

# Trenching and Shoring Requirements

## Scope & Application

This policy establishes the approved practices required for excavations made by University of South Alabama employees or contractors on property owned by the University of South Alabama.

## General Requirements:

All excavations shall be made with a University representative present to serve as the competent person in charge. **Competent person** for the purposes of this policy will be a person trained and experienced with supervising trenching/shoring projects. Underground utilities must be located and marked before excavation work is started. Workers are not allowed in the excavation/trench while heavy equipment is digging.

The competent person shall conduct inspections:

- ! Daily and before the start of each shift.
- ! As dictated by the work being performed in the excavation/trench.
- ! After every rain storm.
- ! When fissures, cracks, undercutting, water seepage, or other similar conditions occur.
- ! When there is a change in the size, location, or placement of the excavation pile.
- ! When there is any indication of change or movement of adjacent structures.

Excavations 4 feet or greater in depth will require additional safety precautions as determined by the competent person. Because most excavations on USA's property are conducted to repair/replace existing pipelines or equipment, the soil will have been previously disturbed and will be considered unstable.

## Excavation Pile

Temporary excavation material piles shall be placed no closer than 2 feet from the surface edge of the excavation. This will be measured from the nearest base of the pile to the cut. This is to prevent loose rock or soil from the pile from falling on workers in the trench. Excavation material should be placed so that rainwater and run-off water is channeled away from the excavation. Excavation material should be placed so that it cannot accidentally run, slide, or fall back into the excavation.

Permanent excavation material removal not to be used as backfill shall be removed from the site and disposed of as directed by the competent person.

## Surface Crossing of Trenches

Surface crossing of trenches should not be made unless absolutely necessary. However, if necessary, they are only permitted under the following conditions:

- Vehicle crossings must be designed by and installed under the supervision of a licensed professional engineer.
- Walkways or bridges must have a minimum clear width of 20 inches, be fitted with standard rails and extend a minimum of 24 inches past the surface edge of the trench.

### **Ingress and Egress**

Trenches, 4 feet or more in depth, shall be provided with a fixed means of egress designed for use as a climbing device.

Spacing between ladders or other means of egress must be such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress.

Ladders must be secured and extend a minimum of 36 inches above the landing.

Metal ladders are prohibited from use on excavation projects with the potential for electric utilities hazards being much higher.

### **Exposure to Vehicles**

Workers exposed to vehicular traffic shall be provided with and required to wear reflective vests or other suitable equipment marked with or made of reflective high-visibility materials.

Trained flag persons, signs, signals, and barricades shall be utilized when necessary.

### **Exposure to Falling Loads**

All workers on an excavation site must wear hard hats.

Workers are not allowed to work under raised loads.

Workers are not allowed to work under loads being lifted or moved by heavy equipment. Workers must stand away from equipment that is being loaded or unloaded to avoid falling materials.

### **Warning Systems for Equipment and Pedestrians**

The following precautions should be taken to prevent equipment and pedestrians from accidentally falling into the trench:

- Substantial barricades must be installed around trenches and excavation areas.
- Hand or mechanical signals must be used as required.
- Trenches left open overnight or when unattended shall be fenced and barricaded.
- Blinking caution light at excavation barricade is required when area has low light and may have high traffic.
- A roped off safety zone must be established for the swing path of backhoe or trackhoe equipment.

### **Hazardous Atmospheres and Confined Spaces**

Workers are prohibited from working in hazardous and/or toxic atmospheres. Such atmospheres include those with:

- Less than 19.5% oxygen
- A combustible gas concentration greater than 20% of the lower flammable limit

- Concentrations of hazardous substances that exceed those specified in the Threshold Limit Values for airborne contaminants established by the ACGIH.

All projects involving such atmospheres must be conducted in accordance with industry standards for confined space entry with controls for personal protective equipment and for rescue. Engineering controls, such as forced ventilation and respiratory equipment may be required. If there is any possibility that the trench or excavation could contain a hazardous atmosphere, atmospheric testing must be conducted by a qualified contractor or by the University's Safety and Environmental Compliance Department.

### **Accident/Incident Reporting**

Accidents or incidents involving excavation work on any of the University's properties must be reported immediately to the department of Safety and Environmental Compliance. A written report must be submitted to Risk Management within 48 hours of the event.

### **Utility Interruptions and Unknown Hazards**

In the event that during an excavation project an unknown or known utility line is cut the project must be discontinued. The Central Utilities department should be contacted immediately to check for breaks in the line and if necessary to shut off the utility supply. If workers smell or suspect natural gas they exit the excavation and notify Central Utilities. They are to remain a safe distance from the point of concern until the area has been checked and all hazards corrected. Prior to allowing workers back into the area air sampling must be performed by Safety and Environmental Compliance to verify the area is again safe. Unusual or out-of-the-ordinary findings discovered during excavation may require a suspension in the excavation until the items can be identified by University Officials. Example: archeology related materials.

### **Standing Water and Water Accumulation**

Methods for controlling standing water and water accumulation must be provided and should consist of the following if workers must work in the excavation/trench:

- Use of special support or shield systems approved for such applications.
- Water removal equipment, such as pumps, used and monitored by a competent person. When possible the source of water inflow shall be identified and diverted to avoid the use of sump pumps.
- Workers must exit excavation/trench during any rainstorms.

### **Benching, Sloping, Shoring and Shielding Requirements**

All excavations or trenches 4 feet or greater in depth shall be appropriately benched, shored, or sloped according to the following procedures and requirements.

Excavations or trenches 20 feet deep or greater must have a protective system designed by a licensed professional engineer.

Excavations under the base of a foundation or wall will require a support system designed by a licensed professional engineer.

Sidewalks and pavement shall not be undermined unless a support system or another method of protection is provided to protect workers from their possible collapse.

- **Benching**

The vertical height of the benches must not exceed 4 feet. Benches must be below maximum allowable slope for loose soil. In a 10 - foot deep trench a bench must be created 10 feet back in each direction, with the maximum of a 45- degree angle.

- **Sloping**

Maximum allowable slope for excavations less than 20 feet based in a loose soil type and angle to the horizontal is as follows:

Height/depth ratio (1 1/2:1) with Slope angle of 34 degrees. This would equal 15 feet back in both directions for at least 30 feet across, plus the width of the bottom of the trench itself. See attached examples.

- **Shoring**

Shoring or shielding is to be used when the location or depth of the cut makes sloping back to the maximum allowable slope impractical. Two types of shoring can be utilized, timber or heavy gauge metal hydraulic.

Because the Physical Plant must utilize heavy equipment to position and set hydraulic shores, the use of timber is approved for smaller projects that can be installed by one or two workers. They must ensure even distribution of pressure along the trench line and adapt supports to meet various trench depths and widths. However, if possible a metal hydraulic shore should be utilized when possible.

All shoring shall be installed from the top down and removed from the bottom up. Hydraulic shoring shall be checked at least once per shift for leaking hoses and / or cylinders, broken connections, cracked nipples, bent bases, and any other damaged or defective parts.

The top cylinder of hydraulic shoring shall be no more than 18 inches below the top of the excavation.

The bottom of the cylinder shall be no higher than four feet from the bottom of the excavation. (Two feet of trench wall may be exposed beneath the bottom of the rail or plywood sheeting, if used.)

Three vertical shores, evenly placed, must be used to form a system. Walcs are installed no more than two feet from the top, no more than four feet from the bottom, and no more than four feet apart, vertically.

- **Shielding**

Trench boxes are different from shoring, these are utilized to protect workers from cave-ins and similar accidents.

The excavation area between the outside of the trench box and the face of the trench should be as small as possible. The space between the trench box and the excavation side must be backfilled to prevent lateral movement of the box. Trench boxes may not be subjected to loads exceeding those

which the system was designed to withstand.

Trench boxes can normally be used in open areas, but they may also be used in combination with sloping and benching.

The box must extend at least 18 inches above the surrounding area if there is sloping toward the excavation site. This is accomplished by providing a benched area adjacent to the box.

Any modifications to the box must be approved by the manufacture.

Trench boxes may ride two feet above the bottom of an excavation, provided they are calculated to support the full depth of the excavation and there is no caving under or behind the box.

Workers must enter and leave the trench box in a protected manner, such as by a ladder or ramp.

Workers may not remain in the shield while it is being moved.