

Excavation & Trenching Safety

Trenching activities are some of the most dangerous in public works. The U.S. Bureau of Labor Statistics (BLS) data show that 3+ workers per month (45 per year) are killed in trench collapses. Sixty-eight percent of those fatalities occurred in companies with fewer than 50 workers. Forty-six percent of the deaths occurred in small companies with 10 or fewer workers. Seventy-nine percent of all catastrophic accident cases occurred in trenches less than 15 feet deep.

Trenching Guidelines

Trench collapses cause dozens of fatalities and hundreds of injuries each year. Here are some guidelines that can help you trench safely on the work site:

- Trenches 5 feet deep or greater require that a protective system be used.
- Trenches 20 feet deep or greater require that a registered professional engineer design the protective system.
- Keep heavy equipment and excavation spoils at least a distance of .5 to .75 times the depth of the trench, measured from the top edge of the vertical face of the trench, away from the trench edge.
- Provide stairways, ladders, ramps, or other safe means of access and egress within 25 feet of every worker in all trenches 4 feet or deeper. Consider this for shallower trenches as well.



Protective Systems

- Sloping protects workers by cutting back the trench wall at an angle inclined away from the excavation.
- Shoring protects workers by installing timber or aluminum hydraulic supports to prevent soil movement.
- Shielding protects workers by using trench boxes or other types of supports to prevent soil cave-ins.



Competent Person

- An [Occupational Safety and Health Administration's \(OSHA\)](#) “competent person” is defined as “one who is capable of identifying existing and predictable hazards in the surrounding or working conditions which are unsanitary, hazardous, or dangerous to employees, and who have authorization to take prompt corrective measures to eliminate them”.
- The OSHA standards require that a competent person inspect the trench daily and as conditions change.

- The designated competent person should have authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.

Competent Person Actions

- Do not allow work in an excavation in which there is accumulated water or in which water is accumulating unless adequate precautions are taken.
- Implement precautions, such as special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
- If excavation work interrupts the natural drainage of surface water (such as streams), use diversion ditches, dikes, or other suitable means to prevent surface water from entering the excavation and to adequately drain the adjacent area.
- Excavations subject to runoff from heavy rains require an inspection by a competent person to evaluate water accumulation hazards.

Four Types of Soil (Quick Overview)

- **Stable Rock:** Natural solid material that remains intact
- **Type A:** Not previously disturbed cohesive soil with an unconfined compressive strength of 1.5 tons per square foot or greater
- **Type B:** Unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf—angular gravel, silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam
- **Type C:** Unconfined compressive strength of 0.5 tsf or less—granular soils including gravel, sand, and loamy sand, soil from which water is freely seeping.

Source: [OSHA Soil Classification](#). OSHA requires two testing methods (Visual and Manual) when determining soil classification. That is why it's generally recommended that you assume the soil is Type C (the least cohesive soil) and use the protection accordingly. Soil type usually varies in the trench, from top to bottom.

Configurations

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Configurations of sloping and benching systems shall be in accordance with the following:

Soil or Rock Type	Maximum Allowable Slopes (H:V) ¹ for Excavations Less Than 20 Feet Deep ³
Stable Rock	Vertical (90°)
Type A ²	¾ : 1 (53°)
Type B	1 : 1 (45°)
Type C	1½ : 1 (34°)

Source: [OSHA 29 CFR 1926 Subpart P App B](#)

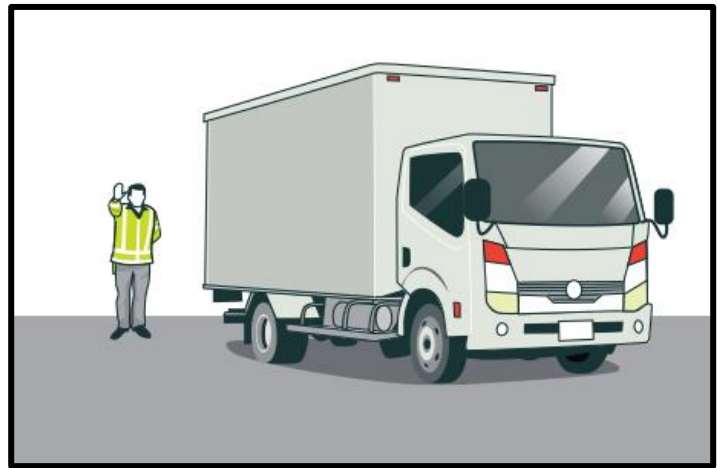
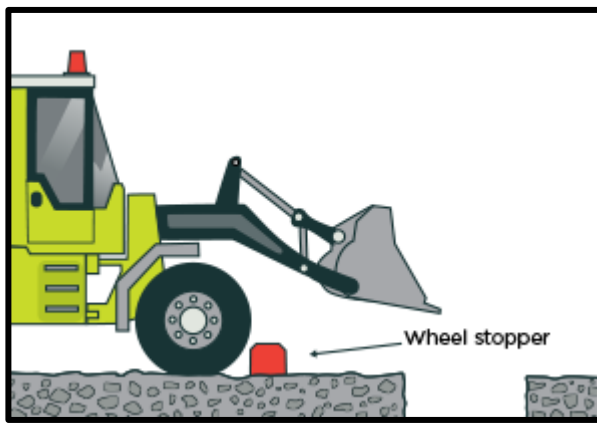
¹ Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

² A short-term maximum allowable slope of ½ H : 1 V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67m) in depth shall be ¾ H : 1 V (53°).

³ Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

Using Equipment Near Trenches & Excavations

When mobile equipment is operated adjacent to an excavation, the operator must have a clear and direct view of the edge of the excavation, or... a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.



- Use a signal person.
- Operators should get out of their vehicles and walk to the rear to look for people, objects and/or confirm clearances.
- Warn nearby workers who might be in the way.
- Nearby on-foot workers must pay attention to the equipment and watch it come to a complete stop.

Protection from Hazards Associated with Water Accumulation

- Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.
- Use of special support or shield systems approved by a registered professional engineer.
- Water removal equipment used and monitored by a competent person.

- Safety harnesses and lifelines used; in conformance with 29 CFR 1926.104.
- Surface water diverted away from the trench.
- Employees removed from the trench during rainstorms.
- Trenches carefully inspected by a competent person after each rain and before employees are permitted to re-enter the trench.



- The presence of water generally means a less stable soil (Type C). Appropriate protective system must be in place.
- Select, inspect and use water removal equipment correctly; consider such things as air quality and personal health issues as well as any potential for environmental contamination.

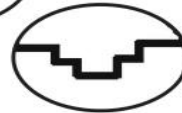
Working Safely in Trenches

Two workers are killed every month in trench collapses. Each worker in a trench shall be protected from a cave-in by an adequate protective system. Some of the protective systems for trenches are:

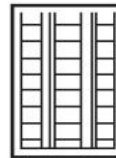
- Sloped for stability; or



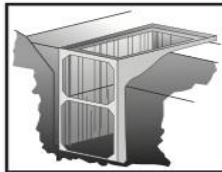
- Cut to create stepped benched grades (Type A or B soil only); or



- Supported by a system made with materials such as posts, beams, shores or planking and hydraulic jacks; or



- Shielded by a trench box to protect workers in a trench.



Excavated or other materials and equipment must be at least 2 feet back from the edge of a trench; and



A safe way to exit must be provided within 25 feet of workers in a trench.



A competent person must inspect trenches daily and when conditions change. An unprotected trench is an early grave. Do not enter an unprotected trench.

For more information:

OSHA[®] Occupational Safety and Health Administration
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www.osha.gov (800) 321-OSHA (6742)
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For additional information about excavation and trenching safety, please visit the OSHA website at: <https://www.osha.gov>.

Notes
