

# CONFINED SPACE ENTRY

# What is a Confined Space?

A space that meets all of the following:

- Is large enough and so configured that an employee can enter bodily and perform work;
- Has limited or restricted means of entry or exit;
- Is not designed for continuous human occupancy.



# Hazards

- Atmospheric
  - Physical
  - Mechanical
  - Other hazards
- Conditions that exist or may develop
  - Examples:
    - Oxygen enrichment or deficiency
    - Engulfment & entrapment
    - Lockout & isolation
    - Weather, electrical, etc.



# Non-Permit Confined Space

- A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.
- Examples:
  - Boot pit, Motor Control Center, Office basements, Dryer control room, Fertilizer blending tower, Etc.



# Permit-Required Confined Space

- A Permit-Required Confined Space is confined space that has one or more of the following characteristics:
  - Contains or has the potential to contain a hazardous atmosphere;
  - Contains a material that has the potential for engulfing an entrant;
  - Has an internal configuration such that an entrant could become trapped or asphyxiated; or
  - Contains any other serious safety or health hazard.



# Atmospheric Hazards

In general industry, most deaths are related to atmospheric hazards due to poor ventilation

- **Acceptable oxygen levels**
  - **19.5% to 23.5% oxygen concentration**
    - 23.6% - enriched
    - 19.5% - min. for safe entry
    - 16% - impaired judgment and breathing
    - 14% - faulty judgment, rapid fatigue
    - 6% - death in minutes
- **Flammable Gas and Toxic Vapor**
  - Carbon Monoxide (<25 ppm)
  - Phosphine Gas (.3 ppm or greater)
    - Can spontaneously ignite at 18,000 ppm
  - Hydrogen Sulfide (heavier than air – sinks)
  - Methane (lighter than air – rises)
  - Acetylene
  - Propane
  - Gasoline/Diesel fumes
  - Welding fumes



# Atmospheric Hazards

cont.

- **Combustible Airborne Dust**
  - If visibility becomes less than 5 feet, ventilation measures must be taken to reduce dust concentration and improve visibility
  - Appropriate respiratory protection must be used in these situations
- **Locations must use manufacturer's specifications to calibrate and maintain their air monitoring device, and certify employees to perform testing.**
  - At a minimum, employees must have comprehension testing of atmospheric hazards, tester operation and proper procedures for testing, which includes documented observations.
    - Air monitoring device must be fresh air calibrated before each use to confirm operation.
  - Recertification required annually. This should be done in conjunction with annual confined space training.



# Atmospheric Hazards

cont.

- **Air monitoring equipment must be equipped with an alarm to inform of sensor or equipment failure**
- **Air monitoring must detect the following gases:**
  - **Oxygen (O<sub>2</sub>) (19.5%-23.5%)**
  - **Carbon Monoxide (CO) (<25ppm)**
  - **Phosphine (PH<sub>3</sub>) (<.3ppm)**
  - **Methane (CH<sub>4</sub>)**

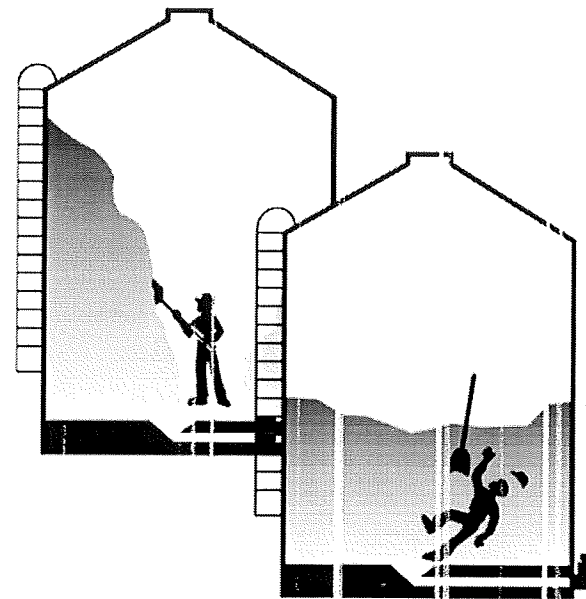




# Physical Hazards

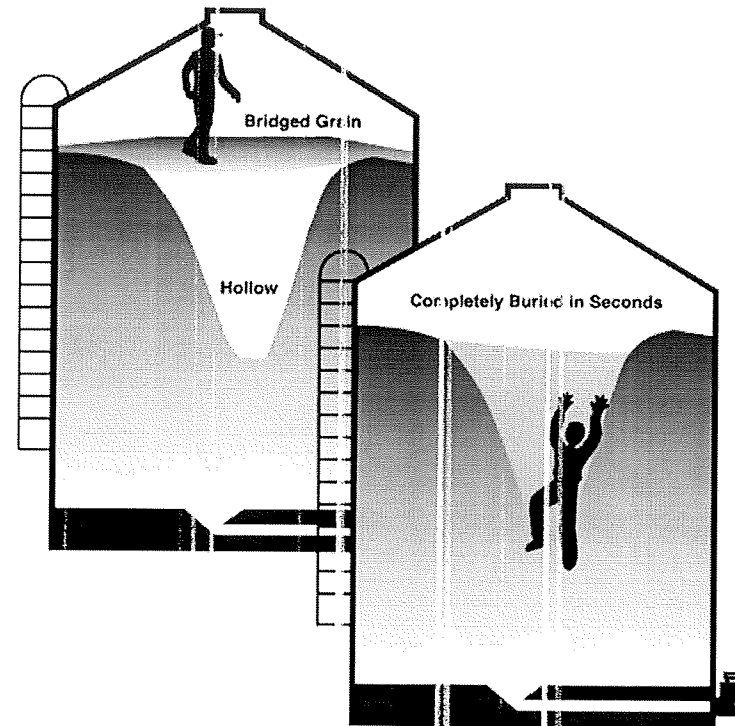
In the grain industry, engulfment is the leading cause of death

- Hung-Up Material
  - including any standing grain on the side of bin above the natural angle of repose ( $27^\circ$ ), could shift and bury a worker.



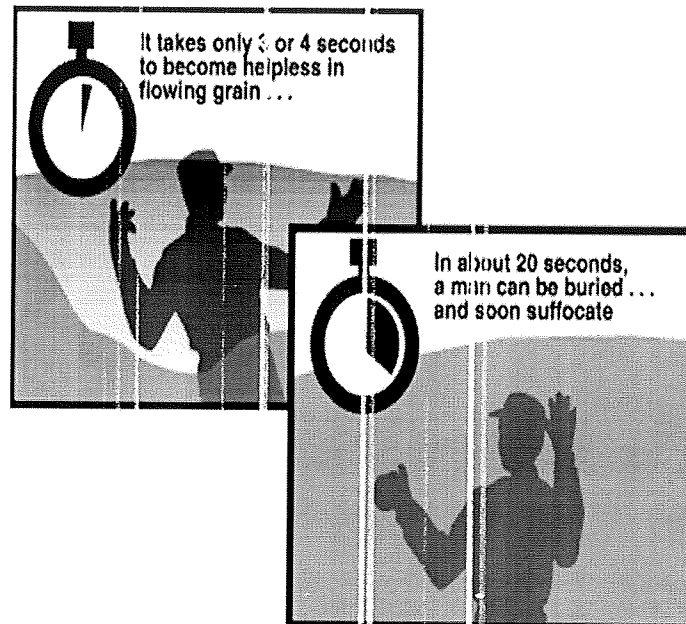
# Physical Hazards

- Bridged Material
  - Forms when grain is drawn off from beneath a top layer of compacted or crusted grain. Bridges are caused when grain becomes compacted and does not flow properly due to poor grain condition or other problems.
  - The bridge can collapse beneath a worker at any moment!



# Physical Hazards

- Moving/Flowing Material
  - Never enter a bin or confined space while it is being filled or when grain is being removed through natural gravity flow.
  - Within seconds the entrant can become completely engulfed.



# Mechanical Hazards

- Mechanical equipment presents the potential for injury when there is contact with the worker
  - Mechanical equipment:
    - Bin sweeps
    - Tractors
    - Augers
    - Shovel machine cables
    - Fill and discharge equipment



# Other hazards

- Examples:
  - Internal design that presents an entrapment hazard
  - Water, snow, ice or other surfaces that create a slip, trip or fall hazard
  - Defective safety and fall protection equipment
  - Electrical equipment
  - Temperature extremes
  - See manual for other hazards

