1. **PURPOSE**
   This plan has been developed as a guide for trenching and excavation projects at Wake Forest University. Excavation has the potential for a number of hazards to employees. All excavation projects must follow this plan. Prior to any excavation projects it is essential to review the referenced OSHA regulations to ensure compliance and ensure the safety of employees.

2. **REFERENCE**
   29 CFR 1926.650 Subpart P

3. **DEFINITIONS**

   *Accepted engineering practices* means those requirements which are compatible with standards of practice required by a registered professional engineer.

   *Bell-bottom pier hole* means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

   *Benching* (Benching system) means a method of protecting employees from cave-ins 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.

   *Cave-in* means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

   *Competent person* means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

   *Cross braces* mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

   *Excavation* means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a “registered professional engineer” within the meaning of this standard when approving designs for “manufactured protective systems” or “tabulated data” to be used in interstate commerce.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with §1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as “trench boxes” or “trench shields.”

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Structural ramp means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See “Shield.”
4. RESPONSIBILITIES

Environmental, Health and Safety (EHS)

The EHS Office is responsible for development of this plan. The plan will be reviewed at least annually or when relevant OSHA regulatory changes are made.

Responsible for reading and understanding all relevant OSHA regulations for excavations under 29 CFR 1926 Subpart P.

Project Managers / Supervisors

Prior to excavation, review pertinent regulations and ensure all have been met.

Ensure all employees working in excavation are properly trained and work in a safe manner.

Monitor excavation work and alert SRT if there is an emergency response situation.

Competent Person

Responsible for ensuring excavation requirements conform to standards under 29 CFR 1926 Subpart P, including:
- Soil classification
- Trench design and shoring
- Structural ramps and means of entry and egress
- Selection of Protective Systems

Employees

Employees are responsible for working in a safe manner and for following all guidelines and directions from supervisors at excavation work sites.

5. PROCEDURE

Excavation Site Pre-Work Assessment

Prior to any excavation work, the project manager and supervisor will review the site plan and work project to ensure the following requirements are met:

All surface encumbrances that may create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

The estimated location of utility installations shall be determined prior to opening an excavation and when excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined.
While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

Structural ramps used for access or egress of equipment shall be designed by a competent person and will meet the requirements of 29 CFR 1926.651©.

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.

Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails will be provided where walkways are 6 feet or more above lower levels.

Air monitoring will be used during excavations greater than 4 feet in depth. Monitoring will be conducted using air monitor capable of measuring oxygen level, Lower Explosive Limit (LEL), Carbon monoxide (CO) and Volatile Organic Compounds (VOC).

Air monitoring must be conducted prior to entry of the trench if trench is greater than 4 feet. Results of initial monitoring will determine if rescue equipment must be at the excavation site.

If the trench is deeper than four feet and exhibits a hazardous atmosphere, entry will conducted under discipline of Permitted Confined Space Entry program. Confined Space Permit must be obtained from the EHS office prior to entry. If oxygen deficiency other hazardous atmosphere is present, additional ventilation of the trench must be in place and / or supplied air respirators be worn.

**Excavation Site Work Practices**

After Pre-Work Site Assessment is complete, supervisors and Project Managers will ensure employees working in the excavation follow the procedures below:

Employees exposed to public vehicular traffic shall wear reflector warning vests.

No employee shall be permitted underneath, or in vicinity to, loads handled by lifting or digging equipment.

When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

If any air monitoring readings reach alarm levels, work will discontinue and not proceed until levels are within acceptable range.
Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless a special support or shield system to protect from cave-ins is employed, and water is removed to control the level of accumulating water.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches or dikes shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person.

Soil piles will be managed with silt fencing perimeters to prevent dirt and/or mud from entering storm drains.

**Stability of adjacent structures**

If stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

Excavation below the level of the base or footing of any foundation or retaining wall shall not be permitted except when:

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure
- The excavation is in stable rock
- A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity
- A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees

Sidewalks, pavements, and similar structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse.
Protection of employees from loose rock or soil

Protection from loose rock or soil that could pose a hazard by falling or rolling from an excavation face will be provided by scaling loose material or installation of barricades.

Excavated materials or equipment will be placed at least 2 feet from the edge of excavations.

Inspections

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence.

Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

Requirements for protective systems

To protect employees during excavation, Wake Forest University will comply with regulations set forth in 29 CFR 1926.652 and associated Appendices.

Prior to excavation work a Certified Professional Engineer or other competent person will review the excavation plans to ensure compliance with these regulations and will identify which options will be employed for:

*Design of sloping and benching systems*, and *Design of support systems, shield systems, and other protective systems*.

A review will also be made to ensure compliance with:

*Materials and equipment, Installation and removal of support, Sloping and benching systems, and Shield systems*.

6. TRAINING

Supervisors and employees involved in excavation work will be trained to understand the requirements of the regulations and pertinent information on employee protective systems. Training will be conducted by a qualified individual and will be completed prior to work in an excavation site.
7. **REVISIONS**

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