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
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