

Goal

This program provides information on the Occupational Safety and Health Administration's (OSHA) general safety requirements for excavation work as published in 29 Code of Federal Regulations 1926 Subpart P.

Objective

To familiarize workers with the hazards and safety requirements associated with trenching and excavation.

Definitions (According to 29 CFR 1926 Subpart P)

Competent person - one who is capable of identifying existing or predictable hazards in the surroundings or identifying working conditions which are unsanitary, hazardous, or dangerous to employees and who has the authority to take prompt corrective action to eliminate them.

Excavation - any man-made cut, cavity, trench, or depression made in the earth's surface formed by earth removal.

Registered Professional Engineer - any person who by education and training, having passed the requirements for registration, is registered as a professional engineer in the state the work is being performed.

Trench - a narrow excavation made below the surface of the ground. In general the depth is greater than the width, but the width is no greater than 15 feet.

Trench shield - a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect workers within the structure.

Shoring - a structure such as a metal hydraulic, mechanical, or timber system that supports the sides of an excavation and is designed to prevent cave-ins.

Background

Prior to the 1970s, most excavations were shored with timber. Timber shoring was very expensive, took considerable time to install and had to be adjusted with shims and wedges several times a day. Entering an unsupported excavation to install or remove the timber shoring proved to be a major hazard. The development of lightweight hydraulic and pneumatic shoring dramatically reduced the hazard of entering an unsupported excavation. Another device that added to worker safety was the trench box. A trench box may be placed in an excavation prior to employees entering the excavation.

Specific Excavation Requirements



A basic rule for excavation is "Plan your dig, then dig your plan". If you encounter something unplanned for stop and replan.

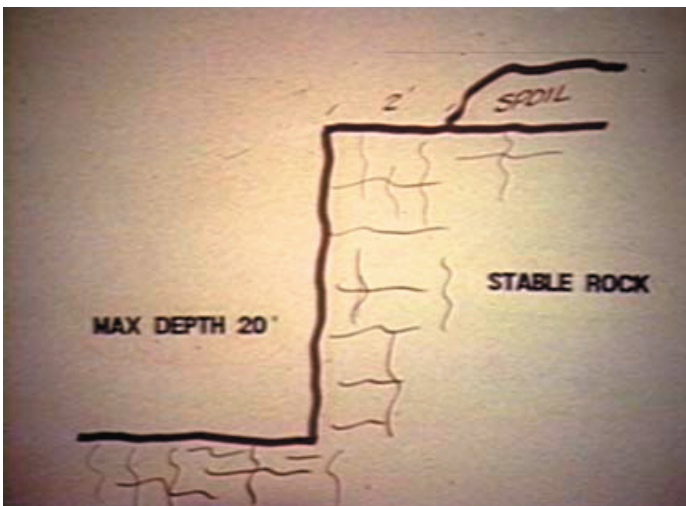
Before you dig, know everything possible about the excavation route. Have the route surveyed and mapped. Although OSHA does not require soil borings, it is good engineering practice to conduct soil borings to determine soil classes along the route. A soil-boring log provides information on possible water table and soil contamination from leaking underground storage tanks.

1. **Surface encumbrances** includes buildings, trees, signs, sidewalks, power poles, parking lots, and walls which must be removed, braced, shored, or otherwise supported to prevent a hazard.
2. **Underground utilities** such as sewer, water and gas lines, and communications and electric lines must be identified, and physically located. Call the local area utility locator company, give them the location or the route and depth of the proposed excavation and request utility locations. Usually the locator company requires a minimum of 48 hours advance notice. Give them as much lead time as possible. When located, the utility must be physically and cautiously exposed.

Once the utility is uncovered, it becomes your responsibility to support, protect, or have the utility removed as necessary. Locating all buried utilities that cross or parallel your route may be time-consuming, but failure to do so could have serious consequences. In Dallas, there are an average of 98 utility-crossings in a city block. Though preventable, the consequences of digging into a petroleum gas line or buried electrical utility could be fatal.

3. **Access and egress.** Any trench or excavation four feet or deeper must have a means of exit. Ladders and/or ramps must be located no more than twenty five feet in any direction. Ladders must extend three feet above the surface of the excavation and be tied off if necessary.

4. **Exposure to vehicular traffic.** Workers exposed to vehicular traffic must wear “high visibility” vests or clothing. An excavation must also be protected by barricades and a flag person to direct traffic.
5. **Exposure to falling loads.** Under no condition should workers be permitted under loads handled by lifting or digging equipment. Workers must stand away from vehicles being loaded or unloaded. Vehicle operators may stay in their vehicles during loading or unloading, provided they are protected by a cab constructed in accordance with 29 CFR 1926.601(b)(6).
6. **Warning systems.** All mobile equipment (front-end loaders, bulldozers and dump trucks) shall be equipped with a warning device such as a backup alarm. When the mobile equipment approaches an excavation, there must be some method to warn the operator that he is approaching the edge of the excavation. Use of hand signals from a flag person, stop logs, barricades or other mechanical signals are a few of the warning methods. An attentive operator and a flag person who knows and uses proper hand signals is the safest method. If possible and practical, grade the slope away from the excavation. This serves a dual purpose of keeping equipment and vehicles from accidentally rolling into the excavation and directing rainwater away from the excavation.
7. **Hazardous atmospheres.** In excavations deeper than four feet with the potential for a hazardous atmosphere or oxygen deficiency, conduct air testing before workers enter the excavation and as often as necessary to ensure the atmosphere remains safe. Ventilation or respiratory protection may be needed to protect workers from harmful atmospheres.



8. **Hazards associated with water accumulation.** Workers shall not work in excavations where water is accumulating unless adequate precautions are taken to protect workers from these hazards. This protection involves specific shoring, pumping, and well points for water removal, and careful monitoring by a competent person.
9. **Stability of adjacent structures.** Any excavation below the base or footing of a foundation, wall, sidewalk, pavement, or other structure shall have shoring or bracing

to provide structural support that ensures the stability of the structure for the protection of the workers, or shall have the approval of a registered professional engineer who has determined that (1) the structure is far enough from the excavation that it will not be affected or (2) such excavation work will not pose a hazard to the workers.

10. **Protection from loose rock and soil.** Excavated earth (spoil), materials, tools, and equipment shall be placed no closer than two feet from the edge of the excavation. Rock and soil should be scaled off the face of the excavation or retained by shoring or other acceptable methods to prevent the material from falling and striking workers. Good work practices should dictate that no person will work on the sides of the slope or benched excavation above other workers unless the lower workers are protected from falling materials. OSHA 1926.100(a) requires the use of hard hats where there is a possible danger of head injury from falling objects. Excavation operations expose workers to these hazards in every work zone during excavation.
11. **Inspections.** A competent person must inspect the excavation and its support system for evidence of a situation that could result in possible cave-ins, indications of failure of the protective system, hazardous atmospheres, or other hazardous conditions. The inspections shall be done prior to start of work and as often as needed throughout the shift. Inspections shall be made after every rain storm or other hazard-increasing occurrence. When inspection finds evidence of a situation that could result in a hazard to the worker, exposed workers will be removed from the hazardous area until necessary precautions have been taken to ensure their safety.
12. **Fall protection.** Where personnel and/or equipment must cross an excavation, a walkway or bridge shall be engineered to withstand the maximum expected load. The walkway or bridge shall be provided with standard guardrails that meet OSHA standards outlined in 29 CFR 1926 Subpart M. All excavations in a remote location or unattended should have adequate barriers or physical protection to prevent people from falling into the excavation. Upon completion, back fill all trenches, wells, pits, or shafts as soon as practical.

Conclusion

Even with the introduction of new equipment and strict enforcement of OSHA standards, more than 400 workers die each year and 6,400 are seriously injured in trench accidents. Being buried alive is just one of the hazards of excavation.

This program only covers the general requirements of excavation safety. Following the safety measures listed in this publication and not taking shortcuts will make a dangerous job safer.

Review questions

1. In excavations deeper than ____ feet with the potential for a hazardous atmosphere or oxygen deficiency, conduct air testing before workers enter the excavation and as often as necessary to ensure the atmosphere remains safe.
 - a. 4
 - b. 10
 - c. 7
 - d. 6
2. If an underground utility is accidentally dug into, the only danger is that you may have to pay for any damage to it.

(true) (false)
3. OSHA requires a ladder or ramp be in place for exit from a trench if the excavation is ____ feet or deeper.
 - a. 3 feet
 - b. 4 feet
 - c. 6 feet
4. All mobile equipment working around an excavation must be equipped with a warning device such as a backup alarm.

(true) (false)

Answers:

1. a 2. false (electrocution) 3. b 4. true

Resources

The Texas Department of Insurance, Division of Workers' Compensation (TDI/DWC) Resource Center offers a workers' health and safety video tape library. Call (512) 804-4620 for more information or visit our web site at www.tdi.state.tx.us.

Disclaimer: Information contained in this training program is considered accurate at time of publication.