



Excavation & Trenching

1926 Subpart P

A Trenching Tragedy

- ▶ False sense of security
- ▶ Knew they were out of compliance
- ▶ Thought the soil was stable
- ▶ Conditions changed overnight
- ▶ A worker died



What Is an Excavation

- ▶ Any man-made cut, cavity, trench or depression in an earth surface, formed by earth removal



What Is a Trench

- ▶ A narrow excavation that is deeper than it is wide
- ▶ No more than 15 feet wide at bottom
- ▶ Walls will eventually fail



Excavation Person

- ▶ Statistics
 - ▶ 79% of trenches involved in accidents are 5 - 15 feet deep. (NUCA)



Qualified vs. Competent

Qualified Person

- ▶ One who, by possession of a recognized degree, certificate or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.



Competent Person

- ▶ One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measure to eliminate them.



Hazards of Excavations

- ▶ Equipment
- ▶ Material Handling
- ▶ Water
- ▶ Environmental
- ▶ Access & Egress
- ▶ Utilities
- ▶ Atmospheres
- ▶ Cave – ins
- ▶ Existing Structures
- ▶ Biological / Environmental
- ▶ Vehicles
- ▶ Public & Pedestrian
- ▶ Utilities



Cave-in

- ▶ Soil or rock that suddenly falls or slides into an excavation
- ▶ Sufficient quantity to entrap, bury, injure or immobilize
- ▶ Soil gravitates downward, pressure pushes soil inward toward the trench
- ▶ Bottom third of wall typically fails first
- ▶ Soil above the collapsed lower wall follows



Cave-in Injuries

- ▶ Soil weighs approximately 125 lbs. per cubic foot
- ▶ A worker can be crushed by soil, rock, or an object
- ▶ Suffocation-even if worker's head is not buried, soil prevents chest expansion
- ▶ Immobilized by soil's suction effect

DANGER



What Are the Hazards?



Numbers to Remember

- ▶ 2
- ▶ 3
- ▶ 4
- ▶ 4
- ▶ 5
- ▶ 20
- ▶ 24
- ▶ 25



2

- ▶ Keep spoil pile 2 feet from edge of trench.



3

- ▶ Ladders secured and extend a minimum of 3' above the landing.



4

- ▶ Trenches 4 feet or more in depth need proper access and egress



Is this Proper ?



4

- ▶ If a competent person suspects a hazardous atmosphere, testing will begin at 4 feet or less





5

- ▶ Each employee in an excavation must be protected from cave-ins when:
- ▶ Excavation is deeper than 5 feet; or,
- ▶ The Competent Person determines protection is necessary



18

- ▶ Support systems should extend 18 inches above the excavation



20

- ▶ At 20 feet or deeper, a professional registered engineer will design the protective system.



24

- ▶ Excavations of earth material to a level not greater than 24 inches below the bottom of the shield



25

- ▶ Spacing between ladders or other means not more than 25 feet laterally



Excavation Inspections

- ▶ Inspections conducted before work starts, throughout shift, after rainstorm
- ▶ Excavations inspected for:
 - ▶ Evidence of possible cave-ins
 - ▶ Indications of failure of protective systems
 - ▶ Potential hazardous atmosphere
- ▶ If hazardous condition found, workers are removed



Signs of Soil Distress

- ▶ Fissures or cracks on excavation face
- ▶ Slumping of material from excavation face
- ▶ Bulging or heaving of material at the bottom of excavation wall
- ▶ The sinking of excavation's edge
- ▶ Ravelling, or small amounts of material (i.e., pebbles) trickling into excavation



Conditions Causing Soil Distress

- ▶ Nearby vibrating machinery
- ▶ Nearby heavy, moving loads
- ▶ Seeping water or rain
- ▶ Hot, dry weather



Appendix A – Soils Analysis

- ▶ Soil Types
 - ▶ Stable Rock
 - ▶ Type A
 - ▶ Type B
 - ▶ Type C



Sloping

- ▶ Maximum allowable slopes for excavations less than 20 ft. (6.09 m) based on soil type and angle to the horizontal are as follows:

Soil type	Height/Depth ratio	Slope angle
Stable Rock	Vertical	90°
Type A	¾:1	53°
Type B	1:1	45°
Type C	1½:1	34°
Type A (short-term)	½:1	63°

(For a maximum excavation depth of 12 ft)



Benching

- ▶ Type A Soil
- ▶ Simple Bench ¾ :1
- ▶ Type B Soil
- ▶ Simple bench 1:1



Benching

- ▶ You Cannot Bench Type C soil



Hazardous Atmospheres

- ▶ Excavations near sewers, landfills, hazardous substances storage area
- ▶ Test atmosphere when deeper than 4 feet
- ▶ Ventilation or appropriate PPE
- ▶ Rescue and emergency equipment



Falling Soil or Equipment

- ▶ Protect workers from loose rock/soil that may fall from an excavation face
 - ▶ Scaling to remove loose soil
 - ▶ Protective barricades, such as shoring or shields
- ▶ Protect workers from material or equipment that could fall into the excavation
 - ▶ Keep material/equipment 2 feet from edge
 - ▶ Use retaining devices



Adjacent Structures

- ▶ Excavations might endanger stability of buildings, walls, other structures
- ▶ Sidewalks, pavement not undermined unless supported to prevent collapse on excavation workers
- ▶ Shoring, bracing, or underpinning used to ensure stability for employee protection



Water Accumulation

- ▶ Workers have drowned in the water at the bottom of a trench or excavation
- ▶ Never work in an excavation where water is accumulating without proper precautions
- ▶ Special shoring or shield system
- ▶ Water removal system
- ▶ Use of safety harness and lifeline



Other Trenching Issues

- ▶ Mark underground utilities
- ▶ Stand away from lifting/digging equipment
- ▶ Use of warning systems or barricades
- ▶ Use hard hats
- ▶ Use fall protection
- ▶ Do not work on sides of sloped or benched excavation above other workers
- ▶ Worker on top watches excavation walls to warn trench workers of potential hazards



Protection

- ▶ Shoring
- ▶ Shielding
- ▶ Trench Boxes
- ▶ Benching
- ▶ Sloping



Summary

- ▶ Cave-ins occur suddenly and can entrap, bury, or injure
- ▶ Soils have varying stability that determines the appropriate protection
- ▶ Always use protection systems
- ▶ Be aware of signs of soil distress
- ▶ Be aware of all the hazards associated with working around excavations



Contact Information

Dean Hiles
Loss Prevention Consultant
Risk Management Services

dhiles@gibsonins.com

www.gibsonins.com

P: 574-245-3564

C: 574-238-4652

F: 574-936-4125

