EXCAVATIONS AND TRENCHING

Environmental Health and Safety Office

July 2014
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EXCAVATIONS AND TRENCHING

The purpose of the UNC Charlotte Excavations and Trenching Program is to define procedures that ensure employees who are working safely while excavating and trenching on campus. This procedure is designed to provide the minimum safety requirements in accordance with the Occupational Safety and Health Administration’s (OSHA) Excavations and Trenching, 1926.650.

This policy applies to all open excavations made in the earth’s surface. Excavations are any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal. A trench is a narrow excavation in which the depth is generally greater than the width, but with the width (measured at the bottom) not greater than 15 feet.

I. General Requirements:

A. All surface encumbrances that may create a hazard to employees will be removed or supported in order to safeguard employees.

B. Underground Installations

1. The estimated location of utility installations (such as fuel, electric, sewer) must be determined prior to excavating.

2. Notify local utility companies and call 811 to be advised of proposed underground utility lines to establish the locations well in advance of beginning work.

3. When the responsible party cannot respond to a request to locate underground installations within Twenty-four hours, it is permissible to proceed provided the exact locations are determined by detection equipment or other acceptable means.

4. While the excavation is open the underground installations must be protected, supported or removed in order to safeguard employees.

C. Access and Egress from Excavations

1. Structural ramps used for access and egress of equipment must be designed by a *Competent Person.

2. A stairway, ladder, ramp or other safe means of egress is required in trenches four (4) feet or more in depth (Lateral travel distance no more than 25 feet..)

D. Employees exposed to public vehicular traffic must wear warning vests or other suitable garments marked with or made of reflectorized or high-visibility material..

E. Employees shall not be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to
avoid being struck by any spillage or falling materials.

F. A warning system, such as barricades, mechanical signals, or stop logs must be used when mobile equipment is operated adjacent to an excavation or when the operator does not have a clear view of the edge.

G. Hazardous Atmospheres

1. Testing and Controls
   a. Atmosphere must be tested before entering excavations deeper than four (4) feet where oxygen deficiency (less than 19.5% oxygen) or other hazardous atmospheres could reasonably be expected.
   b. Ventilation or respiratory protection must be adequate to control:
      - Oxygen deficiency
      - Toxic exposure
      - Flammable gas in excess of 20% of the lower flammable limit.

2. Emergency rescue equipment such as breathing apparatus and safety harness shall be readily available where atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use. Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it.

H. Water Accumulation Hazards

1. Employees shall not work in excavations where water is accumulating unless special precautions such as special support or shield systems to protect from cave-ins, or water removal to control the level of accumulating water.

2. Water removal equipment and operations shall be monitored by a *Competent Person* to ensure proper operation.

3. Surface water (such as streams), diversion ditches, or other suitable means shall be used to prevent surface water from entering excavations. Excavations will require an inspection by a *Competent Person* after heavy rain.

I. Stability of Adjacent Structures

1. Where the stability of adjoining buildings, walls or other structures is endangered by excavation operations, support systems shall be provided to ensure the stability of such structures for the protection of employees.

2. Excavations below the level of footings of foundations or retaining wall that could be
reasonably expected to pose a hazard to employees shall not be permitted except when:

a. A support systems, such as underpinning, is provided to ensure the safety of employees and stability of the structure; or

b. The excavation is in stable rock; or

c. A **Registered Professional Engineer** has approved the determination that such excavation work will not pose a hazard to employees.

3. Sidewalks, pavements and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect employees.

J. Protection from Loose Rock or Soil

1. Protection from rock or soil falling from an excavation face must be provided by scaling, protective barricades, or other means.

2. Hazards from falling excavated or other materials or equipment must be protected by keeping all materials at least **two (2) feet (.61m)** from the edge of excavations or use of retaining devices.

K. Inspections

1. Daily inspections of excavations, adjacent areas, and protective systems shall be made by a **Competent Person** for hazardous conditions:
   a. Prior to the start of work
   
   b. After every rainstorm
   
   c. As needed throughout the shift

2. When the **Competent Person** finds evidence of a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees must be removed from the excavation.

L. Fall Protection

1. Walkways or bridges with standard guardrails must be provided where employees are permitted to cross over excavations. Walkways that are six (6) feet or more above lower levels must be provided with the appropriate guard rails which comply with 1926.502(b).

2. Physical barriers must be provided at all remotely located excavations.
II. Protective Systems

A. Employees in excavations must be protected from cave-ins by adequate protective systems except when:

1. Excavations are made in stable rock; or

2. Excavations are less than (5) feet in depth (1.52m) and an examination of the ground by a *Competent Person has been completed that there is no indication of a potential cave-in.

3. Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

B. Sloping and Benching Systems

The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of the OSHA standard, 1926.652(b).

1. Option 1, Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical.

2. Option 2, Determination of slopes and configuration using Appendices A and B of the OSHA standard. Maximum allowable slope and allowable configuration for sloping and benching system, shall be determined according to OSHA Construction Standard 1926.252 (Appendices A, Soil Classification and B, Slope Configuration).

3. Option 3, Design of sloping using tabulated data, maintained in writing, and kept on site identifying *Registered Professional Engineer who approved data.

4. Option 4, Design of sloping system by a *Registered Professional Engineer.

C. Design of Support Systems, Shield Systems, and other Protective Systems:

Designs of support systems, shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of the OSHA standard, 1926.652©.

1. Option 1, Design according to standard 1926.252 Appendices A; Soil Classification, Appendix C; Timber Shoring, Appendix D; Aluminum Hydraulic Shoring.

2. Option 2, Design using manufacturers tabulated data.

3. Option 3, Design by using other tabulated data which identifies the approving
*Registered Professional Engineer.*

4. Option 4, Design by a *Registered Professional Engineer.*

D. Materials and Equipment

1. Materials and equipment shall be free from damage and defects and shall be used in accordance with manufacturer’s recommendations.

2. When material or equipment is damaged, it must be examined by a *Competent Person* for approval or disapproval of current usage.

E. Installation and Removal of Supports

1. Components of Support Systems must be securely connected to prevent sliding, falling, kickouts, or other predictable failure.

2. Support Systems shall be installed and removed in a manner that protects employees.

3. Individual members of support systems shall not be subjected to actual loads exceeding those which those members were designed to withstand.

4. Before temporary removal of individual members begins, additional components precautions shall be taken to ensure the personnel safety of employees, such as installing additional supports.

5. Removal shall begin at, and progress from, bottom to top of the excavation.

6. Release components slowly to observe possible failures.


F. Additional Requirements:

1. Excavation **no greater than two (2) feet (.61m)** below bottom of Support System shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind the bottom of the support system.

2. Installation of the Support System must progress closely with the excavation.

G. Sloping and Benching Systems:

Employees shall not be permitted to work on the faces of sloped or benched excavations at
levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

H. Shield Systems:

1. Shield Systems shall not be subject to actual loads greater than design load.

2. Shields shall be installed in a manner to restrict lateral movement.

3. Employees shall be protected from cave-ins while entering and exiting.

4. Employees shall not be permitted in the shield when they are being installed, removed, or moved vertically.
Appendix A

*DEFINITIONS

1. **Accepted Engineering Practice**- Requirements which are compatible with standards of practice required by a Registered Professional Engineer. Competent person must know which aspects of the protective system require the involvement of a Registered Professional Engineer.

2. **Benching (Benching System)** – 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.

3. **Cave-In**- 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.

4. **Competent Person**- One who is capable of identifying existing or 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.

5. **Excavation**- Any man made cut, cavity, trench, or depression in the earth surface formed by earth removal. This standard applies to all open excavations made in the earth’s surface. Excavations are defined to include trenches.

6. **Faces or sides** – Vertical or inclined earth surfaces formed as a result of excavation work.

7. **Hazardous Atmosphere** – 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.

8. **Protective Systems**- 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, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

9. **Registered Professional Engineer (RPE)** - A person who is registered as a professional engineer in the State where the work will be performed. However, a professional engineer registered in any state is deemed to be a “Registered Professional Engineer” within the meaning of the standard of when approving designs for “manufactured protective systems” or “tabulated data” to be used in interstate commerce. The competent person
should know or have access to the name of the RPE or the name of the engineering firm and the “engineer of record” and the RPE registration number of that individual.

10. **Shield (Shield System)** – A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees with 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 OSHA standard 1926.652©(3) or ©(4). Shields used in trenches are usually referred to as “trench boxes” or “trench shields.”

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

12. **Sloping (Sloping System)** – 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 types, environmental conditions of exposure, and application of surcharge loads.

13. **Stable Rock**- Natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by an RPE.

14. **Structural Ramp**- A ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rocks are not considered to be structural ramps.

15. **Support System**- A structure such as underpinning, bracing, or shoring which provides support to an adjacent structure, underground installation, or the side of an excavation.

16. **Tabulated Data**- Tables and charts approved by an RPE that are used to design and construct a protective system.

17. **Trench** – 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).