



Goal

This program provides information on safety when performing trenching and excavation operations.

Objective

The participant will understand how to identify the hazards and safety requirements associated with trenching and excavation.

Definitions

Competent person - one who can identify existing or predictable hazards in the surroundings or identify 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 can 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.

Specific Excavation Requirements

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

Before you dig, know everything possible about the excavation route. Have the route surveyed and mapped. 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, should 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' advanced 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, for example, 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** (entrance and exit) - Any trench or excavation four feet or deeper should have a means of exit. Ladders and/or ramps are best located no more than twenty-five feet in any direction. Ladders should 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 ought to wear "high visibility" vests or

clothing and the excavation should be protected by barricades and a flag person to direct traffic.

5. Exposure to falling loads – It is best practice to prohibit workers from being underneath any loads handled by lifting or digging equipment. Workers should stand away from vehicles being loaded or unloaded. Provided they are protected by a cab, vehicle operators may stay in their vehicles during loading or unloading.



6. Warning systems - When mobile equipment approaches an excavation, there must be some method to warn the operator that they are approaching the edge of the excavation, so all mobile equipment (front-end loaders, bulldozers and dump trucks) should be equipped with a warning device such as a backup alarm. Use of hand signals from a flag person, stop logs, barricades or other mechanical signals are examples of other 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 shouldn't work in excavations where water is accumulating unless adequate precautions are taken to protect 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 needs 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 should be kept at least two feet away 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 practice is 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. Excavation operations expose workers to possible danger of head injury from falling objects in every work zone during excavation, so hard hats should always be worn.



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 should be performed prior to start of work and as often as needed throughout the shift. Inspections should also be conducted 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 need to 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 with appropriate guardrails should be engineered to withstand the maximum expected load. All excavations in a remote or unattended location 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.

Review

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. It is best practice for 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

For more information on other construction and work safety topics see the Service Lloyds website. In Risk Control's Training Materials section, we have additional resources including:

- Demolition and Cleanup
- Asphalt Safety
- Industrial Hygiene
- Hurry Up Can Hurt – Toolbox Talk

Remember to practice Safety; don't learn it by accident.

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