

Safety is Team Effort



Protective systems are required in all trenches deeper than four feet and where potential for cave-in exists.

By **LeRoy LaMar**

Safety is always on the mind of trench workers. That's because the injury rate for excavation crews is more than 112 percent higher than it is for general construction workers.

Maintaining safety while working with trenches requires the diligence of an entire team. Everyone from the equipment operator to the job site foreman needs to be conscientious of the area around him and the risks posed by the situation at hand.

Monitoring the conditions of an excavation site is the most important aspect of maintaining safety in a trench operation. Following is a discussion of just what to look for and how to prevent accidents.

Protective Systems

It's important to note that all excavations will eventually cave-in, as the forces of nature want that trench to reach its natural slope. Therefore, the question is not "Will it cave-in?" Rather, it's "When?"

Protective systems—which are used to prevent movement of soil, underground utilities, roadways and foundations—are required in all trenches deeper than four feet and where potential for cave-in exists. Slopping, shoring and shielding are three common protective systems.

The least technical process, sloping, is the process of excavating the sides of a trench at an angle. The appropriate angle of the incline varies based on the soil type, environmental conditions and surcharge loads.

Shoring or shielding should be used when the location or depth of the cut makes slopping impractical.

Shoring systems support the sides of an excavation with posts, wales, struts and sheeting designed to brace the trench walls. There are two basic types of shoring: timber and aluminum hydraulic.

A shield—often referred to as a "trench

box"—is not designed to prevent a cave-in. Rather, it is designed to protect the worker from a cave-in. Shields can be permanent structures or can be designed to be portable and moved along as work progresses.

Shields are the most popular protective system because they can be placed where the worker has to work and then be removed. However, shielding is a more involved process, requiring a backhoe, excavator or crane to place the shield in the trench.

Soil Conditions

The more cohesive the soil, the less your chances for a collapse. Cohesiveness is determined by how solid the soil is. For instance, gravel is one of the least cohesive soil classifications possible. Clay, on the other hand, is one of the most cohesive. That is not to say a crew working in clay conditions aren't still at risk.

Determining soil conditions requires more than a quick glance or touch. A penetrometer is an industry tool used to check the strength of soil and can be purchased at outdoor professional supply houses or several online sources.

A second method for checking the consistency of soil is the dry strength test where a soil sample is formed into a patty and allowed to dry. When dry, the patty is then broken to determine cohesiveness. This method takes training and practice to give accurate results.

A third procedure is the thumb penetration test where the individual responsible for inspecting the site presses his finger into the dirt. The determination of soil type is made based on the depth of indentation the individual is able to make (see sidebar). While this is the least accurate of the methods, it's better than failing to check at all.

Tension Cracks

While no crew member wants to see a tension crack develop, it may just be the best thing to happen, as it provides a warning that something is about to go wrong.

A tension crack is a crack in the soil that appears parallel to the trench edge and can be found as far away from the edge as one-half to three-fourths of the trench width. These cracks occur when the soils begin to lose cohesiveness. They may cause toppling, sliding, heaving and bulging—all dangerous trench failures—and therefore, need to be addressed when noticed.

Evacuation Precautions

It's human nature for many people to run to the rescue of a colleague in danger. However, there are important factors to consider when attempting to free a worker from a collapse.

First, realize that as the ground settles following a cave-in, additional sliding is likely to occur.

Crew members may not feel as pressed for time if they can see the head of a cave-in victim. Often people will feel that the person is safe if his airways are clear. What they don't consider is that soil weighs 114 lbs per cu. ft., putting as much as 800 lbs. of pressure on the chest of a buried worker.

Ladders need to be within 25 feet of all trench workers in case a fast evacuation is necessary. They must be secure and extend out of the trench by at least three feet.

General Precautions

Excavation sites are required to have a competent person available to monitor the trench conditions. This individual needs to be capable of identifying existing and predict-

able hazards or working conditions that are hazardous, unsanitary, or dangerous to employees. Most important, this person must have the authority to take prompt, corrective measures to eliminate or control these hazards and conditions.

General precautions include keeping equipment and material at least two feet from the edge of the trench and keeping workers out of the trench while excavating is taking place.

Monitoring the conditions of an excavation site is the most important aspect of maintaining safety in a trench operation.

Keeping equipment, supplies and unauthorized people out of the trench is important. Establishing barricades will help prevent this from happening.

Training

Equipment owners and renters who have workers in trenches need to take care to provide a safe work environment to prevent accidents. This would include developing an accident prevention program with formal training for all workers.

Thumbs Up: Using the thumb penetration test to determine soil conditions.

If you have trouble making an indentation in the soil on site, you're likely dealing with Type A soil. If you can poke a hole as deep as your thumb nail, you're looking at Type B. Type C soil will let you sink your entire thumb into the ground.

Type A: Clay, silty clay, sandy clay, clay loam, silty or sandy clay loam.

Type B: Angular gravel, silt, silt loam or previously disturbed soils not classified as type C.

Type C: Gravel, sand, loamy sand, soil with seeping water or unstable rock.

Luckily, there are many options available in today's training market. Everything from on-line training courses, such as those recently launched by Arxcis, to multi-day training courses, exist to help employers protect their crews.

LeRoy LaMar is a trainer for Arxcis. He can be reached at leroy@arxcis.com. Arxcis designs customizable training kits on CD for equipment owners, professional trainers and safety equipment distributors. For more information, visit www.hardhattraining.com. UF

SoftDig®
SUBSURFACE UTILITY ENGINEERING

Our Technicians Locate Your Sub-Surface Utilities

- ✓ Accurately
- ✓ Safely
- ✓ Quickly
- ✓ Neatly
- ✓ Economically
- ✓ Without Damage

800-545-1531

UNDERGROUND SERVICES, INC.
24 Hagerty Blvd. Ste. 11
West Chester, PA 19382
Fax: 610-696-7864
www.softdig.com