



## **TRENCHING EXCAVATION AND SHORING**

Integrated Water Services, Inc.  
(the Company)



## Purpose

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This Excavation and Trenching Plan (the Plan) applies to all open excavations or man-made cut, cavity, trench, or depression in an earth surface formed by earth removal. It is designed to prevent a cave-in (i.e., 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 that could entrap, bury, or otherwise injure and immobilize a person.

Trenches are a subset of excavations. All trenches are a type of excavation, but all excavations are not trenches. See the Definitions Section of the Plan to determine whether your worksite is classified as a trench or an excavation.

The Plan addresses the safety requirements of the federal excavation rules for construction at 29 CFR 1926.650 to 1926.652 and appendices, and the employee training rules at 29 CFR 1926.20(b)(1) and 29 CFR 1926.21(b)(2).

## Scope

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This procedure applies to all Company employees.

When work is performed by a subcontractor on a company site, the contractor's written safety program shall take precedence for their employees. However, subcontractors may adopt this procedure for their use.

## Definitions

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

**Confined Space:** a space that is large enough and so configured that an employee can bodily enter and perform work and has limited or restricted means of entry or exit and is not designed for continuous employee occupancy.

**Excavation:** any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal.

**Hazardous Atmosphere:** means an atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful that may cause death, illness, or injury to persons exposed to it.

**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.

**Registered Professional Engineer:** a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer who is registered in any state is deemed to



be a “registered professional engineer” within the meaning of federal rules when approving designs for “manufactured protective systems” or “tabulated data” to be used in interstate commerce.

**Shield (trench box):** means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structures. 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 the OSHA regulations at 29 CFR 1926.652(c)(3) or 29 CFR 1926.652(c)(4). Shields used in trenches are usually referred to as trench boxes or trench shields. Trench boxes or shields protect employees from cave-ins that might occur by providing sheltered space where employees may work. They are not designed to prevent cave-ins. A typical shield consists of two steel plates separated by structural members to form a box open at the top, bottom, and both ends. The box is lowered into the trench so that the steel plates face the trench's sidewalls. Employees then climb into the protected area defined by the steel plates. As the work progresses, the box is dragged along the bottom of the trench by a chain or cable suspended from a backhoe above the ground.

**Shoring System:** a structure such as a metal hydraulic mechanical or timber shoring system that supports the sides of an excavation and is designed to prevent cave-ins.

**Sloping:** a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavations 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, environment conditions of exposure, and application of exposure and application of surcharge loads.

**Support System:** structures such as underpinning, bracing, and shoring that provide support to an adjacent structure or underground installation or to the sides of an excavation or trench.

**Surface Encumbrance:** anything that creates a hazardous surcharge load on the sides of a trench or excavation, such as equipment, building materials, vehicles, soil, and sources of vibration, foundations, streams, water tables, or geological anomalies, that could cause it to cave in and injure or kill those inside.

**Trench:** a narrow underground excavation that is deeper than it is wide, and no wider than 15 feet (ft) (4.5 meters (m)). In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 ft (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 ft (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

the employee(s) to whom the training was given.

## Responsibilities

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### Plan administrator

- The plan administrator will be a competent person and will:
- Review and approve the digging, trenching, and excavation drawing and permit.
- Ensure that known underground utilities and structures have been identified and physically located and marked.
- Ensure that precautions will be taken to protect existing underground utilities and structures.
- Ensure that all responsible organizations have given their input for the proposed excavation site.
- Ensure that adequate safety control measures have been identified and implemented.



- Approve (by signature) or disapprove trenching-related permits.
- Monitor the overall effectiveness of the program through audits and annual reviews.
- Conduct atmospheric testing, other technical assistance, or equipment selections needed.
- Provide or assist with arranging site worker training, competent person training, and retraining of those who may be involved in excavations.
- Conduct an annual audit of the trenching program.
- Maintain records relating to training and audits.
- Investigate and document all reported accidents and/or near-miss accidents that are directly or indirectly related to trenching.

The plan administrator may designate a competent person with the authority to administer or implement one or more components of this Plan.

### **Competent Person**

The competent person must be able to demonstrate the training, experience, and knowledge of soil analysis, use of protective systems, and the requirements of this Plan and all relevant local, state, and federal regulatory requirements, including the federal rules for excavations at 29 CFR Part 1926, Subpart P.

The competent person will be able to:

- Evaluate soil conditions and select appropriate protective measures.
- Construct protective systems in accordance with the excavation regulatory requirements.
- Preplan, such as contact utilities (gas, electric) to locate underground lines; plan for traffic control, if necessary; and determine proximity to structures that could affect choice of protective systems.
- Test for low oxygen, hazardous fumes, and toxic gasses, especially when gasoline engine-driven equipment is running, or the dirt has been contaminated by leaking lines or storage tanks.
- Ensure adequate ventilation or respiratory equipment, if necessary.
- Provide safe access into and out of the excavation.
- Provide appropriate protection if water accumulation is a problem.
- Inspect the site daily at the start of each shift, following a rainstorm, or after any other hazard-increasing event.
- Keep excavations open the minimum amount of time needed to complete operations.

The competent person must be able to detect:

- Conditions that could result in cave-ins
- Failures in protective systems
- Hazardous atmospheres
- Other hazards, including those associated with confined spaces.

The competent person will have the authority to take prompt corrective measures to eliminate existing and predictable hazards and stop work when required.

### **Supervisor**



A supervisor must be classified as a competent person and will be in charge of each excavation. The supervisor will:

- Successfully complete training for classification as a competent person for trenching operations.
- Implement the Excavation and Trenching Plan for work areas under their control.
- Act as the competent person for excavation sites under his or her control.
- Ensure that the equipment necessary to complete an excavation safely is available and in good condition.
- Conduct soil tests to determine soil type.
- Ensure that all underground utility installations are located and marked before excavation begins.
- Receive written approval from the relevant utilities and landowners for digging, trenching, or excavating operations.
- Ensure that underground installations are protected, supported, or removed while the excavation is open. Notify the appropriate agencies when utility systems are exposed during the excavation process to allow the location and condition of the utility to be evaluated.
- Ensure worker protection and compliance with other applicable safety plans or programs.
- Ensure protection of the public with appropriate barricades.
- Determine what protective systems will be used to prevent cave-ins.
- Conduct daily inspections of excavations, the adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions.
- Immediately notify your supervisor if a utility system is damaged during the trenching or excavation process.

**Employee:**

Each employee engaged in trenching or other excavation-related activities must:

- Complete training, and request assistance when uncertain about any activity he or she must perform.
- Use appropriate personal protective equipment (PPE).
- Adhere to the requirements of the Plan.
- Report all workplace injuries and unsafe conditions to the supervisor.

## **Excavation and Trenching Safety Program**

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### **Hazard Assessment**

Excavation and trenching work presents serious hazards to all workers involved. Cave-ins pose the greatest risk and are much more likely than other excavation-related accidents to result in worker fatalities. Other potential hazards include falls, falling loads, hazardous atmospheres, and incidents involving mobile equipment.

Before work begins on an excavation or trench, the competent person(s) will evaluate the specific hazardous conditions at the worksite through jobsite studies, observations, test borings for soil type or conditions, and consultations with local officials and utility companies. The following factors will be considered to determine the hazards associated with specific site conditions:



- Traffic
- Proximity and physical conditions of nearby structures
- Soil
- Surface water and groundwater
- Location of the water table
- Overhead and underground utilities
- Weather

### Soil Classification

Before any work is begun on an excavation or trench, the soil classification will be determined by the competent person and in accordance with [Soil Classification guidelines \(29 CFR 1926 Subpart P, Appendix A\)](#).

Soils shall be classified into **Type A, B, or C** based on **visual and manual analysis** as described below. When soils exhibit multiple characteristics, classify the soil in the **lowest** category (most unstable).

#### Type A – Most Stable

- Cohesive soils with an unconfined compressive strength of **1.5 tons per square foot (tsf) or greater**
- Examples: clay, silty clay, sandy clay, clay loam
- **Not Type A** if:
  - Fissured
  - Subject to vibration
  - Previously disturbed
  - Seepage or water present
  - Layered with other soil types

#### Type B – Medium Stability

- Cohesive soil with strength **between 0.5 tsf and 1.5 tsf**
- Includes:
  - Fissured Type A soils
  - Previously disturbed soils
  - Stable rock not meeting Type A
  - Dry, unstable granular soils (e.g., angular gravel)
  - Soil subject to vibration
  - Layered soils with a dip of less than 4:1

#### Type C – Least Stable

- Cohesive soils with strength **less than 0.5 tsf**
- Granular soils like gravel, sand, loamy sand
- Submerged soils or those seeping water
- Submerged rock that is not stable



## **Classification Procedure**

### **A. Visual Test**

Performed before any manual testing.

- Observe the soil during excavation.
- Note particle size, shape, and layering.
- Check for:
  - Water presence or seepage
  - Fissures or cracks
  - Signs of previously disturbed soils
  - Organic material or foreign debris
  - Signs of vibration

### **B. Manual Test**

Performed after visual test to confirm classification.

1. **Plasticity Test**
  - Roll a moist soil sample into a thread.
  - If it can be rolled into a 1/8" thread without breaking, it is cohesive.
2. **Dry Strength Test**
  - Let the soil dry.
  - If it crumbles easily, it may be Type C.
  - If it can withstand some pressure without breaking, it may be Type B or A.
3. **Thumb Penetration Test**
  - Press the thumb into a fresh soil clump.
    - If thumb enters easily past knuckle → **Type C**
    - Thumb indents soil but doesn't penetrate easily → **Type B**
    - Thumb makes only a dent → **Type A**
4. **Pocket Penetrometer or Shear Vane Tester**
  - If available, measure unconfined compressive strength:
    - $\geq 1.5$  tsf → Type A
    - 0.5 to 1.5 tsf → Type B
    - $< 0.5$  tsf → Type C

### **Surface Encumbrances**

All surface encumbrances that are located so as to create a hazard to employees will be removed or supported, as necessary, to safeguard employees.



### **Underground Installations**

The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, will be determined before opening an excavation.

Utility companies or owners will be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations before the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law) or cannot establish the exact location of these installations, the excavation work may proceed provided that such work is done with caution, and detection equipment or other acceptable means to locate utility installations are used.

When operations approach the location of underground utilities, excavation will progress with caution until the exact location of the utility is determined. While the excavation is open, underground installations will be protected, supported, or removed as necessary to safeguard employees.

## **Safety Procedures**

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### **General Requirements**

If evidence of a situation that could result in possible cave-ins, slides, failure of protective systems, hazardous atmospheres, or other hazardous condition is identified, exposed workers will be removed from the hazard and all work in the excavation or trench stopped until all necessary safety precautions have been implemented.

### **Competent Person**

A competent person will oversee work performed at any excavation to ensure compliance with this Plan.

### **Worker Training**

Employees who work in or around excavations will be provided training according to their work activities. See the Training subsection of this Plan for specific training requirements.

### **Safe Access and Exit**

Workers will be provided with safe access into and exiting from trenches or excavations that are more than 4 ft deep.

**Access:** The means of access and the design specifications for such access will be determined by the competent person and in accordance with the following guidelines:

- Ladders used as access to a trench or excavation will extend from the bottom of the excavation to not less than 3 ft (0.9 m) above the surface.





- Ramps used solely for personnel access will be a minimum width of 4 ft (1.2 m) and provided with standard guardrails.
- Ramps used for equipment access will be a minimum width of 12 ft (3.6 m). Curbs not less than 8-in x 8-in (20.3-cm x 20.3-cm) timbers, or equivalent protection, will be provided. Equipment ramps will be designed and constructed in accordance with accepted engineering practice.

**Exit Route:** The means of exit and the design specifications for such exit will be determined by the competent person and in accordance with the following guidelines:

- A stairway, ladder, ramp, personnel hoist, or other safe means of exit will be located in trench excavations that are 4 ft (1.2 m) or more in depth.
- Exit route(s) will be placed within 25 lateral ft of workers.
- When two or more components form a ramp or runway, they must be connected to prevent displacement and be of uniform thickness.
- Cleats or other means of connecting runway components must be attached in a way that would not cause tripping (e.g., to the bottom of the structure).
- Structural ramps used in place of steps must have a nonslip surface.
- Earthen ramps may be used as a means of exit only if a worker can walk them in an upright position and only if they have been evaluated by a competent person.

#### **Perimeter Protection**

Protection will be provided to prevent personnel, vehicles, and equipment from falling into excavations.

#### **Fall Protection**

- All wells, calyx holes, pits, and shafts will be barricaded or covered.
- Excavations will be backfilled as soon as possible. Upon completion of exploration and similar operations, test pits, temporary wells, and calyx holes will be backfilled immediately.
- Walkways or bridges will be provided with standard guardrails where people or equipment are required or permitted to cross over excavations.

#### **Falling Loads**

Workers and other personnel must be prevented from passing or standing underneath loads handled by lifting or digging equipment. They must stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator during loading and unloading operations.

#### **Falling Material**

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



Employees will be protected by scaling, ice removal, benching, barricading, rock bolting, wire mesh, or other means from loose rock or soil that could create a hazard by falling from the excavation wall. Special attention will be given to slopes that may be adversely affected by weather, moisture content, or vibration.

#### **Placement of Excavated Material**

Excavated material will be placed at least 2 ft (0.6 m) from the edge of an excavation or will be retained by devices that are sufficient to prevent the materials from falling into the excavation. In any case, material will be placed at a distance to prevent excessive loading on the face of the excavation. Materials such as boulders or stumps that may slide or roll into the excavation will be removed or made safe.

#### **Hazardous Atmospheres**

Workers will not be permitted to work in or near hazardous atmospheres unless required testing and monitoring, worker precautions, and rescue services are in place. Work conducted in enclosed areas where hazardous atmospheres or gases could accumulate (e.g., landfills, manure pits, gas distribution lines, or hazardous materials storage locations) must be done in accordance with the Confined Spaces Plan.

#### **Types of Atmospheres**

Such atmospheres include those with the following:

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
- A combustible gas concentration greater than 10 percent of the lower flammable limit
- Concentrations of hazardous substances that exceed those specified in the threshold limit values (TLVs) for airborne contaminants established by the American Conference of Governmental Industrial Hygienists (ACGIH)

#### **Atmospheric Tests**

Air quality tests will be taken before employees enter excavations more than 4 ft in deep when a hazardous atmosphere exists or could be expected to exist. If there is any possibility that the trench or excavation could contain a hazardous atmosphere, the supervisor or other competent person will ensure that:

- Atmospheric testing is conducted before worker entry and continuously during work.
- Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, the atmospheres in the excavation will be tested before employees enter excavations greater than 4 ft (1.2 m) deep.
- Tests will be conducted as often as necessary to ensure the quality and quantity of the atmosphere, including checks for flammable gases and oxygen deficiency.
- A log of all test results will be maintained at the worksite.

#### **Worker Precautions**

Suitable precautions will be taken as necessary to protect workers in areas where hazardous atmospheres exist or potentially exist. These precautions will include the following:

- Engineering controls such as ventilation
- Respiratory protection in accordance with the Respiratory Protection Plan



- Full body harnesses and lifelines

### **Rescue Equipment**

Where hazardous atmospheres exist or may reasonably be expected to exist, emergency rescue equipment will be on the worksite and readily accessible to rescue personnel. See the Emergency Rescue Operations subsection of this Plan for more information about emergency procedures.

### **Daily Inspections**

Daily inspections for hazardous atmospheres must be conducted by a competent person.

### **Walkways and Guardrails over Excavations**

Walkways will be provided where workers or equipment are allowed to cross over excavations. Guardrails will be provided on walkways used by the general public regardless of the height above the excavation. Guardrails will be provided on walkways used only by on-site personnel if the walkway is 4 ft or more above lower levels. If workers pass below a walkway, guardrails and toeboards will be provided.

### **Confined Spaces**

Employees entering excavations classified as confined spaces or that otherwise present the potential for emergency rescue, such as bell-bottom pier holes or similar deep and confined footing, will wear rescue equipment and maintain communication with the confined space attendant. See the Confined Space Plan for more information about safety procedures related to confined spaces.

### **Water Accumulation**

**Control measures:** Employees will not work in excavations in which there is accumulated water or in which water is accumulating unless the water hazards posed by accumulation is controlled. Freezing, pumping, draining, and similar control measures will be planned and directed by a registered engineer. Consideration will be given to the existing moisture balances in surrounding soils and the effects on foundations and structures if the soil is disturbed.

**Drainage:** Diversion ditches, dikes, or other means will be used to prevent surface water entering an excavation and to provide good drainage of the area adjacent to the excavation.

**Water Control Equipment:** When continuous operation of groundwater control equipment is necessary, an emergency power source will be provided. Water control equipment and operations will be monitored by a competent person to ensure proper operation.

**Mobile Equipment and Motor Vehicle Traffic Precautions:** Traffic around the excavation or trench site must be controlled and barricades, signs, and/or flag persons used as needed to control both vehicular and pedestrian traffic.

**High visibility PPE:** Workers exposed to public vehicular traffic will be provided with and will wear warning vests or other suitable garments marked with or made of reflective or high-visibility material.



**Barricades:** When vehicles or mobile equipment are used or allowed adjacent to an excavation, substantial stop logs or barricades will be installed. The use of a ground guide is recommended.

**Loading/unloading vehicles:** Workers will stand away from vehicles being loaded or unloaded to avoid being struck by spillage or falling materials.

**Hoisting operations:** Excavating or hoisting equipment will not be allowed to raise, lower, or swing loads over or adjacent to personnel in the excavation without substantial overhead protection. Personnel will maintain a safe distance from a hoisting operation until the load has been placed.

**Warning system:** 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 will be utilized, such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

### **Stability of Adjacent Structures**

**Protective systems:** If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning will be provided to ensure the stability of the structure and to protect employees.

**Support Systems:** Sidewalks, pavements, and related structures will not be undermined unless a support system is provided to protect employees and the sidewalk, pavement, or related structure.

**Excavation below the level of adjacent structures:** Excavations below the level of the base of footing of any foundation or retaining wall will not be permitted unless:

- A support system, such as underpinning, is provided to ensure the stability of the structure and to protect employees involved in the excavation work or in the vicinity thereof; or
- The excavation is in stable rock; or
- 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 or determines that the excavation will not pose a hazard to employees.

### **Site Inspections**

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When personnel will be in or around an excavation, a competent person will inspect the excavation, the adjacent areas, and protective systems daily:

- Before each work shift
- Throughout the work shifts as dictated by the work being done
- After every rainstorm
- After other events that could increase hazards (e.g., snowstorm, windstorm, thaw, earthquake)
- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur
- When there is a change in size, location, or placement of the spoil pile



- Where there is any indication of change in adjacent structures

The competent person will use the attached Excavation/Trench Inspection Checklist or equivalent form when conducting inspections. All completed inspection forms will be maintained in the support center and available to the submitter via email.

## Protective Systems

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### General Requirements

**Excavations less than 5 ft deep:** For excavations less than 5 ft (1.5 m) deep, the competent person will examine the excavation for potential cave-in hazards and determine if a protective system is needed.

**Excavations 5 ft deep or deeper:** All workers in an excavation or trench 5 ft deep or deeper will be protected from cave-ins by an adequate protective system. Protective systems will 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.

**Excavations more than 20 ft deep:** Protective systems for all excavations more than 20 ft (6.0 m) deep will be designed and approved by a registered professional engineer.

**Protective System Selection:** The competent person will select the method of protection that is most suitable for the particular excavation site, taking into consideration soil type and surrounding structures. See the Soil Classification subsection of this Plan for more information.

**Types of protective systems:** Excavations in which employees could potentially be exposed to cave-ins will be protected by:

1. Sloping or benching the sides of the excavation; or
2. Supporting or shoring the sides of the excavation; or
3. Placing a shield between the side of the excavation and the work area.

### Exempt Excavations

The following excavations do not require protective systems:

- Excavations made entirely in stable rock; or
- Excavations are less than 4 ft (1.52 m) deep and examination of the ground by a competent person provides no indication of a potential cave-in.

A fixed means to safely exit exempt excavations will be provided for workers.

### Sloping and Benching Systems

The competent person or supervisor will select and construct slopes and configurations of sloping and benching systems from one of four options.



**Slope the walls of the excavation at an angle so that soil does not roll into the excavation:** The degree of the sloping angle needed depends on the stability of the soil at the site. The minimum allowable slopes for excavations less than 20 ft deep based on soil type and angle to the horizontal are as follows:

<i>Soil Type</i>	<i>Height/Depth Ratio</i>	<i>Slope Angle</i>
<i>B</i>	<i>1:1 or less</i>	<i>45</i>
<i>C</i>	<i>1 1/2:1</i>	<i>34</i>

**Examples:**

In **Type B soil**, a 10-ft deep trench must be sloped to a 45-degree angle. The total distance across such a trench would be 20 ft plus the width of the trench.

In **Type C soil**, the 10-ft deep trench would be sloped at a 34-degree angle. The total width of the trench would be 15 ft in both directions, for a total of 30 ft across plus the width of the trench.

Sloping will be greater if the areas near the excavation are subject to heavy loads (e.g., soil piles and vehicles).

**Excavation in an Unclassified Soil**

If the soil is not classified, the excavation must be sloped according to the requirements for Type C soil.

Benching may be used in conjunction with simple sloping. Benches must be below the maximum allowable slope for that soil type. For example, a 10-ft-deep trench in Type B soil must be benched back 10 ft in each direction with the maximum 45-degree angle.

**Tables for Sloping and Benching**

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## Excavations in Layered Soils

<p><b>TYPE A SOIL</b> Simple Slope Excavations</p> <p>20' Maximum</p> <p>1 3/4</p>	<p><b>TYPE B SOIL</b> Simple Slope Excavations</p> <p>20' Maximum</p> <p>1 1</p>	<p><b>TYPE C SOIL</b> Simple Slope Excavations</p> <p>20' Maximum</p> <p>1 1 1/2</p>
<p><b>TYPE B SOIL</b> over <b>TYPE A Soil</b></p> <p>Type B</p> <p>Type A</p> <p>1 3/4</p> <p>1 1</p>	<p><b>TYPE A SOIL</b> over <b>TYPE B Soil</b></p> <p>Type A</p> <p>Type B</p> <p>1 1</p> <p>1 1</p>	<p><b>TYPE C SOIL</b> over <b>TYPE C Soil</b></p> <p>Type A</p> <p>Type C</p> <p>1 1 1/2</p> <p>1 1 1/2</p>
<p><b>TYPE C SOIL</b> over <b>TYPE A Soil</b></p> <p>Type C</p> <p>Type A</p> <p>1 3/4</p> <p>1 1 1/2</p>	<p><b>TYPE C SOIL</b> over <b>TYPE B Soil</b></p> <p>Type C</p> <p>Type B</p> <p>1 1</p> <p>1 1 1/2</p>	<p><b>TYPE B SOIL</b> over <b>TYPE C Soil</b></p> <p>Type B</p> <p>Type C</p> <p>1 1 1/2</p> <p>1 1 1/2</p>
<p><b>TYPE A SOIL</b> Unsupported vertically sided lower portion Maximum 12 Feet in depth</p> <p>12' Maximum</p> <p>1 1</p> <p>3 1/2 Max.</p>	<p><b>TYPE A SOIL</b> Simple Bench Excavation</p> <p>20' Maximum</p> <p>1 3/4</p> <p>4' Max.</p>	<p><b>TYPE A SOIL</b> Multiple Bench Excavation</p> <p>12' Maximum</p> <p>5' Max.</p> <p>1 3/4</p> <p>4' Max.</p>
<p><b>TYPE A SOIL</b> Unsupported vertically sided lower portion Maximum 8 Feet in depth</p> <p>8' Maximum</p> <p>1 3/4</p> <p>3 1/2 Max.</p>	<p><b>TYPE A SOIL</b> Simple Slope – Short Term</p> <p>12' Maximum</p> <p>1 1 1/2</p>	



### **Worker Safeguards**

Workers must not 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.

### **Shoring and Shielding Systems**

#### **Option 1**

Design the shoring system using the soil classification, timber shoring, and aluminum shoring of the OSHA excavation rule or applicable state regulations. Designs for timber shoring in trenches will be determined according to the conditions and requirements of Appendices A and C of the excavation rule. Designs for aluminum hydraulic shoring must be according to the manufacturer's tabulated data, but if such data cannot be used, designs must follow the requirements of Appendix D of the rule. The system must be approved by a registered professional engineer.

#### **Option 2**

Design using the system manufacturer's tabulated data. Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data will be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer, and the data will be in written form and kept at the jobsite during construction of the protective system. The system must be approved by a registered professional engineer.

#### **Option 3**

Design using other tabulated data. Designs of protective systems will be selected from and be in accordance with tabulated data, such as tables and charts approved by a registered professional engineer. These data must be in writing and must include sufficient explanatory information to enable the user to make a selection, including the criteria for determining the selection and limits of the data. A copy of the information must be kept at the worksite during construction of the protective system. Upon completion of the system, the data may be stored away from the jobsite but must be made available to regulatory staff on request.

#### **Option 4**

Use a registered professional engineer to design the shoring and shield protective systems. Designs must be in the form of a written plan kept at the jobsite during construction of the protective system.

### **Shoring**

Shoring is used when the location or depth of the trench makes sloping back to the maximum allowable slope impractical. Shoring will be used for unstable soil or depths greater than 5 ft (1.5 m) unless benching, sloping, or other acceptable plan is accepted by the competent person.

### **Installation and Removal of Shoring or Support Systems**

Installation of a shoring or support system will be closely coordinated with the excavation of trenches. All shoring will be installed from the top down and removed from the bottom up.





### **Installation procedures**

Members of shoring or support systems will be securely connected together to prevent sliding, falling, kick-outs, or other predictable failure.

Support systems will be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

Individual members of support systems will not be subjected to loads exceeding those that those members were designed to withstand.

Removal procedures. Before temporary removal of individual members begins, additional precautions will be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

Removal will begin at, and progress from, the bottom of the excavation. Members will be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

Backfilling procedures. Backfilling will progress together with the removal of support systems from excavations.

Excavation of material to a level no greater than 2 ft (0.6 m) below the bottom of the members of a support system will 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 or below the bottom of the support system.

### **Shields**

A trench shield may be used as long as the protection it provides is equal to or greater than the protection that would be provided by the appropriate shoring system. The competent person or supervisor must follow manufacturer's instructions for premade boxes and shields once a design has been chosen.

Shields may be used in conjunction with sloping or benching.

### **Load requirements**

Shield systems will not be subjected to loads exceeding those that the system was designed to withstand.

Installation requirements. Shields will be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

### **Worker protections**

Workers will be protected from the hazard of cave-ins when entering or exiting the areas protected by shields. Workers will not be allowed in shields when shields are being installed, removed, or moved vertically.



Excavations below the depth of the shield. Excavations of earth material to a level not greater than 2 ft (.6 m) below the bottom of a shield will be permitted, but only if the shield 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 or below the bottom of the shield.

## **Protective System Materials and Equipment**

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### **Maintenance of Materials and Equipment**

Materials and equipment used for protective systems will be free from damage or defects that might impair their proper function. Manufactured materials and equipment used for protective systems will be used and maintained in a manner that is consistent with the recommendations of the manufacturer and in a manner that will prevent employee exposure to hazards.

### **Damaged Materials and Equipment**

When material or equipment that is used for protective systems is damaged, a competent person will examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot ensure that the material or equipment is able to support the intended loads or is otherwise suitable for safe use, such material or equipment will be removed from service and will be evaluated and approved by a registered professional engineer before being returned to service.

### **Emergency Rescue Operations**

[Modify the following rescue procedures as applicable to your operations.]

In the event of any emergency situation requiring rescue from an excavation, workers will not attempt to enter an unprotected excavation or trench to perform rescue. Local emergency services will be notified using the standard reporting system.

Rescue operations that can be performed safely from outside the excavation, such as hoisting a harnessed victim, will be carried out. Other personnel in the excavation will exit immediately and may provide assistance only when their own safety is ensured.

### **Contractors**

All contractors and contractor employees must have their own excavation and trenching safety policies that are in compliance with federal and any applicable state and local regulations. They must also comply with the requirements of this Plan and any additional requirements stipulated by the plan administrator, competent person, or the Contractor Safety and Health Agreement.

### **Enforcement of Safety Procedures**

All employees, including all levels of management, will be held accountable for obeying the worksite safety and health rules. The following four-step disciplinary policy will be applied to everyone by the appropriate level of supervisor:

- Oral warning
- Written reprimand



- Suspension
- Dismissal

Visitors, including contractors who violate safety and health rules and procedures, will be escorted from the site. Should the disciplined person request a review of the disciplinary action, the supervisor will review the situation and make a recommendation to management, which reserves the right for final decision.

#### Training

All employees, including contractors, involved in trenching or excavation work must be trained in the requirements of this Plan before any trenching- or excavation-related activities begin.

#### Supervisor Training

All supervisors of trenching and excavation activities must satisfy OSHA requirements for a competent person. Such supervisors must attend competent person training conducted by a trainer approved by the plan administrator or designee.

#### Employee Training

Personnel who perform work in trenches or excavations must comply with the requirements of this Plan and receive appropriate training that will include:

- Safe work practices during work in excavations
- The use of personal protective equipment (PPE) that will typically be required during work in excavations
- Procedures to be followed if a hazardous atmosphere exists or could reasonably be expected to develop during work in an excavation
- Emergency and nonentry rescue methods and procedures for calling rescue services

#### Refresher Training

Refresher training will be performed whenever worksite inspections conducted by the supervisor or the plan administrator or designee indicate that an employee or contractor does not have the necessary knowledge or skills to safely work in or around excavations.

#### Training Records

Training records will be maintained by the safety director and stored in the safety support center.

#### Recordkeeping

The safety director will ensure that the following electronic records and documents are kept for each excavation or trench project in the electronic DMS of the safety support center and made available for inspection by authorized personnel and regulatory agency staff:

- The credentials of the competent person(s)
- Soil classification methodology and results of tests
- Methodology and background information used to determine which protective systems are required and the type of systems used



- Records of the employee training program, including dates of training and attendee lists
- Safety program enforcement activities
- Worksite inspection reports or logs
- The aspects of the protective systems that have been designed or approved by a registered professional engineer, including the name of such individual or, if a firm, the firm's name, the name of the engineer of record that approved the work for the firm, and the registration number
- Where applicable, evidence that the registered professional engineer of record is in fact working within a discipline applicable to the excavation work
- Accident investigation and near-miss incident reports
- Copies of related safety and health plans
- Injury and illness records