

## Soil Pits

Soil science and other educators use soil pits as a valuable educational tool which can present potentially serious risks to those who construct them or work in/around them.

### What is a “soil pit”?

As the name implies, a soil pit is an excavation, made in the earth’s surface, which exposes the various layers of soil (“Horizons”) present. They are usually no more than 4-5 feet deep. Their length, width, and general shape vary widely. Almost by definition, at least one wall of the pit is vertical or near vertical, so that the various horizons of soils can be better visualized.

Students and staff enter these pits for teaching and learning purposes including collecting small soil samples or simply observing the stratification of soil horizons.

### Hazards of soil pits

Although reports of serious incidents involving soil pits are rare, there are some risks associated with cave-ins that must be addressed. These hazards exist throughout the entire life span of the pit — from before it is dug, during excavation, and up until it is completely backfilled, not just while the pit is occupied.

Soil pits are analogous to trenches and excavations commonly found on construction sites. In the construction environment, trenching and excavating is one of the most hazardous activities with dozens of workers killed every year.

### Cave-ins

The most serious hazard of any type of excavation, including soil pits, is the possibility of cave-in while the pit is occupied. This is the sudden, unexpected collapse of one or more pit walls, burying anyone who is in the pit. Victims can be killed

by suffocation, crushing, or even by being struck by excavators and other equipment used to rescue them.

The most effective method to limit the likelihood and consequences of cave-ins is to limit the depth of all soil pits. All pits require highly specialized cave-in protection measures, *unless* one of the following exceptions applies:

- The pit is made entirely in solid rock, or
- If the pit is less than five feet deep *and* examination by a “competent person” shows no evidence of potential cave-in.

If the depth of a pit exceeds five feet or shows signs of cracking or fissuring, please consult with University Health and Safety staff on requirements for cave-in protection. These methods are extremely technical and in most cases will not be feasible in soil testing pits.

Other cave-in prevention methods include:

- Construct the pit so that it is as wide as feasible. Avoid pits that are only one excavator bucket wide. A good rule of thumb is that the pit should be at least 1-2 times as wide as it is deep.
- Slope or step all pit walls other than the soil horizon wall.
- Keep heavy equipment and unnecessary people away from edges.
- Keep spoil piles several feet away from the pit to prevent superimposing a load onto the pit wall and preventing rocks and other debris from falling into the pit.
- Dig the pit as close to the time that it will be used as possible. The walls of pits will decay, and be more likely to cave-in over time.

### Falling into the pit

The pit must be protected by high visibility snow fence or similar protective fencing whenever it is not in use and left unattended. “DANGER KEEP OUT” signs are encouraged.

# Soil Pits (cont.)

## Falling objects

Persons who enter the pit must be protected from objects falling on them from above. Most frequently, this results from spoil piles being placed too close to the opening of the pit. Loose and/or exposed rock that are partially buried in the walls of the pit must be removed. Use of hardhats by all persons in the pit is encouraged.

## Underground utilities and installations

Prior to excavating the pit, staff must verify that the excavation will not damage or contact underground installations such as sewer, electrical, gas, etc. When necessary, contact Gopher-State One call for location services 48 hours in advance of excavation for underground utility location services.

## Earthmoving equipment / high-visibility vests

Earthmoving equipment should never approach the soil pit while it's occupied. Equipment should only be operated by trained, authorized staff. Ground workers must stay clear of the earthmoving equipment, keeping in mind the significant visibility obstructions that will be present. Ground workers must also wear High Visibility vests (Class II or higher).

The pit may not be occupied by anyone while earthmoving equipment is in operation, especially while the backhoe bucket is inside the pit.

## Rain and other water accumulation

Water intrusion in pits greatly increases the likelihood of cave-in and presents other hazards. Precautions must be taken to prevent rain water from collecting in pits. Pits must be covered with tarps, panels, covers, or other such materials to prevent rain water intrusion and accumulation.

Another source of water intrusion is ground water. There is very little that can be done to prevent this, but accumulations of water at the bottom of the pit must be removed prior to allowing the pit to be occupied.

## Precautions

### Inspection

The pit must be inspected prior to being placed into service and before use each day by a competent person.

“Competent person” is a concept which appears frequently in discussions about soil pits and trenching in general, so its meaning must be understood.

A “competent person” is one who has specialized training and education in identifying existing and predictable hazards in the surroundings, or working conditions which are hazardous and who has authorization to take prompt corrective action to eliminate hazards.

### Access and Egress

Any pit which is four feet or more in depth will require means for routine and emergency access and egress. This may include a ladder, stairs or ramp. Access and egress means must be positioned so that no greater than 25 feet of lateral travel is required to reach it from any point in the pit. Any side of the pit which is benched or sloped as recommended above, will almost always be sufficient to meet the access/egress requirements. Access/Egress must be included in the required daily inspections.

## Decommissioning the soil pit

When the soil pit is no longer needed, it must be backfilled as soon as feasible.

## Questions

If you have questions on this topic, please contact Health, Safety, and Risk Management at (612) 626-6002.