

# Excavation and Trench Safety

(Rev 2-2018, 12/2018, 12-2019, 12-2020, 11-2021)

- 29.1 PURPOSE
  - 29.2 REQUIREMENTS
  - 29.3 VERIFICATION OF SOIL TYPE
  - 29.4 PROTECTIVE SYSTEMS
  - 29.5 EMPLOYEE TRAINING
  - 29.6 PERMITS
  - Exhibit 29A OSHA Trenching and Excavation Safety
  - Exhibit 29B Earthmoving Equipment Reference Card
- 

## 29.1 PURPOSE

The purpose of this policy is to establish safe operating procedures for any earthwork or underground work including trenches and excavations. It is to ensure the safety of T.A. Woods Company's employees who are required to enter/work in the excavations, to protect employees working near excavations, to protect equipment in and near excavations, and to protect nearby structures. Standards may be applied to hazardous locations less than 5'0" based on a hazard analysis. Excavations and trenching activities to which our employees may be exposed of 5'0" or less if additional hazards may be present will be examined by the Competent Person on site to verify that the company in control of the excavation work has ensured compliance with OSHA Subpart P, Excavation Safety.

## 29.2 REQUIREMENTS

### 29.2.1 Competent Person

Earthwork including excavations and trenches will be supervised by a Competent Person meaning one who is capable of identifying existing and predictable hazards in the surrounding or working conditions which are unsanitary, hazardous, or dangerous to employees; and who has authorization to take prompt corrective measures to eliminate them. A Competent Person will be designated by T.A. Woods Company based on a combination of training and experience.

Upon determination that T.A. Woods Company employees may be exposed to hazards associated through completion of a Job Hazard Analysis (Exhibit 14B) with excavation work at a given project, the Competent Person will establish control of the excavation site. This constitutes

- Understands the hazards associated with work in excavations;
- Knows the applicable safety and health standards associated with work in excavations and the proper methods of hazard control; and

- Has authorization to take prompt corrective action (and takes it, as necessary)
- For purposes of excavation work, the Competent Person must be knowledgeable in at least the following:
  - Methods of soil analysis to determine the types of soils (type A, B, C, or stable rock) and the required protective systems (shoring, sloping, benching etc.);
  - The selection and specification of protective systems, equipment, methods of installation, sizes and spacing of members;
  - The procedures for evaluating potential atmospheric hazards in excavations;
  - General excavation requirements contained in OSHA Subpart P.

An initial determination of the “competency” of individuals overseeing excavation work can be made from written documentation bearing the person’s receipt of training and instruction regarding Excavation Safety and work experience. In most cases, persons who have received such training will be provided with a certificate of completion.

Whenever a subcontractor is engaged in excavation, the T.A. Woods Company supervisor will ensure that an excavation contractor’s designated competent person produces this kind of documentation for review before work in excavations is initiated. As well, the T.A. Woods supervisor will ensure that all proper procedures are taken during the excavation process and while employees are engaged in work in the excavation.

### 29.2.2 Planning

Prior to beginning any excavation, the Competent Person is required to review the work site for primary hazardous exposures to employees and the public.

Exposures include, but are not limited to the following: Surface hazards or encumbrances; underground installations; means of access or exit from trenches or excavations; exposure to vehicular traffic; exposure to falling loads; warning system for mobile equipment; hazardous atmospheres; contaminated soil; emergency rescue equipment; water accumulation; stability of adjacent structures; protection from loose rocks and soil; fall protection; support systems; and materials/equipment.

Upon determination of soil type, work environment, tasks assignments, hazardous gas accumulation, and other safety precautions, T.A. Woods Company's Competent Person will determine necessary protective system to be put in place. Protective systems typically include shoring systems, sloping of the walls/faces of excavations, combinations of those systems, and other methods to prevent cave-in hazards. Their design specifications and construction are predicated on the types of soils (type A, B, C, etc.) encountered in the excavation process. The following issues should be covered:

- A. The specific locations of utilities (both buried and overhead) including but not limited to sewer, telephone, fuel, electric, water lines, or/and underground installations such as abandoned tanks; Utilities locator will be contacted prior to dig. Excavation will not commence until utility markings are completed.
- B. The specific actions contemplated to deal with surface encumbrances and structures which may impact on the safety of workers in the excavation(s);
- C. Where possible, from geo-technical surveys or other reliable sources, the make-up of the soils being excavated to enable effective planning for protective systems;
- D. Verification that protective systems, when identified, will be used in a manner consistent with the tabulated data contained in OSHA Subpart P (Appendices) at Title 29, Code of Federal Regulations, Part 1926.650 et seq.
  - If shoring is used, the exact types, sizes and spacing of members;
  - If sloping and/or benching is used, the angle of repose/stepping of excavation walls;
  - If trench boxes/trench shields are used, the design criteria for the shields to demonstrate that they have been constructed in accordance with accepted engineering principles.
- E. Methods to measure potential atmospheric hazards and provide worker protection. Testing for atmospheric hazards such as low oxygen, hazardous fumes, and toxic gases must be completed both prior to and while employees are working in an excavation of 4 feet or deeper.

### 29.2.3 Access and Egress

Means of access and egress must be instituted for trench excavations that are more than 4' or more in depth, and will be located so as to require no more than 25' 0" lateral travel by employees.

Access and egress may be in the form of a stairway, ladder or ramp. If structural ramps are to be used, they must be designed by a Competent Person and constructed in accordance with design.

#### 29.2.4 **Vehicular Traffic**

Employees exposed to vehicular traffic will be provided and will wear at minimum a Class II high visibility vest.

#### 29.2.5 **Exposure to Falling Loads**

No T.A. Woods Company employee will be permitted to work under loads handled by lifting or digging equipment including power shovels, derricks, or hoists. Employees are required to stand away, at minimum 5 feet, from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators will remain in the cabs of equipment being loaded or loaded when the equipment provides adequate protection for the operator.

#### 29.2.6 **Warning System Mobile Equipment**

When mobile equipment is utilized or allowed adjacent to excavations, appropriate barricades should be erected. If possible, the grade should be away from the excavation.

If it is necessary to place or operate equipment or heavy objects on a level above or near an excavation, the side of the excavation should be shored or braced as necessary to resist the extra pressure.

#### 29.2.7 **Hazardous Atmospheres**

- *Testing and Controls*

Testing for oxygen deficiency (19.5% minimum) or hazardous atmosphere including fumes and toxic gases will be performed in any excavation greater than 4'0" in depth, or at any depth where employees are doing hand work or repairs within the walls of any trench, where hazardous conditions exist or could reasonably be expected to exist, such as in areas of contaminated soils or areas where hazardous substances are stored nearby.

Testing will begin prior to the onset of work and be continuous while employees are exposed to potentially hazardous conditions using the assigned gas monitor.

- *Precautions*

The following precautions will be taken to prevent employee exposure:

- a) Provide engineering controls, administrative controls such as ventilation and PPE such as respirators.
- b) Rich atmospheres with the potential for explosion must be remediated prior entry or appropriate PPE must be utilized. Non-sparking tools will be used.

#### 29.2.8 **Emergency Rescue**

Emergency Rescue procedures must be established prior to the onset of excavating. When required, owners, owner's representatives, or general contractors may establish rescue procedures. Facility safety or local EMS should be advised of excavation work prior to onset due to the possibility of assistance during a rescue.

An Emergency Rescue Plan should be created prior to the onset of excavating.

Prior to entry into any deep and confined footing excavations, bell-bottom pier holes, or similar deep holes, employees are required to wear a harness with a lifeline securely attached to it. The lifeline must be separate from any line used to handle materials, and must be individually attended by a safety attendant while an employee is in this type of excavation.

#### 29.2.9 **Water Accumulation**

Employees are not permitted to work in excavations where there is an accumulation of water or where water is accumulating, unless adequate precautions have been taken to protect employees against hazards. Precautions may include, but are not limited to, special support or shielding system to protect from cave-in, water removal to control the level of accumulating water, and/or the use of a safety harness and lifeline.

When water removal equipment is used to prevent or control the water from accumulating, the equipment and operations will be monitored by the Competent Person.

Diversions, ditches, or dikes, or other suitable means will be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavations. Any excavation subject to runoff from heavy rains will require inspection by a Competent Person and compliance with the above-stated standards.

#### 29.2.10 **Stability of Adjacent Structures**

If the stability of adjoining buildings or walls is endangered by excavation operations, support systems such as shoring, bracing, or underpinning must be provided as necessary to ensure the stability of such structures for the protection of T.A. Woods Company employees' safety. Such shoring, bracing, or underpinning will be inspected daily or more often, as conditions warrant and the protection effectively maintained.

Except in hard rock, excavations below the level of the base footing of any foundation or retaining wall is not permitted, unless the wall is provided with a

support system such as underpinning to ensure the safety of employees and the stability of the structures.

Sidewalks, pavement, and appurtenant structures are not permitted to be undermined unless a support system or another method of protection against collapse is provided for the safety of employees.

#### **29.2.11 Loose Rock or Soil Protection**

Adequate protection must be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from the excavation face. Protection may consist of scaling to remove loose material; installation or protective barricade at intervals as necessary on the face to stop and contain falling material; or other means to provide equivalent protection.

Sides of trenches in unstable or soft material, 5'0" or more in depth, will be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect employees working within them.

Excavated or other materials must be placed at least 2'0" from the edge of the excavation, or by the use of retaining devices that are sufficient to prevent materials or equipment from rolling into excavations, or a combination of both methods is necessary

#### **29.2.12 Inspections**

- A. At the start of each work shift and as needed throughout the shift
- B. After every rain storm or other hazard increasing occurrence
- C. After an occurrence that may jeopardize the stability of the trench

When there is evidence of a situation that could result in a possible cave-in, indications of a failure in the protective system, a hazardous atmosphere has developed, other hazardous conditions are found, all employees must be removed from the hazardous area until the necessary precautions have been taken to safeguard employees.

#### **29.2.13 Fall Protection**

Where employees or equipment are required or permitted to cross over excavations, walkways, or bridges, standard guardrails must be provided. Adequate barricades providing physical protection will be provided at all excavations. All wells, pits, shafts, etc. will be barricaded and covered. Upon completion of operations, temporary wells, pits, shafts, etc. will be backfilled.

#### **29.2.14 Barricades**

All open trenches and excavations regardless of depth will be barricaded.

- A. At minimum excavations must be barricaded with yellow and black barrier tape erected at approximately 42" high with uprights no further than 12'0".

- B. Excavations requiring saw horse-type barricades with flashing lights are any excavation in or cutting an accepted established nonpublic roadway or walkway, or temporary roadway where vehicles may travel.
- C. All excavations on public streets require that they be completely covered prior to leaving the site at the end of the work shift. If natural cover is not possible, steel plates anchored to the street with asphalt nosing will be used.

### 29.3 VERIFICATION

Upon initiation of the excavation work, T.A. Woods Company Competent Person will verify that the safe work practices outlined by this policy and that necessary for safe conditions are implemented for both T.A. Woods Company employees or by the excavator or controlling entity.

The verification will include:

- A. Inspection of the work areas to ensure that prior to any work in excavations four or more feet in depth, at least one visual and one manual test for each set of ground conditions has been performed by the competent person(s) to determine the type of soil encountered.
  - Visual test. The layered systems will be visually evaluated by the competent person to determine the “weakest link” and other conditions bearing on the selection of protective systems. As an example, if a layer of highly compacted clay with a relatively high-unconfined compressive strength is observed to be on top of sandy or granular soil, the less reliable material would govern construction of a protective system.
  - Manual test. Soil types will generally be identified by a number of acceptable tests performed for each set of ground conditions. The most common tests are: thumb penetration, unconfined compressive and shear strengths of the excavated soils determined by direct reading instruments, sedimentation and wet or dry sieve analysis.
  - Whatever tests the Competent Person performs, it is critical that the tests be performed for as many layers of soils that are excavated and for as many changes in strata that occur. Irrespective of test results, soils known to have been previously disturbed/excavated (in a right of way, etc.) will be considered type C soils for purposes of this procedure.

**Note: All soils in southeastern NC will be treated as type C soil.**

## 29.4 PROTECTIVE SYSTEMS

Each employee in an excavation will be protected from cave-ins by an adequate protective system designed in accordance with applicable standards. Exceptions include excavations made entirely in stable rock and excavations less than 5'0" in depth and examination of the ground by a Competent Person provides no indication of potential cave in.

Protective systems must 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

### 29.4.1 Design of Sloping and Benching Systems

The slopes and configurations of sloping and benching systems are to be selected and constructed in accordance with the requirements of this policy and the appropriate standards as listed.

A. Excavations are to be sloped at an angle not steeper than one and one-half horizontal to one vertical, 34 degrees measured from the horizontal unless one of the following options are used:

1. Slopes and configurations are designed using written tabulated data such as tables and charts, to include the identification of the parameters that affect the selection of sloping or benching system including its limit of use, size and configuration to be safe, and the necessary information to aid in selecting a correct system approved by a Registered Professional Engineer, and a copy of the approved data is maintained.
2. Design by a Registered Professional Engineer in written form to include calculations, magnitude, and configurations determined to be safe for the project, with a copy maintained.

### 29.4.2 Design of Support Systems, Shield Systems and other Protective Systems

If used, these systems are to be designed in accordance with the requirements of the manufacturer and safety standards.

### 29.4.3 Materials and Equipment

All materials and equipment used for protective systems is to be free from damage or defects that might impair proper function, and used and maintained according to manufacturer's specifications.

When material or equipment is damaged, the Competent Person will examine it for approval, suitability, continued use, or replacement.

### 29.4.4 Installation and Removal of Support Systems, Trench Boxes and Shields

A. General Requirements



1. Members of support systems must be securely connected together to prevent sliding, falling, kick out, or other predicable failure.
2. Support systems must be installed and removed in a manner that protects employees from cave-in, structural collapse, or from being stuck by members of the support system.
3. Individual members of support systems must not be subject to loads exceeding those which the members were designed to withstand.
4. Before temporary removal of individual members begins, additional precautions must be taken to protect employees such as installing other structural members to carry the loads imposed on the support system.
5. Removal must begin at, and progress from, the bottom of the excavation. Members must be released slowly and carefully removed so as to note any indication of possible failure and possible cave in of the sides of the excavation.
6. Backfilling must progress together with the removal of support systems from excavations.

#### B. Additional Requirements for Support Systems for Trench Excavations

1. Excavation of material to a level no greater than 2'0" below the bottom of the members of the support system is permitted, but only if the system is designed to resist the forces calculated for the full dept of the trench, and there is no indications while the trench is open of a possible loss of soil behind or below the bottom of the support system.
2. Installation of a support system must be closely coordinated with the excavation of trenches.

#### 29.4.5 Sloping and Benching Systems

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

#### 29.4.6 Shield Systems

Should a shield system be used on any job, it must be designed for the job requirements and approved safety procedures followed.

### 29.5 EMPLOYEE TRAINING

Prior to the beginning work in an excavation regardless of depth, all employees must receive training. Training is to include at minimum:

- Location of underground utilities and associated hazards
- Placement of spoil pile
- Maintain heavy equipment from edge of trench

- Equipment use or activities that could affect trench stability
- Atmospheric testing, use of gas monitor, alarms
- Trench inspection
- Roles in emergency rescue including Rally Point
- Safe work practices including access/egress, not working under raised loads, etc.

## **29.6 PERMITS**

As applicable and required by the owner, owner's representatives, or general contractor, a permit will be completed and approved prior to the start of work.