



Trenching Safety Training Presentation

Presented by Innovise Business Consultants

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Learning Objectives

- Review definitions (excavation vs. trench).
- Understand the hazards of working in a trench.
- Know the role and responsibilities of the competent person.
- Learn specific employer responsibilities.
- Identify three protective systems to prevent trench accidents.





Definitions

Excavation vs. Trench

- **Excavation**—An excavation is any man-made cut, cavity, trench or depression formed by earth removal.
- **Trench**—A trench is a narrow excavation made below the surface of the ground. In general, the depth of a trench is greater than its width. However, the width of a trench (measured at the bottom) is typically no greater than 15 feet.



Not all excavations are considered trenches. In general, trenches are more dangerous.



Hazard Overview

Cave-ins

- Above all, cave-ins present the greatest risk in trenching and are more likely to result in worker fatalities than any other excavation-related accidents.
- Trenches naturally want to refill themselves, which can result in worker burials or entrapments.
- One cubic yard of soil can weigh as much as a car, leading to serious injuries or even death in the event of a trench collapse.



Hazardous Atmospheres

- Hazardous atmospheres (e.g., carbon monoxide, noxious gas, vapors or a lack of oxygen) are common in trenches.
- Often, employers who don't test the air quality of trenches can unknowingly put workers in life-threatening situations.
- Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases when trenches are greater than 4 feet deep. Air sampling should be performed using a calibrated air monitor.

Other Hazards

- Falls (e.g., a worker accidentally falls into a trench and injures themselves)
- Flooding or water accumulation
- Mobile equipment (e.g., equipment operated or stored too close to the excavation site falls into the trench)
- Contact with underground utility lines (e.g., electrical, natural gas, water, sewage or telecommunication)



Injury Statistics and the Importance of Safeguarding Workers

- Around 54 workers are killed at excavation sites each year.
- Of those, cave-ins account for 76% of fatalities.
- Taking the appropriate trenching precautions can reduce accidents, prevent business interruptions, ensure workers are safe and healthy, safeguard your business's reputation and help you remain compliant.
- Failing to take the proper protection can result in major penalties of six figures or more.



Employer Responsibilities

Competent Person

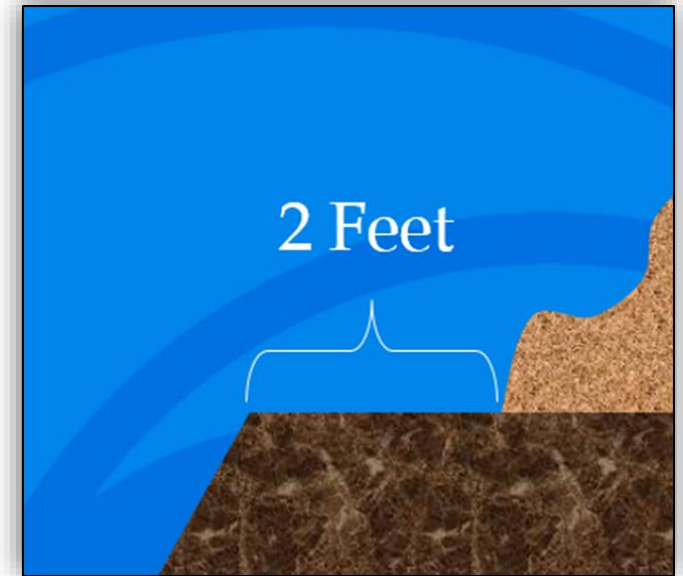
- The Occupational Safety and Health Administration's (OSHA) Excavation standards, 29 Code of Federal Regulations (CFR) Part 1926, Subpart P, contains requirements for excavation and trenching operations.
- Among these requirements, trenches need to be inspected before work begins every day (or whenever conditions change) and by a **competent person** to ensure the elimination of excavation hazards.

The Role of a Competent Person

- Under trenching regulations, a competent person is an individual who can:
 - Recognize working conditions that are hazardous, unsanitary or dangerous to workers.
 - Classify soil types.
 - Inspect protective systems required on the job site.
 - Design structural ramps.
 - Monitor water removal equipment.
 - Conduct site inspections.
- The competent person must be designated by the employer and have the authority to eliminate hazards and unsafe conditions.

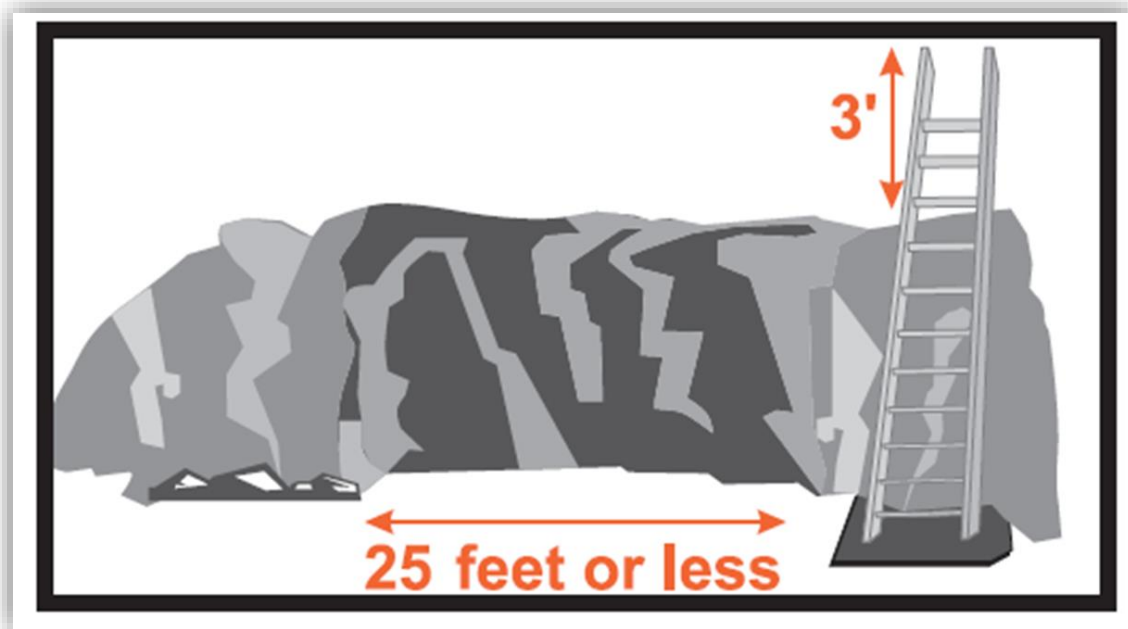
General Requirements

- Inspect the excavation daily and as needed, taking prompt corrective action when a hazard is identified.
- Keep soil piles and heavy equipment away from the edge of trench (at least 2 feet away).
- Use adequate protective systems.
- Train employees on hazard recognition and unsafe conditions.
- Determine the approximate location of underground utilities before digging a trench.



General Requirements (Continued)

- **The 4-foot rule**—Provide access and egress to all excavations, including ladders, steps, ramps or other safe means of exit for employees working in trench excavations 4 feet or deeper. These devices must be located within 25 feet of employees at all times.



General Requirements (Continued)

- **The 5-foot rule**—Trenches 5 feet deep or greater require a protective system unless the excavation is made entirely in stable rock.
- **The 20-foot rule**—Trenches 20 feet deep or greater require protective systems designed by a registered professional engineer, or be based on tabulated data prepared or approved by a registered professional engineer.



This is an example of poor trench safety practices. Protective systems must be used for trenches that are 20 feet deep or more.



Protective Systems

Soil Testing

- Testing and classifying soil is crucial when it comes to protecting employees from a cave-in. This responsibility rests on the competent person.
- Soil classification results can be used to determine what type of protective system can be used.

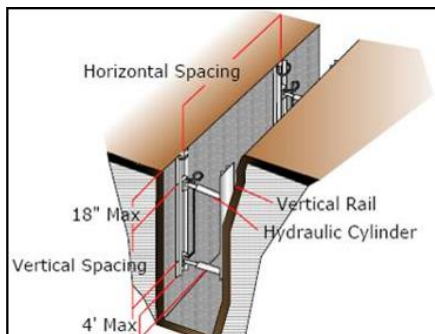


Soil Types

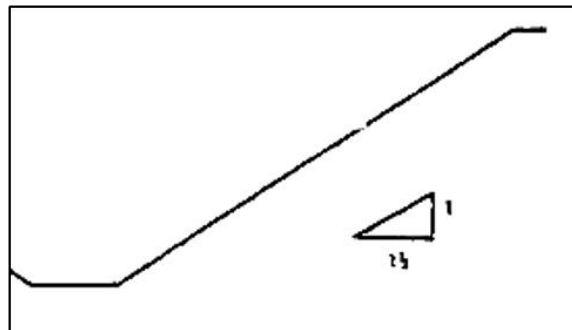
1. **Solid/stable rock**—Natural solid mineral matter (usually granite or sandstone) that can be excavated with vertical sides. This type of soil will remain intact while exposed.
2. **Type A soil**—Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Usually identified as various types of clay.
3. **Type B soil**—Cohesive soils with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf. Examples can include angular gravel or silt.
4. **Type C soil**—Cohesive soils with an unconfined compressive strength of 0.5 tsf or less. Examples include gravel, sand, submerged soil and soil from which water is freely seeping.

Workplace Designs

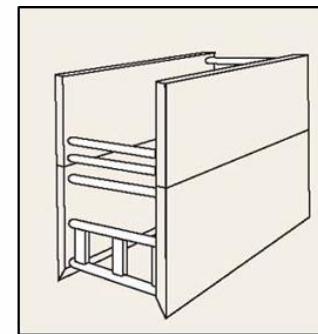
- **Shoring** requires installing aluminum hydraulic or other types of supports to prevent soil movement and cave-ins.
- **Benching/sloping** is a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.
- **Shielding** protects workers by using trench boxes or other types of supports to prevent soil cave-ins.



Shoring



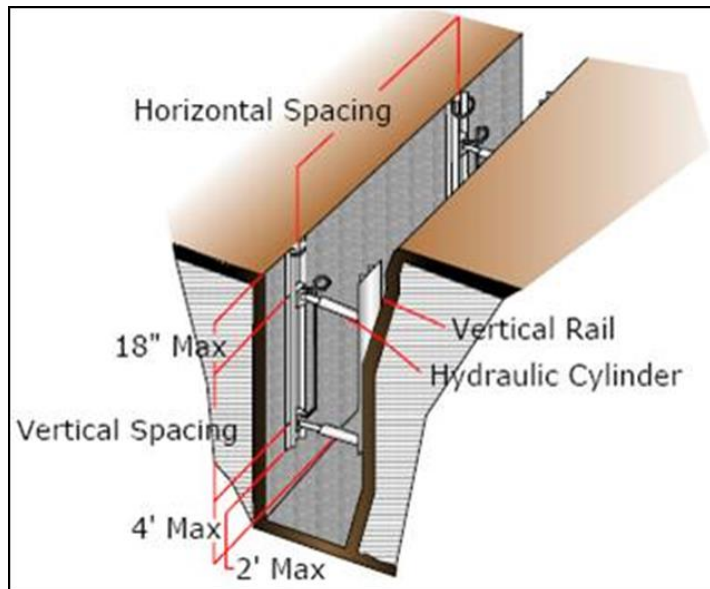
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Shielding

Shoring

- Shoring can help prevent the movement of excavated walls, soil, underground utilities, roadways and foundations.
- Shoring systems typically consist of posts, wales, struts and sheeting.
- There are several kinds of these systems, with hydraulic and timber shoring systems being the most common. Hydraulic shoring is preferable.



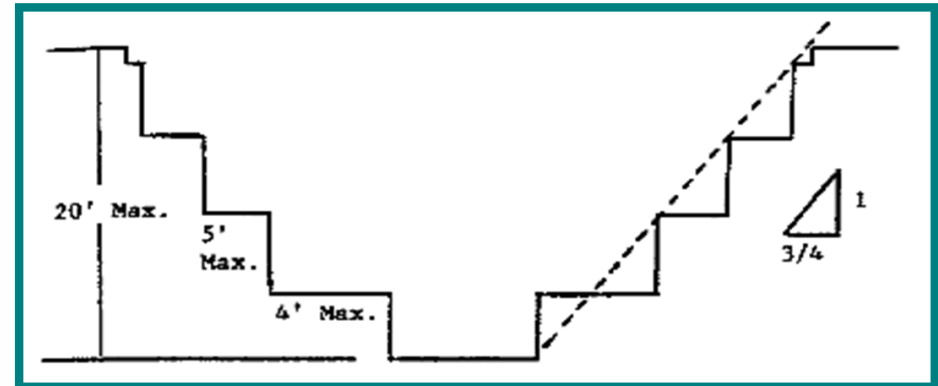
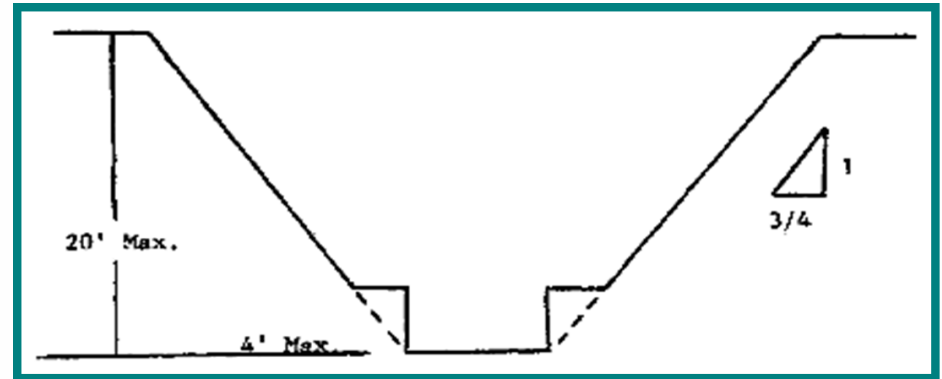
Benching and Sloping

- Sloping, if done correctly, removes the risk of cave-ins by sloping the soil of the trench back from the trench bottom.
- Understanding the soil type can provide more detail when implementing sloping precautions.

Soil Type	Height/Depth Ratio	Slope Angle (In Degrees)
Stable Rock	Vertical	90 (Vertical)
Type A	0.75:1	53
Type B	1:1	45
Type C	1.5:1	34

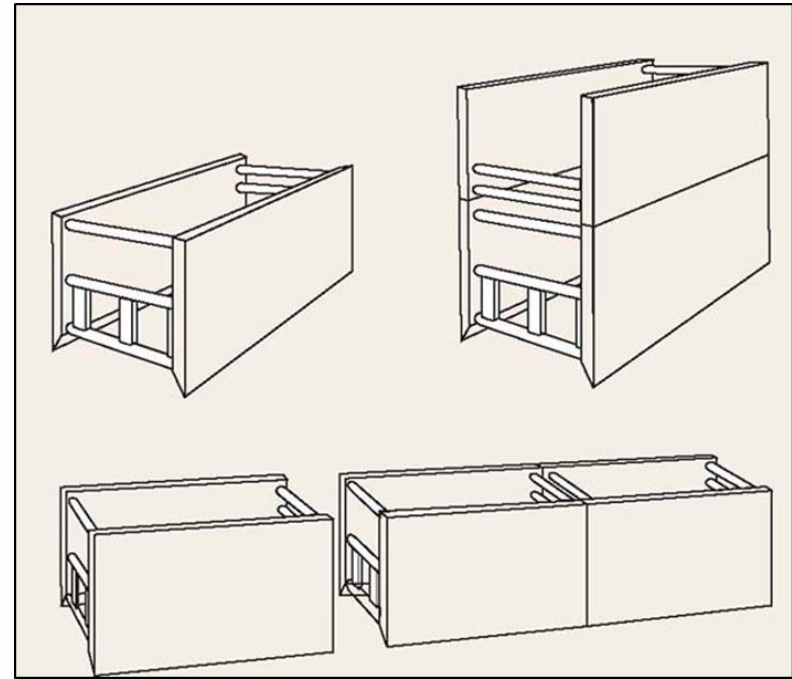
Benching and Sloping (Continued)

- Bench to protect workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.
- Benching cannot be done in Type C soil.



Shielding

- Trench shields and boxes can protect workers from the forces of a cave-in.
- The excavated area between the outside of the trench box and the face of the trench should be as small as possible.
- Trench boxes are different from shoring because, instead of shoring the trench face, they are intended primarily to protect workers from cave-ins and similar incidents.



Shielding (Continued)

- Employers should use a trench box, or a shield designed or approved by a registered professional.
- One drawback of shielding is that, in order for the shield to do its job, workers must stay within the protection of the shield even when entering and exiting.



Installing and Removing Protective Systems

- Support systems must be secure and should not slide or fall.
- Support systems must be installed and removed in a way that protects workers from cave-ins and structural collapses.
- Support systems must never be overloaded.
- Remove support systems from the bottom up. Backfilling should progress in tandem with the removal of support systems.

Other Safety Considerations

- Inspect trenches following a rainstorm or other event that may have altered the properties of the trench.
- Ensure employees do not work under suspended or raised loads and materials.
- Ensure that personnel wear high-visibility or other suitable clothing when exposed to vehicular traffic.
- Equip employees with the proper personal protective equipment:
 - Hard hats
 - Ventilation equipment



Summary of Key Points

Takeaways

- Trenches can be extremely dangerous, and cave-ins, hazardous atmospheres and similar dangers can affect employer safety and job completion.
- Among other requirements, OSHA requires employers to designate a competent person to oversee trenching safety precautions. This individual inspects job sites, tests soil and implements protective systems.
- Protective systems are the primary way to ensure safe trench work. Shoring, benching, sloping and shielding are the most effective methods.

Additional Resources

- View OSHA's resources on trenching and excavation at:
- www.osha.gov/SLTC/trenchingexcavation/index.html
- <https://www.osha.gov/Publications/osha2226.pdf>
- Contact a trusted advisor at CRS Insurance Brokerage.