



Trenching and Excavation Safety

Trenching and excavation present multiple hazards including falls, hazardous atmospheres, water accumulation and incidents involving loads or mobile equipment. Cave-ins pose the greatest risk to excavation workers as they cause dozens of fatalities and hundreds of injuries each year. This document highlights key items that can help protect workers from these hazards. Utilize the resources at the end of this document and in applicable OSHA Standards for specific training and experience requirements.

General Rules

Never allow anyone to enter a trench before a full evaluation of all hazards has been performed by a competent person and protective methods have been taken!

- Keep heavy equipment away from the edges of an excavation.
- Prior to digging, contact a utility locating service.
- Identify any equipment or activities that could affect trench stability.
- Perform atmospheric testing as often as necessary to ensure that the air is safe for breathing.
- Do not work under suspended or raised loads and materials.
- Wear high-visibility or other suitable clothing when exposed to vehicular traffic.
- An inspection shall be performed and documented by a competent person prior to the start of a shift and throughout the shift as needed. Inspections should be made after every rainstorm or other new hazard.
- Keep yourself and your equipment at least 10 feet away from overhead power lines.

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By the Numbers

- **2 ft.** - Set spoil piles and equipment at least 2 feet back from the excavation. Where the site does not permit a 2-foot setback, spoils may need to be temporarily hauled to another location.
- **4 ft.** - Provide stairways, ladders, ramps or other safe means of egress in all trenches that are 4 feet deep or more. Also, trenches more than 4 feet deep must be tested for atmospheric hazards (low oxygen, hazardous fumes and toxic gases).
- **5 ft.** - Trenches 5 feet deep or greater require a protective system unless the excavation is made entirely in stable rock. A competent person may determine that a protective system is required if less than 5 feet deep.
- **20 ft.** - Trenches 20 feet deep or greater require that the protective system be designed or, based on tabulated data, prepared/ approved by a registered professional engineer.
- **25 ft.** - Position means of egress within 25 feet of all workers.

Competent Person Criteria

- Capable of identifying existing and predictable hazards
- Can identify hazardous, unsanitary or dangerous working conditions.
- Trained in soil analysis
- Trained in the use of protective systems
- Has the authority to immediately eliminate hazards

Soil Types

- **Type A** - Consists of soils such as silty, sandy or regular clay as well as clay loam. Type A has a high unconfined compressive strength of 1.5 tons per square foot or greater.
- **Type B** - Consists of soils like gravel, silt, silt loam or soils near a source of vibration. Type B has a moderate unconfined compressive strength between 0.5 - 1.5 tons per square foot.
- **Type C** - Consists of granular soils like sand and gravel. Type C has a low unconfined compressive strength less than 0.5 tons per square foot.

Soil Evaluation Methods

- **Pocket Penetrometer** - A direct-reading, calibrated instrument that provides estimates of the unconfined compressive strength of soils. Once pushed into the soil, an indicator sleeve displays the reading.
- **Wet Thread Test** - A test performed by molding a moist sample of the soil into a ball and attempting to roll it into a thin thread. If the thread can be held by one end without any breaking or tearing occurring, then the soil is considered cohesive.
- **Visual Test** - This test is a qualitative evaluation of conditions around the entire excavation site. The evaluator should check for any signs of vibration, crack-line openings, previously disturbed soil, utilities, standing water, bulging and boiling, as well as evaluate the spoil distance from the edge of the excavation.

Designing a Protective System

Factors to Consider

- Soil classification
- Available real estate
- Depth of cut
- Water content of soil
- Changes caused by weather or climate
- Surcharge loads (e.g., spoil, other materials to be used in the trench)
- Location of underground utilities
- Other operations in the vicinity

Protection Methods

Sloping

Involves cutting the trench wall back at an angle inclined away from the excavation. OSHA outlines different ratios for sloping dependent on the soil classification.

- Often the most cost-effective method.
- Removes less material than benching and requires the same amount of real estate to achieve.
- Easier to accomplish on equipment and is easy to construct.
- Can only be chosen when there is enough space around the excavation to get the required slope ratio.



Benching

Excavate the sides of the trench/excavation in accordance with OSHA's 1926 Subpart P to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

- Only for type A and B soils, not type C.
- Can only be chosen when there is adequate space available around the excavation for it to be constructed in accordance with the regulatory standard.
- The least commonly used method because it is often difficult for employees to understand the many requirements of the system.

Shoring

Install a hydraulic shoring system, posts, wales, struts and sheeting or other types of supports for the face of an excavation to prevent soil movement and cave-ins. Typically used when the depth of the cut or the location eliminates sloping as a solution.

- Can be used to support the weight that man-made systems and structures (sidewalks, roadways, adjacent buildings, etc.) impose on the soil.
- Require less real estate than conventional systems.
- Can be tailored to the specific dimensions of an excavation.
- Hydraulic shoring systems are lightweight, versatile, have gauges to ensure there is even pressure distribution, can use the soil's natural cohesion to prevent soil displacement and workers do not have to enter the excavation to install or remove them.
- May be more cost-effective as an alternative to sloping or shielding.

Shielding

Install trench boxes, steel plates and/or a combination of protective systems that extend above the top of the trench. This method is intended to protect workers, not support the excavation. These systems must be used in accordance with manufacturer recommendations.

- Offers the most effective protection from potential collapses.
- Prevents equipment and spoils from falling back into the excavation.
- Multiple types of systems are available, each with specific requirements for their installation.
- Can be used in all soil types.

Additional Resources

- Occupational Safety and Health Administration (OSHA) – [Trenching and Excavation Safety Guide & Fact Sheet](#)
- Occupational Safety and Health Administration (OSHA) – [Excavation, Trenching and Soil Mechanics](#)
- Centers for Disease Control (CDC) – [Trenching and Excavation](#)

