

# Recognizing and Mitigating the Hazards of Potential Energy

ECI Safety 2013

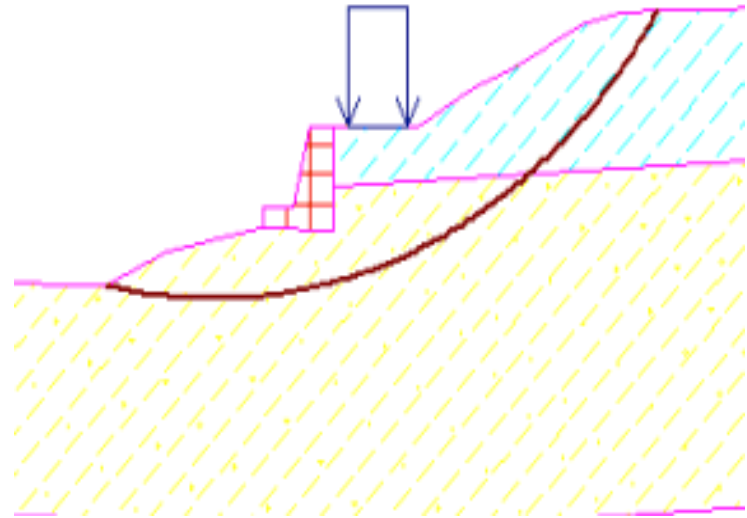
# Potential Energy Definition

- Potential Energy is the stored up energy of a body or system at rest (KP definition):
  - Gravity
  - Compressed Spring
  - Pressurized Fluid Systems
  - Chemical Systems
  - Electrical Systems
- Kinetic Energy is the energy of a moving body

# Potential Energy due to Gravity

## Slope Stability Hazards:

- Trenches
- Shored Excavations
- Retaining Walls



# Potential Energy Due to Gravity

## Lifting Hazards

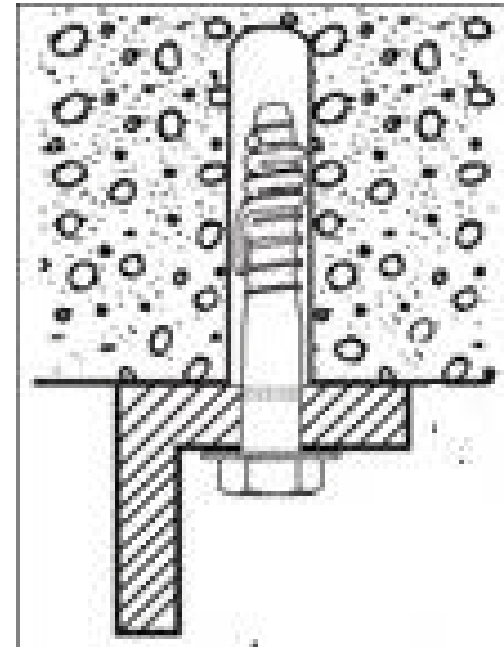
- Crane Stability
- Foundation Capacity
- Rigging Capacity
- Internal Crane Failures
  - Wire Rope, winches, etc.
  - Boom, pendant, bridle, etc.
  - Sheaves, tip, etc.



# Potential Energy Due to Gravity

## Overhead Hazards

- Rigging
- Tension Connections
- Concrete Anchors in Tension



Downward  
Force

# Potential Energy Due to Gravity

## Sliding on Slopes

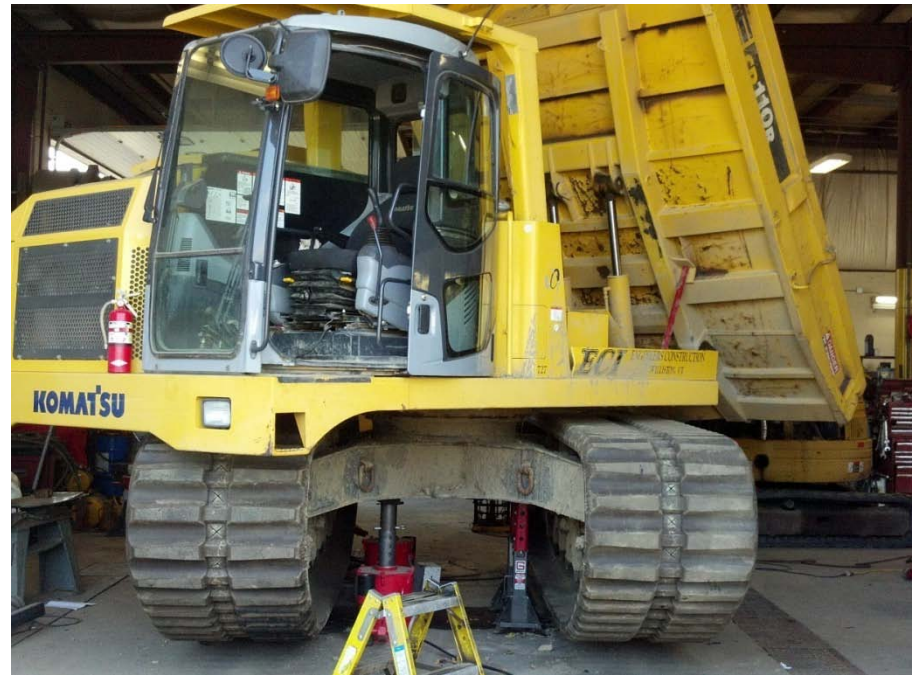
- Equipment on Slopes
- Braking vehicles on downhill slippery surfaces (winter driving)



# Potential Energy Due to Gravity

## Overhead Hazards

- Raised Dump Body
  - In Shop
  - On Site Working
- Jacks Supporting Equipment or Vehicles
- Structural Demolition
- Falling Materials from Workers Above





# Potential Energy Due to Gravity

- Storage of Materials
  - Blocks
  - Piping
  - Pallets
- Unloading from Trucks





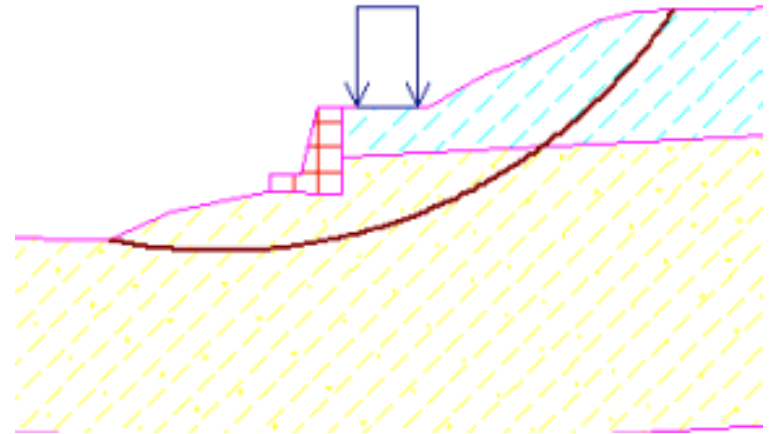
# Potential Energy Due to Gravity

## General Precautions

- Provide Redundancy in Support System
- Provide Bearing Supports - when possible
- Use High SF for Concrete Anchors in Tension
- Work from a Stable, Dry, and Level Surface
- Look for and Restrain Underlying Weak Support Systems

# Underlying Weak Support System Example

A potential slope failure surface can extend through a lower weak soil layer which might not be visible.



# Example of Redundant Engineered System



- Multiple Hanger Straps
- Double Supports under Beam
- Angle Steel Legs



# Potential Energy Due to Compressed Spring

- Hazards of Pipe in Bending Conditions
  - Coiled pipe under tension
  - Long sections of straight pipe being lifted or moved



# Potential Energy Due to Spring Compression

## Hazards:

- Anchor Load Tests
- Installing Springs into Mechanical Systems
- Retaining Rings
- Rail Anchors





# Other Potential Energy Hazards

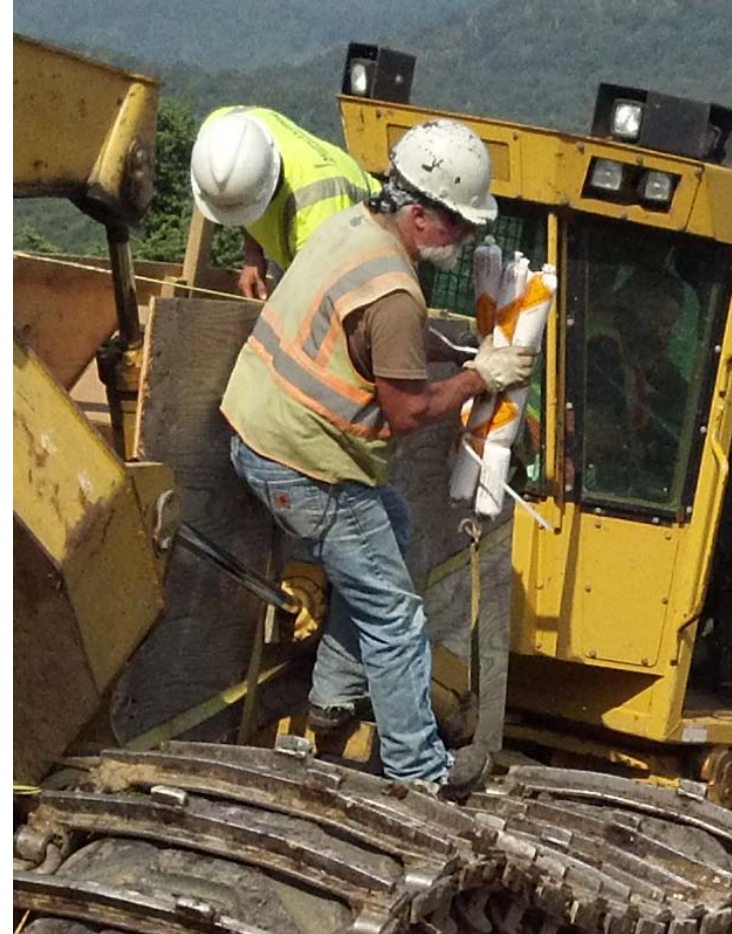
## Compressed Fluids

- Compressor Hoses
- Air Testing of Pipelines
- Live Pressurize Pipelines adjacent to excavations
- Compressed Gas Cylinders



# Other Potential Energy Hazards: Chemical Systems

- Explosives
- Flammable Gases
- Reactive Solids and Liquids





# Other Potential Energy Hazards: Electrical Systems

- High Voltage
- Capacitors
- Ground Gradients
- Charged Batteries



# Mitigation of Potential Energy Hazards

1. Recognition of the Hazards
2. Redundancy in Safety Systems
  - a. Supports
  - b. Worker PPE
  - c. Guards/Barriers
  - d. Engineered Systems
3. Controlled Dissipation of the Potential Energy