

# Excavation Safety

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for the Onsite Journal by Nancy Deal

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Every person on a job site is responsible not only for his or her own safety but also the safety of those around them. If safety is the most important goal on the site, everyone gets to come back to work the next day. Companies in this industry do not typically have an employee assigned specifically to oversee safety. That means that the supervisor or crew leader is often the “competent person” according to Occupational Safety and Health Administration (OSHA) standards. Workers should always feel free to express their safety concerns to the crew leader on the site at any time. When they do, the leader should stop, listen to the worker, and evaluate the potential safety issue that has been raised. Installers must identify critical issues, follow OSHA standards, and have a written safety plan that is followed by all. Under these conditions, an accident is an unforeseen incident that occurs while following established protocol instead of an incident resulting from an unsafe condition on the site.

As the use of advanced pretreatment components becomes more frequent, deep excavations for installations become

more common. Such units must be installed level and this means that personnel must sometimes enter the excavation to adjust the grade. One cubic yard of soil can weigh 3000 pounds. Identifying and mitigating potential hazards related to excavation is obviously critical.

An excavation greater than 4 feet deep is considered a confined space according to OSHA standards. If employees will be working in such an excavation, OSHA standards apply including the requirement for a “competent person” on the site. The competent person must have a higher level of training in order to make decisions regarding the types of hazards present on the site and appropriate safety precautions. OSHA standards state that a “competent person” meets all of the following criteria:

- By way of training and/or experience, is knowledgeable of applicable standards.
- Is capable of identifying commonly foreseeable workplace hazards.
- Is designated by the employer.
- Has authority to take appropriate actions.

## Soil Classification

The competent person is responsible for general safety requirements, but in particular, (by law) the competent person is responsible for classifying the soil on the site. This classification is different from the United States Department of Agriculture (USDA) Classification. It is critical that the installer understand the distinction between the two classification systems. The USDA classification is essentially based upon the size of the particles present in a given soil. The OSHA system is also based on particle size but includes additional criteria regarding soil stability. The OSHA classification determines what sort of protection systems must be used for a given excavation and is based upon the relative risk of cave-in of an excavation. When one considers that most trench fatalities occur in trenches that are 5 to 15 feet deep, it makes sense that the soil classification is a critical component in any installation. The competent person must make decisions that determine the safety of all employees working in and around excavations.

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## Protective Measures

The purpose of classifying the soil is to determine what protective measures are required to prevent a cave-in and keep workers safe around excavations. Sloping, shoring, and shielding are the three standard preventive measures used in excavations less than 20 feet deep.

Sloping the sides of an excavation is one way to prevent a cave-in. The amount of sloping required is dependent upon the OSHA soil classification as shown in Table 1. Note that excavations in Type A soils that are less than 12 feet deep and will remain open for less than 24 hours can have a 1/2:1 slope. However, it is critical that the competent person obtain appropriate OSHA training prior to making such decisions.

**TABLE 1.**  
**Maximum allowable slope for excavations less than 20 feet deep based on soil type.**

Soil or Rock Type	Maximum Allowable Slopes (H:V*) for Excavations Less Than 20 Feet Deep
Stable Rock	Vertical (90 Deg.)
Type A	3/4:1 (53 Deg.)
Type B	1:1 (45 Deg.)
Type C	1 1/2:1 (34 Deg.)

\* Horizontal to vertical ratio of slope

Benching is a protective measure achieved 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.

Shoring is a protective measure that uses aluminum hydraulic shoring to stabilize the walls of the excavation. The OSHA standard (Appendix D of Subpart P of standard 1926) provides information on the maximum vertical and horizontal spacing required according to the size of the aluminum members and the hydraulic cylinders used. Such structures should be designed by qualified individuals who have the appropriate knowledge, training, and experience.

Shielding involves the use of trench boxes in the excavation. Do not subject a trench box to loads exceeding those which the system was designed to withstand. Install and remove trench boxes in a manner that protects employees from cave-ins. Workers should never be inside of a trench box as it is being moved.

## Access and Egress

If personnel will be working in the excavation, access and egress (a means of exit) must be provided every 25 feet of

lateral travel. Ladders must extend 3 feet out of the excavation (at least one rung above edge). Make sure ladders are rated for the appropriate load (250+ pounds). If ramps are provided as egress, personnel must be able to walk out without the use of their hands.

If there is a risk of falling loads (as there typically will be with the installation of a septic system), do not permit employees to work underneath loads handled by lifting or digging equipment. Any risk of overhead exposure means that employees should be provided with hardhats. Some states have additional requirements for high-visibility vests under these conditions.

## Stability of Adjacent Structures

Note the relative stability of structures that may be adjacent to the location of the installation. Additional measures may be needed to ensure that adjoining buildings, walls, footings, foundations, retaining walls, sidewalks, or other structures are not compromised as a result of the excavations for the tank and soil treatment area. Measures might include shoring, bracing, or underpinning of these structures. Such protection must be designed by a professional engineer. If the installer suspects that excavation may compromise existing structure, they should consult the designer.

## Water Accumulation

Employees should not be allowed to work in excavations where there is accumulated water. Appropriate options for dewatering excavations for tanks or other components should be implemented. If dewatering is not performed, protective systems must be installed to prevent cave-in. Workers entering an excavation containing water will be entering a confined space and must therefore have confined space entry training. This includes training in how to utilize confined space entry equipment such as safety harnesses and life lines.

If conditions indicate the need for dewatering of soil treatment areas, the installer should contact the designer immediately because such conditions should not be present at the depths typically excavated for trenches or beds.

## Clear Line of Site

When the equipment operator does not have a clear and direct view of the edge of the excavation, certain safety procedures must be followed. Either use a barricade (such as guard rails, stop logs, or fences) or hand/mechanical signals conveyed from someone on the ground. The system of signals must be uniformly followed by all personnel, but only one person at a time should be designated to give signals to the equipment operator.

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## Excavated Material

Excavated material should be placed a minimum of 2 feet away from the edge of the trench. If placed too close and for too long a period of time, the combination of the equipment vibration and the weight on the edge of the trench can cause a cave-in. Material placed too close to the excavation effectively increases the overall depth. For example, a trench that is 3 feet 6 inches deep becomes several feet deeper if spoil is placed right next to it.

## Re-inspection of Trenches

Trench excavations must be re-inspected by the competent person as needed. They must be re-inspected whenever hazardous conditions exist, prior to the start of work, when soil conditions change and after every rainstorm.

## Conclusion

The most important safety device is under each employee's hat: each individual is responsible for not only for his or her own safety but also the safety of others on the site. Every company should discuss emergency response. Time is critical

and all should know the protocol for various emergencies including electrical shock, cave-ins, allergic reactions, and basic first aid. Excavation safety is a critical matter that the Onsite/decentralized industry must directly address by seeking guidance from appropriate sources, ensuring that safe practices are followed and all workers are protected. ■

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