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Purpose

One of the preventable hazards of site 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 Trenching, Shoring, & Excavation Procedures for both our daily and occasional excavation workers. It is the policy at Trinity to permit only trained and authorized personnel to create or work in excavations.

Administrative Duties

The Training and Compliance Manager (TCM) is responsible for developing and maintaining the written Trenching, Shoring & Excavations Program. These procedures are kept in the Operations office.

Our Trenching, Shoring & Excavations Program is 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. These competent persons include the TCM and all Site Supervisors.


Definitions

Aluminum hydraulic shoring means an engineered shoring system comprised of aluminum hydraulic cylinders (cross braces), used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such a system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Benching means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

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

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. All competent persons must complete the 4-hour Physical Plant trenching and shoring class, successfully pass the exam, and be certified for successful completion of the class. A competent person should have and be able to demonstrate the following:

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- Training, experience, and knowledge of:
 - soil analysis,
 - use of protective systems, and
 - requirements of applicable OSHA regulations.
- Ability to detect:
 - conditions that could result in cave-ins,
 - failures in protective systems,
 - hazardous atmospheres, and
 - other hazards including those associated with confined spaces.
- Authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Registered professional engineer means a person who is registered as a professional engineer.

Shield (shield system) means 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 structure or can be designed to be portable and moved along as work progresses. Also known as trench box or trench shield.

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


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

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

Trenching Plan

To ensure the safety of Trinity's employees, we have established the follow Trenching Plan:

General Safe Practices

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- All surface encumbrances that are located so as to create a hazard to employees will be removed or supported, as necessary, to safeguard employees.
- 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 prior to 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 prior to 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 Company may proceed, provided the Company does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.
- When excavation operations approach the estimated location of underground installations, the exact location of the installations will be determined by safe and acceptable means.
- While the excavation is open, underground installations will be protected, supported or removed as necessary to safeguard employees.

Structural Design


All design related to our excavation, trenching and shoring projects will be conducted by the Project Engineer. This competent person has the knowledge, training and experience necessary to meet the responsibilities of his/her duties. Responsibilities include:

- Design of structural ramps, benching, sloping, shoring, and shielding of excavations.

The Project Supervisor is the competent person in charge of the oversight of the construction of ramps, benching, sloping, shoring, and shielding to ensure construction meets the design requirements of the Project Engineer.

Access & Egress

- Structural ramps that are used solely by employees as a means of access or egress from excavations will be designed by a competent person. Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design, and will be constructed in accordance with the design.
- Ramps and runways constructed of two or more structural members will have the structural members connected together to prevent displacement.
- Structural members used for ramps and runways will be of uniform thickness.
- Cleats or other appropriate means used to connect runway structural members will be attached to the bottom of the runway or will be attached in a manner to prevent tripping.

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- Structural ramps used in lieu of steps will be provided with cleats or other surface treatments on the top surface to prevent slipping.
- Means of egress from trench excavations. A stairway, ladder, ramp or other safe means of egress will be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

Exposure to Vehicular Traffic

Employees exposed to public vehicular traffic will be provided with, and will wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

Exposure to Falling Loads

No employee will be permitted underneath loads handled by lifting or digging equipment. Employees will be required to 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, in accordance with applicable OSHA standards, to provide adequate protection for the operator during loading and unloading operations.


Warning System for Mobile Equipment

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

Hazardous Atmospheres

In addition to the requirements set forth in applicable OSHA standards, to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements will apply:

- Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation will be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.
- Adequate precautions will be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation in accordance with subparts D and E of this part respectively.
- Adequate precaution will be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

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- When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing will be conducted as often as necessary to ensure that the atmosphere remains safe.

Emergency Rescue Equipment

Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, will be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment will be attended when in use.

Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, will wear a harness with a lifeline securely attached to it. The lifeline will be separate from any line used to handle materials, and will be individually attended at all times while the employee wearing the lifeline is in the excavation.

Protection from Hazards Associated with Water Accumulation

All trenches will be inspected by a competent person before work begins. Employees will not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.


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

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

Stability of Adjacent Structures

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

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees will not be permitted except when:

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- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; 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 activity; or
- A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

Sidewalks, pavements and appurtenant structure will not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

Protection of Employees from Loose Rock or Soil

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


Employees will be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection will be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) 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.

Inspections

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

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

Fall Protection

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Walkways will be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with applicable OSHA standards will be provided where walkways are 6 feet (1.8 m) or more above lower levels.

Soil Classifications

The determination of soil types & special considerations must be done in specific measures. Shoring, sloping, shield & excavation must be done as needed. Timber shoring, aluminum hydraulic shoring must be determined according to the applicable OSHA standard(s). The devices should be used while in good repair & maintenance; if damaged, they must be inspected. The employees should be protected from hazards of falling, rolling, or sliding materials or equipment. They should not be subjected to excessive forces and be installed to protect employees from lateral loads, employees must be restricted from being in the shield when installing or removing; the shield must be designed to resist calculated trench forces.


Underground Installations

The location of underground installations shall be determined before excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours, or cannot establish exact location of these installations, the Company may proceed, provided the Company does so with caution and provided detection equipment or other acceptable means to locate utility installations are used.

Before Excavating

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

- 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.
- 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, provide employees with detection equipment or other safe and acceptable means to locate utility installations.
- Remove or adequately support the following objects (i.e., trees, rocks, and sidewalks) in the excavation area that could create a hazard to employees.
- Using applicable OSHA regulations, 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 a competent person. Details of the acceptable visual and manual analyses are to be found in the OSHA regulation. NOTE: Soil classification is not necessary if the excavation will be sloped to an angle of one and one-half horizontal to one vertical.

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- 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.

Testing Methods

The competent person in charge of the excavation will be responsible for determining whether the soil is Type B or C. The competent person will use a visual test coupled with one or more manual tests.

The determination of soil types & special considerations must be done in specific measures. Shoring, sloping, shielding of the excavation will be conducted as needed. Timber shoring, aluminum hydraulic shoring must be determined according to the appendixes A & C of the standard. The devices should be used while in good repair & maintenance; if damaged, they must be inspected. The employees should be protected from hazards of falling, rolling, or sliding materials or equipment. They should not be subjected to excessive forces and be installed to protect employees from lateral loads, employees must be restricted from being in the shield when installing or removing; the shield must be designed to resist calculated trench forces.

Visual test

In addition to checking the items on the trench inspection form, the competent person should perform a visual test to evaluate the conditions around the site. In a visual test, the entire excavation site is observed, including the soil adjacent to the site and the soil being excavated. The competent person also checks for any signs of vibration.


During the visual test, the competent person should check for crack-line openings along the failure zone that would indicate tension cracks, look for existing utilities that indicate that the soil has been previously disturbed, and observe the open side of the excavation for indications of layered geologic structuring.

This person should also look for signs of bulging, boiling, or sloughing, as well as for signs of surface water seeping from the sides of the excavation or from the water table.

In addition, the area adjacent to the excavation should be checked for signs of foundations or other intrusions into the failure zone, and the evaluator should check for surcharging and the spoil distance from the edge of the excavation.

Manual tests

Thumb penetration test - Attempt to press the thumb firmly into the soil in question. If the thumb penetrates no further than the length of the nail, it is probably Type B soil. If the thumb penetrates the full length of the thumb, it is Type C. It should be noted that the thumb penetration test is the least accurate testing method.

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Dry strength test - Take a sample of dry soil. If it crumbles freely or with moderate pressure into individual grains it is considered granular (Type C). Dry soil that falls into clumps that subsequently break into smaller clumps (and the smaller clumps can only be broken with difficulty) it is probably clay in combination with gravel, sand, or silt (Type B).

Plasticity or Wet Thread Test - Take a moist sample of the soil. Mold it into a ball and then attempt to roll it into a thin thread approximately 1/8 inch in diameter by two inches in length. If the soil sample does not break when held by one end, it may be considered Type B.

A pocket penetrometer, shearvane, or torvane may also be used to determine the unconfined compression strength of soils.

Spoil

Temporary spoil will be placed no closer than 2 feet from the surface edge of the excavation, measured from the nearest base of the spoil to the cut. This distance should not be measured from the crown of the spoil deposit. This distance requirement ensures that loose rock or soil from the temporary spoil will not fall on employees in the trench.

Spoil should be placed so that it channels rainwater and other run-off water away from the excavation. Spoil should be placed so that it cannot accidentally run, slide, or fall back into the excavation. Permanent spoil should be placed some distance from the excavation.

Surface Crossing of Trenches


Surface crossing of trenches should not be made unless absolutely necessary. However, if necessary, they are only permitted under the following conditions:

- Vehicle crossings must be designed by and installed under the supervision of a registered professional engineer.
- Walkways or bridges must: have a minimum clear width of 20 inches, be fitted with standard rails, and extend a minimum of 24 inches past the surface edge of the trench.

Ingress & Egress

- Trenches 4 feet or more in depth will be provided with a fixed means of egress.
- Spacing between ladders or other means of egress must be such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress.
- Ladders must be secured and extend a minimum of 36 inches above the landing.
- Metal ladders should be used with caution, particularly when electric utilities are present.

Protective Support Systems

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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. Trinity 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 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:

- 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.
- Use the OSHA standard to determine the maximum allowable slope and allowable configurations for sloping systems. The soil type must be determined in order to use this option.
- Use other tabulated data approved by a registered professional engineer.
- 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.

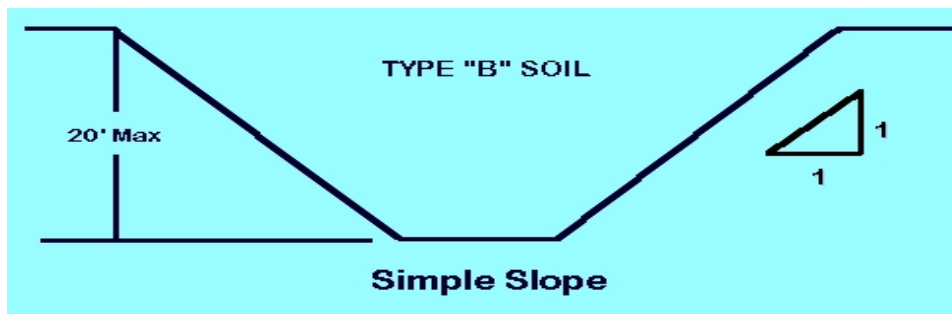
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- In Type A soil, excavations 20 feet or less with vertically sided lower portions that are supported or shielded will have a maximum allowable slope of 3/4 H:1V. The support or shield system must extend at least 18 inches above the top of the vertical side.
- In Type B soil, all excavations 20 feet or less which have vertically sided lower portions will be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation will have a maximum allowable slope of 1H:1V.
- In Type C soil, all excavations 20 feet or less which have vertically sided lower portions will be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation will 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 the OSHA standard.


Maximum allowable slopes for excavations less than 20' based on soil type and angle to the horizontal are as follows:

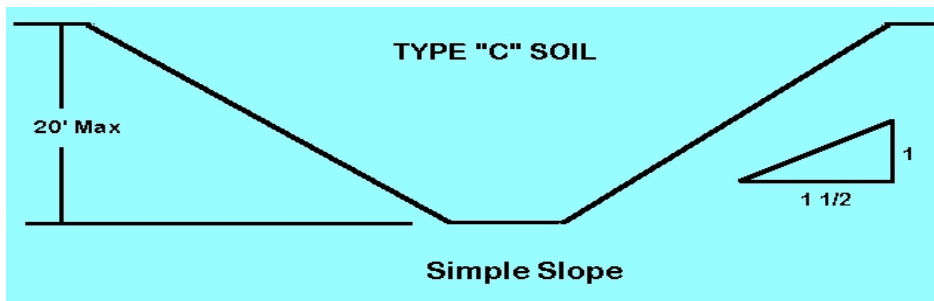
Soil Type	Height/depth ratio	Slope angle
Type B	1:1	45 degrees
Type C	1 1/2:1	34 degrees

A 10-foot-deep trench in Type B soil would have to be sloped to a 45-degree angle, or sloped 10 feet back in both directions. Total distance across a 10-foot-deep trench would be 20 feet, plus the width of the bottom of the trench itself.



In Type C soil, the trench would be sloped at a 34-degree angle, or 15 feet back in both directions for at least 30 feet across, plus the width of the bottom of the trench itself. All simple slope excavations 20 feet or less in depth will have a maximum allowable slope of 1 1/2:1.

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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:

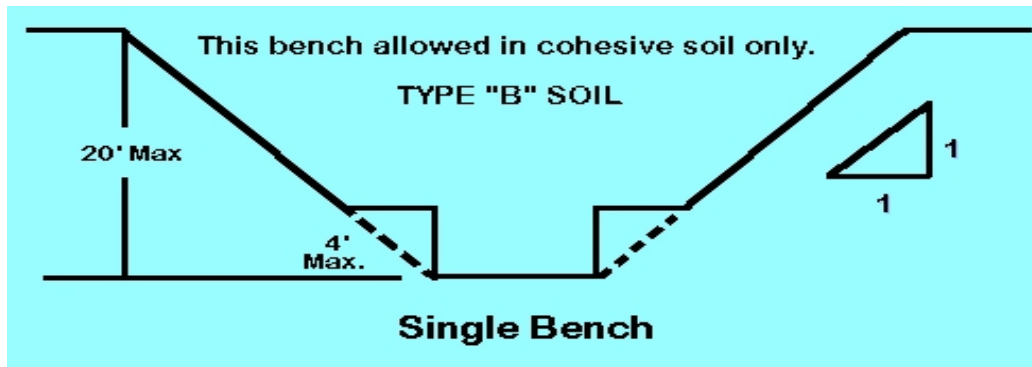
- Use Appendices A and B of 29 CFR 1926, Subpart P to determine the maximum allowable slope and allowable configurations for benching systems. The soil type must be determined in order to use this option.
- Use other tabulated data approved by a registered professional engineer.
- Have an engineer design and approve the system to be used.

There are a number of exceptions or special cases to these general benching guidelines, which should 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 will 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 will be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation will have a maximum allowable slope of 1H:1V.
- In Type C soil, all excavations 20 feet or less which have vertically sided lower portions will be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation will have a maximum allowable slope of 1-1/2 H:1V.

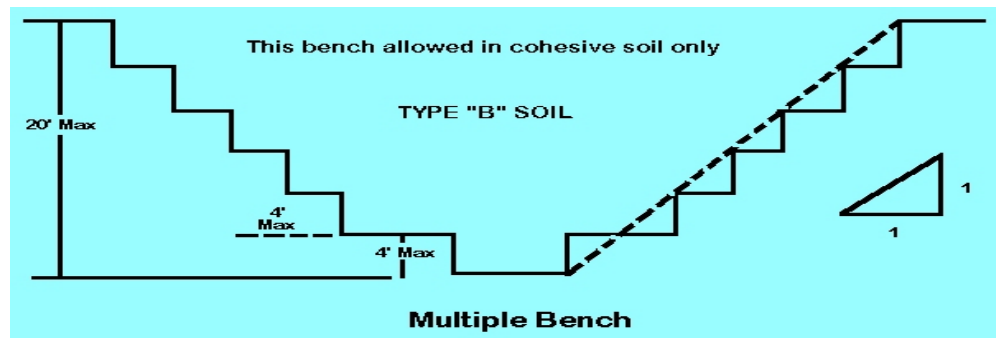
When an excavation contains layers of different types of soils, the general sloping requirements do not apply. The excavation must be sloped according to the OSHA standard.

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There are two basic types of benching, single and multiple, which can be used in conjunction with sloping.

All benched excavations 20 feet or less in depth will have a maximum allowable slope of 1:1. In Type B soil, the vertical height of the benches must not exceed 4 feet. Benches must be below the maximum allowable slope for that soil type. In other words, a 10-foot deep trench in Type B soil must be benched back 10 feet in each direction, with the maximum of a 45-degree angle.



Benching is not allowed in Type C soil.


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):

- Use the requirements set forth by OSHA. The design specifications for timber shoring provided by OSHA may be found in the OSHA standard. These tables refer to the actual dimensions and not nominal dimensions of the timber. If the competent person

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chooses to use nominal size shoring, he/she must use the additional tables found in the OSHA standard. 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.

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

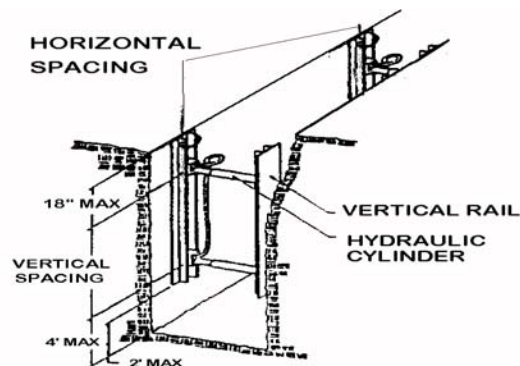
Aluminum Hydraulic Shoring


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

- 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.
- Use the OSHA specifications if the manufacturer's tabulated data cannot be utilized. NOTE: Before using the OSHA data, the soil type must be determined.
- Use other tabulated data approved by an engineer.

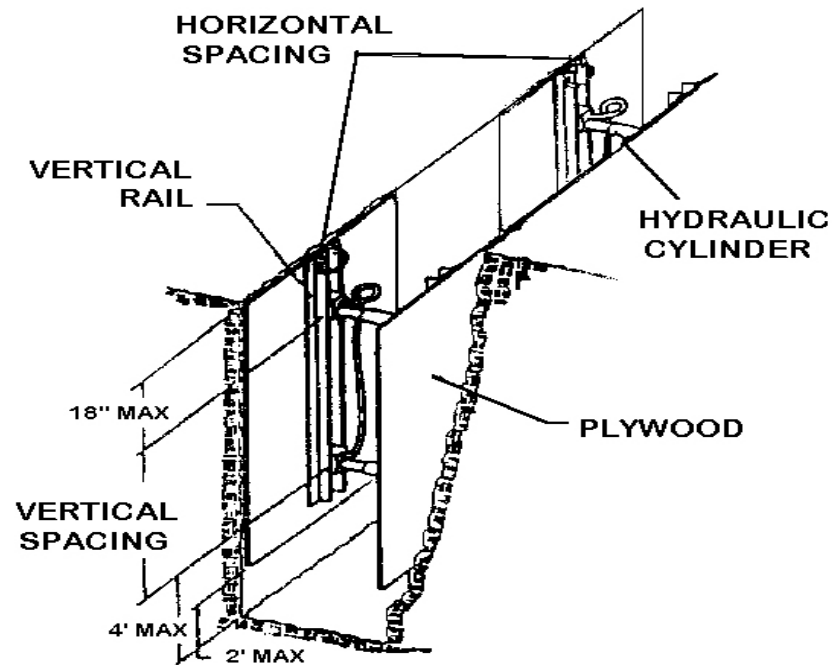
Here are some typical installations of aluminum hydraulic shoring:

Vertical aluminum hydraulic shoring (spot bracing)

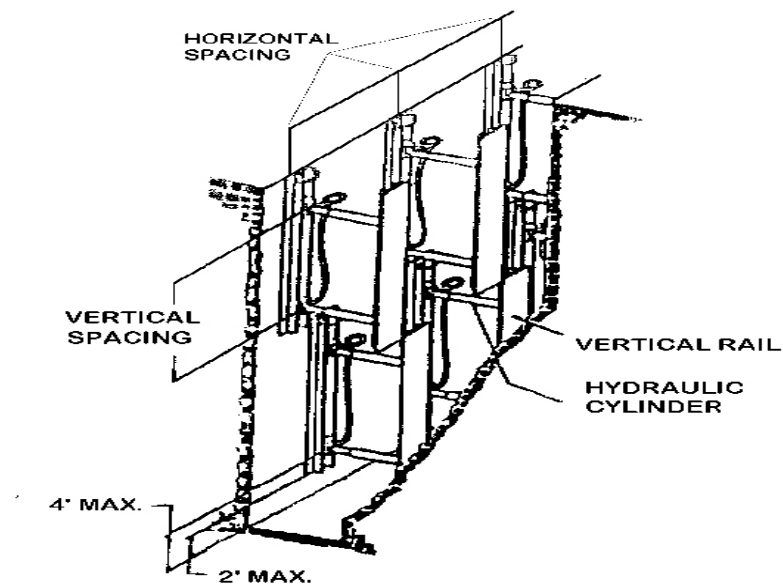



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Vertical aluminum hydraulic shoring (with plywood)

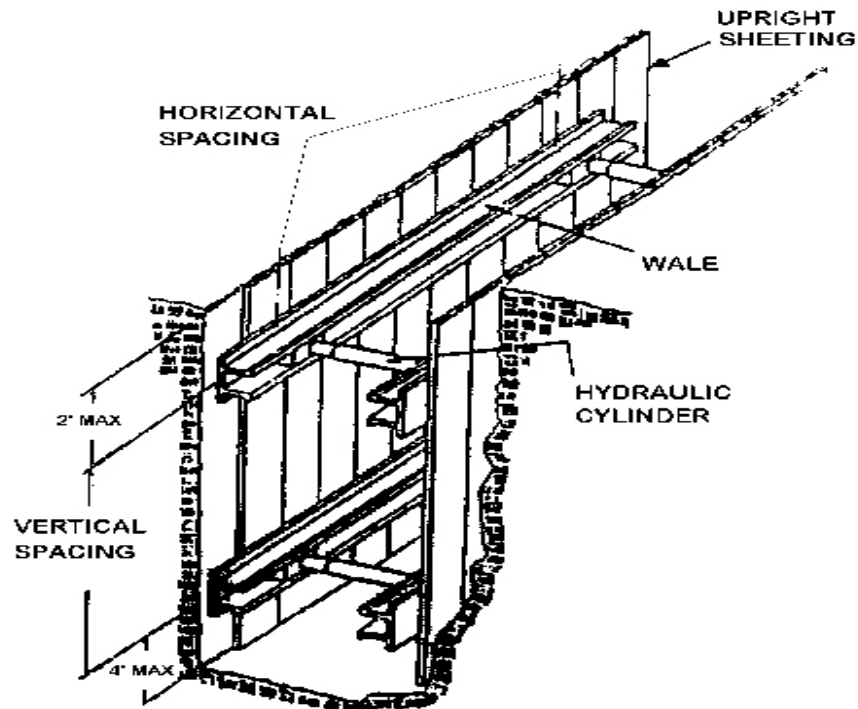


Vertical aluminum hydraulic shoring (stacked)



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Aluminum hydraulic shoring waler system (typical)



Other Support Systems

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

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


Shielding

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

- Use data provided by the manufacturer of the support system.
- Use other tabulated data approved by an engineer.
- 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):


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- Use data provided by the manufacturer of the support system.
- Use other tabulated data approved by an engineer.
- 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 (see appendices for Daily Inspection Checklist. 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. Shields, diversion ditches, dikes, or other means are used to prevent surface water from entering an excavation and to provide drainage to the adjacent area and must be inspected by a competent person before work begins.
- 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. Ventilation will be provided where necessary.
- 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.

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Training

The Training and Compliance Manager will identify all new employees in the employee orientation program and make arrangements with management to schedule training. The following person(s) will conduct initial training and evaluation: TCM and/or the Site Supervisor. These instructor(s) have the necessary knowledge, training, and experience to train excavation workers.

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. Training and Compliance is responsible for keeping a copy of all training certification records.

Current Certified Excavation Workers

Under no circumstances will 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 inspection checklist is attached to these written Excavation Procedures. Site Supervisor is responsible for retaining completed inspection checklists.


Personal Protective Equipment

All excavation workers required to wear all required personal protective equipment and 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.

Recordkeeping

We keep a copy of the following documents at the job site during construction of a particular excavation protective system and then store them in the RSO's office at company headquarters where 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

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- 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

Appendices

HSE-BF-032 Excavation & Trenching Inspection Checklist

HSE-BF-033 Excavation, Trenching & Shoring Soil Analysis Inspection Checklist