

Excavation Procedures

One of the preventable hazards of construction work is the danger of trench cave-ins. Yet every year in the U.S., there are an estimated 75 to 200 deaths and more than 1,000 lost work days per year from trenching accidents. Other hazards associated with trenches include contact with numerous underground utilities, hazardous atmospheres, water accumulation, and collapse of adjacent structures. For these reasons, we have written Excavation Procedures for both our daily and occasional excavation workers. It is the policy at EMA to permit only trained and authorized personnel to create or work in excavations.

Administrative Duties

The Project Manager is responsible for implementing and maintaining the written Excavation Procedures. These procedures are kept in our written Safety and Health manual and at our corporate offices

Our Excavation Procedures are administered under the direction of our competent person(s), someone 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. The Project Manager is considered our company's competent person. A 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.

Before Excavating

Before anyone at this company begins excavating, we follow the steps below:

1. Contact the utility companies or property owners and ask the companies or owners to find the exact location of the underground installations in the area.
2. If the utility companies or owners do not respond within 24 hours or the period established by law or ordinance, or if they cannot establish the location of the utility lines, the excavation may proceed with caution. In this situation, we provide employees with detection equipment or other safe and acceptable means to locate utility installations.
3. Remove or adequately support the following objects (i.e., trees, rocks, and sidewalks) in the excavation area that could create a hazard to employees.
4. Using Appendix A to 29 CFR 1926, Subpart P, classify the type of soil and rock deposits at the site as either stable rock, Type A, Type B, or Type C soil. The soil classification is based on the results of at least one visual and at least one manual analysis conducted by our competent person. Details of the acceptable visual and manual analyses are to be found in Appendix A of 29 CFR 1926, Subpart P. NOTE: Soil classification is not necessary if the excavation will be sloped to an angle of one and one-half horizontal to one vertical.
5. Have the competent person choose the appropriate method for protective support systems,

as necessary. See the Protective Support Systems section for the procedures he/she used for selecting this system.

DEFINITIONS:

STABLE ROCK refers to natural solid mineral matter which can be excavated with vertical sides and remain intact while exposed.

TYPE A SOIL is cohesive with an unconfined compressive strength of 1.5 tons per square foot (tsf). Type A soils include clay, silty clay, sandy clay, clay loam, caliche, hardpan, and sometimes-silty clay loam and sandy clay loam. No soil should be classified as Type A if it is fissured; subject to vibration from traffic, pile driving, or similar effects; previously disturbed; or part of a sloped, layered system where the slope is four horizontal to one vertical or greater.

TYPE B SOIL is cohesive soil with an unconfined compressive strength greater than .5 tsf but less than 1.5 tsf. Type B soils include granular cohesion less soils like angular gravel, silt, silt loam, sandy loam, and sometimes silty clay loam and sandy clay loam; previously disturbed soils that are not Type C; fissured soils and soils subject to vibration that would otherwise be classified as Type A; dry rock that is not stable; and material that is part of a sloped, layered system where the layers dip on a slope less steep than four horizontal to one vertical.

TYPE C SOIL is cohesive soil with an unconfined compressive strength of .5 tsf or less. Type C soils include granular soils such as gravel, sand, and loamy sand; submerged soil; soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered system where the layers dip into the excavation at a slope of four horizontal to one vertical or steeper.

Protective Support Systems

The company protects each employee in an excavation from cave-ins during an excavation by an adequate protective system designed in accordance with OSHA standards. Protective system options include proper sloping or benching of the sides of the excavation; supporting the sides of the excavation with timber shoring or aluminum hydraulic shoring; or placing a shield between the side of the excavation and the work area.

EMA has the following standard operating procedures regarding protective support systems for excavations, in accordance with safe practices and procedures and OSHA excavation regulations:

- If the excavation is made entirely of stable rock, then no protective system is necessary or used.
- If the excavation is less than 5 feet in depth (provided there is no indication of a potential cave-in), then no protective system is necessary or used.
- If the excavation is less than or equal to 20 feet in depth, then our competent person chooses the most practical design approach (that meets required performance criteria) for the particular circumstance, and/or a registered professional engineer designs all protective systems for use in the excavation..

Sloping

When sloping is used to protect against cave-ins, these options can be chosen for designing sloping systems:

1. If a soil classification is not made, then slope the sides of the excavation to an angle not steeper than one and one-half horizontal to one vertical (34 degrees). A slope of this gradation or less is considered safe for any type of soil.
2. Use Appendices A and B of 29 CFR 1926, Subpart P to determine the maximum allowable slope and allowable configurations for sloping systems. The soil type must be determined in order to use this option.
3. Use other tabulated data approved by a registered professional engineer.
4. Have an engineer design and approve the system to be used. There are a number of exceptions or special cases to these general sloping guidelines, which can be utilized by your company if the conditions meet the exception's requirements. The exceptions and conditions are outlined below:
 - In Type A soil, simple slope excavations which are open 24 hours or less (short term) and which are 12 feet high or less in depth may have a maximum allowable slope of 1/2 horizontal to 1 vertical.
 - In Type A soil, all excavations 8 feet or less in depth which have unsupported vertically sided lower portions must have a maximum vertical side of 3.5 feet.
 - In Type A soil, excavations over 8 feet but less than 12 feet in depth with unsupported vertically sided lower portions must have a maximum allowable slope of 1H:1V and a maximum vertical side of 3.5 feet.
 - In Type A soil, excavations 20 feet or less with vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4 H:1V. The support or shield system must extend at least 18 inches above the top of the vertical side.
 - In Type B soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1H:1V.
 - In Type C soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1-1/2 H:1V.
 - When an excavation contains layers of different types of soils, the general sloping requirements do not apply. The excavation must be sloped according to Appendix B-1.4 of 29 CFR 1926, Subpart P.

The competent person chooses the best option for sloping for the job at hand.

Benching

When benching is used to protect against cave-ins, these options can be chosen for designing benching systems:

1. Use Appendices A and B of 29 CFR 1926, Subpart P to determine the maximum allowable slope and allowable configurations for benching systems. The soil type must be determined in order to use this option.
2. Use other tabulated data approved by a registered professional engineer.
3. Have an engineer design and approve the system to be used. There are a number of exceptions or special cases to these general benching guidelines, which can be utilized if the conditions meet the exception's requirements. The exceptions and conditions are outlined below:
 - In Type A soil, simple slope excavations which are open 24 hours or less (short term) and which are 12 feet high or less in depth may have a maximum allowable slope of 1/2 horizontal to 1 vertical.
 - In Type A soil, all excavations 8 feet or less in depth which have unsupported vertically sided lower portions must have a maximum vertical side of 3.5 feet.
 - In Type A soil, excavations over 8 feet but less than 12 feet in depth with unsupported vertically sided lower portions must have a maximum allowable slope of 1H:1V and a maximum vertical side of 3.5 feet.
 - In Type A soil, excavations 20 feet or less with vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4H:1V. The support or shield system must extend at least 18 inches above the top of the vertical side.
 - In Type B soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1H:1V.
 - In Type C soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1-1/2 H:1V.
 - When an excavation contains layers of different types of soils, the general sloping requirements do not apply. The excavation must be sloped according to Appendix B-1.4 of 29 CFR 1926, Subpart P.

The competent person chooses the best option for sloping for the job at hand.

Support Systems, Shield Systems, and Other Protective Systems

Timber Shoring

When trenches do not exceed 20 feet, timber shoring according to OSHA design specifications may be used. Designs for timber shoring in trenches for company work sites are determined by the competent person using the following method(s):

1. Use the requirements set forth by OSHA in Appendices A and C of the 29 CFR 1926, Subpart P. The design specifications for timber shoring provided by OSHA may be found in Tables C-1.1 through C-1.3 of Appendix C of 29 CFR 1926, Subpart P. These tables refer to the actual dimensions and not nominal dimensions of the timber. If the competent person chooses to use nominal size shoring, he/she must use the additional tables found in Appendix C of 29 CFR 1926, Subpart P. The soil type in which the excavation is made must be determined in order to use the OSHA data. NOTE: The specifications do not apply in every situation experienced in the field; the data were developed to apply to most common trenching situations. If the specifications do not apply to the situation encountered in the field, the competent person will make a determination of what approach to use to allow safe protective support of the excavation.
2. Use data provided by the manufacturer of the support system.
3. Use other tabulated data approved by an engineer.
4. Have a registered professional engineer design the system.

Aluminum Hydraulic Shoring

Determined by the competent person, each design for aluminum hydraulic shoring is based upon the following method(s):

1. Use the manufacturer's tabulated data and design in accordance with the manufacturer's specifications, recommendations, and limitations. Deviations from the manufacturer's specifications, recommendations, or limitations are only allowed upon written approval of the manufacturer, which must be obtained by the competent person prior to implementation. The written approval is kept at the job site during construction of the protective system.
2. Use the OSHA specifications found in Appendix D of 29 CFR 1926, Subpart P, if the manufacturer's tabulated data cannot be utilized. NOTE: Before using the OSHA data, the soil type must be determined.
3. Use other tabulated data approved by an engineer.
4. Have a registered professional engineer design the system

Other Support Systems

Designs for our support systems are determined by the competent person using the following method(s):

1. Use data provided by the manufacturer of the support system.
2. Use other tabulated data approved by an engineer.
3. Have a registered professional engineer design the system.

Shielding

Determined by the competent person, designs for shielding are based upon the following method(s):

1. Use data provided by the manufacturer of the support system.
2. Use other tabulated data approved by an engineer.
3. Have a registered professional engineer design the system.

Other Protective Systems

Designs for our protective systems are determined by the competent person using the following method(s):

1. Use data provided by the manufacturer of the support system.
2. Use other tabulated data approved by an engineer.
3. Have a registered professional engineer design the system.

General Requirements for Excavations

The following rules are to be followed at all times by all employees working on, in, or near excavations, as applicable:

- Employees exposed to public vehicular traffic must wear warning vests or other suitable garments made of reflectorized or high-visibility material.
- The competent person inspects the excavation and the adjacent areas on a daily basis for possible cave-ins, failure of protective systems and equipment, hazardous atmospheres, or other hazardous conditions. Inspections are also required after the occurrence of any natural (such as rain) or man-made events (such as blasting) that could increase the potential for hazards. Employees may not begin work until after being informed by the competent person that these inspections are complete.
- A warning system is used to alert operators of heavy equipment and other employees at the work site of the edge of an excavation.
- Adequate protection is provided to protect employees from falling rock, soil, or other materials and equipment. Protection is provided by placing and keeping such materials or

equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

- Employees are not permitted under loads that are handled by lifting or digging equipment. Employees are not allowed to work in the excavation above other employees unless the lower level employees are adequately protected.
- While the excavation is open, underground installations are protected, supported, or removed as necessary to safeguard employees. Adjacent structures are supported to prevent possible collapse.
- Employees are not permitted to work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken. Diversion ditches, dikes, or other means are used to prevent surface water from entering an excavation and to provide drainage to the adjacent area.
- Before an employee enters an excavation greater than 4 feet in depth, the competent person must test the atmosphere where oxygen deficiency or a hazardous atmosphere exists or could reasonably exist (i.e., excavations in landfill areas or excavations in areas where hazardous substances are stored nearby). Emergency rescue equipment is readily available and attended when hazardous atmospheric conditions exist or may develop.
- Sufficient means for exiting excavations 4 feet deep or more are provided and are within 25 feet of lateral travel for employees.
- Guardrails are provided if there are walkways or bridges crossing over an excavation.

Training

The Project Manager will identify all new employees in the employee orientation program and make arrangements with management to schedule training. The competent Person or designated representative will conduct initial training and evaluation. This/These instructor(s) have the necessary knowledge, training, and experience to train excavation workers.

Initial Training

During an excavation worker's initial training, the instructor(s) uses classroom instruction and practical training. Topics include:

- Classifying soil, conducting manual and visual examinations, protective systems, hazardous atmospheres, and general safety in excavations

For a current copy of the training material and the course outline contact our corporate office or the Project Manager.

Training Certification

After an employee has completed the training program, our company keeps records certifying that each excavation worker has successfully completed excavation training. The certificate includes the name of the worker, the date(s) of the training, and the signature of the person who did the training. The corporate office is responsible for keeping a copy of all training certification records.

Current Certified Excavation Workers

Under no circumstances shall an employee create or work in an excavation until he/she has successfully completed this company's excavation training program. This includes all new excavation workers regardless of claimed previous experience.

Inspection Procedures

Our competent person inspects excavations daily and during poor weather. Our job site inspection checklist is part of our written safety and health manual and supplements our excavation procedures. The competent person is responsible for completing inspection checklists.

Personal Protective Equipment

We have determined that hazards that require personal protective equipment are possible in and around our excavations. For this reason, we require that our excavation workers wear at a minimum approved safety glasses, hardhats, and appropriate work boots. Additionally, ppe is selected based on the hazard analysis conducted by the competent person.

All excavation workers required to wear this equipment are trained when it is necessary; what equipment is necessary; how to properly put on, take off, adjust, and wear it; limitations of the equipment; and proper care, maintenance, useful life, and disposal of PPE.

Non-excavation Worker Protection

As for those who don't work in or around excavations, but who may become bystanders, we limit access to the excavation areas with construction barricades. On multi-employer worksites we inform other employers of the hazards associated with our excavations, how our operations may impact other contractors, and how other contractors operations may impact our excavations.

Record keeping

We have copies of the following documents, when utilizing particular excavation protective systems, such that they will be readily available to OSHA upon request:

- Tabulated data for designing any of our sloping or benching systems

- Designs of any sloping or benching systems approved by a registered professional engineer

- Manufacturer's specifications, recommendations, and limitations for designs of support systems, shield systems, and other protective systems drawn from manufacturer's tabulated data

- Manufacturer's approval to deviate from the specifications, recommendations, and limitations for designs of support systems, shield

systems, and other protective systems drawn from manufacturer's tabulated data.

- Tabulated data for designing any of our support systems, shield systems, and other protective systems
- Designs of all support systems, shield systems, and other protective systems approved by a registered professional engineer