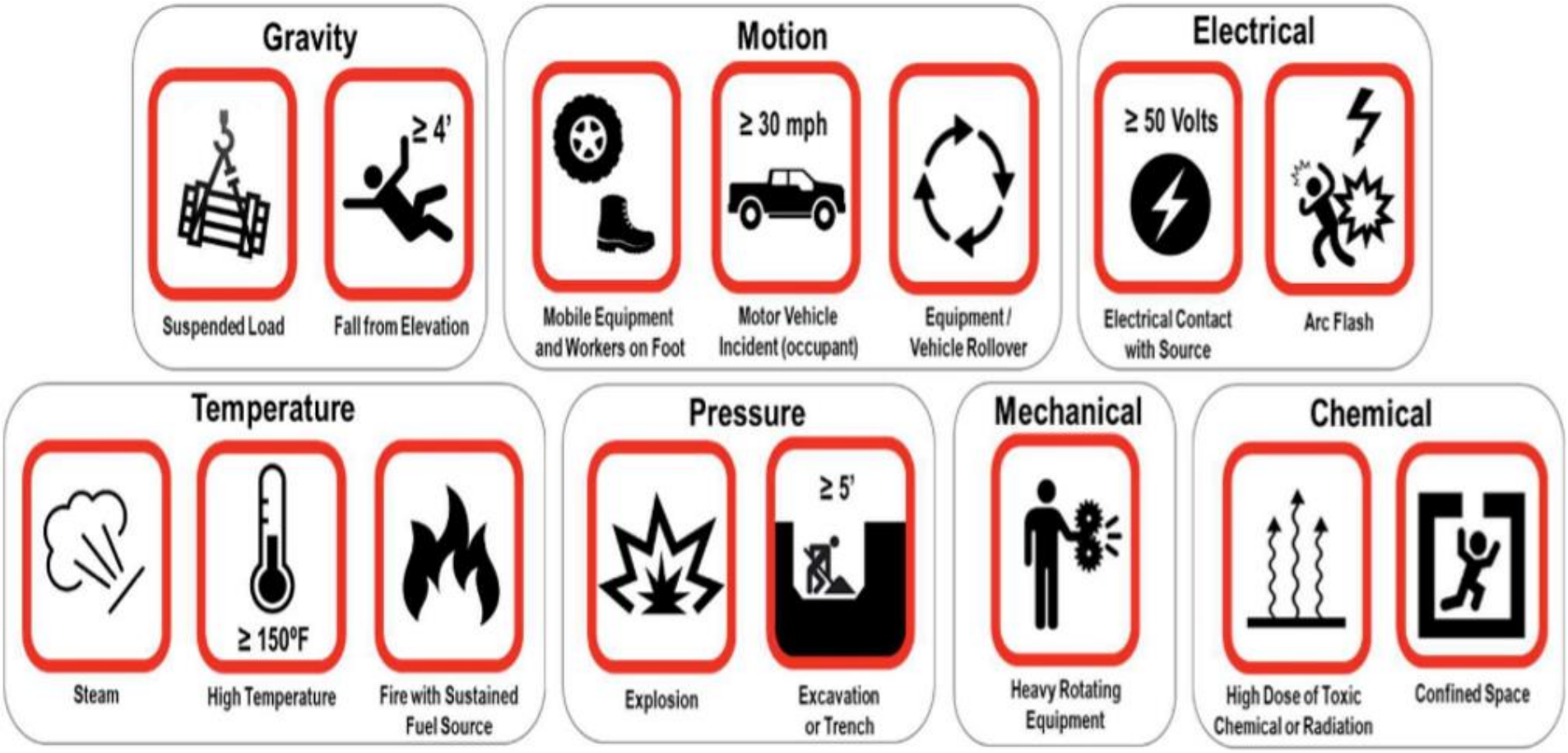
- Identify and Review SIF & PSIF events:
  - Using Lessons Learned Log & GSC / All-Safe Reports
    - Determine which LLs are SIF or PSIF

- Investigate SIF & PSIF events (current and previous)
  - Analyze LL data (2022 PWR GSC log, other business units)
  - Did we identify the SIF potential?
  - Did we learn everything we needed to?
  - Are we still using the corrective actions & Direct Controls?

- Training: Leaders, Supervisors and Crew

THE END

SIF Icons - Handout



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