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Trenching and Excavation Policy

SCOPE

This policy sets forth the official practices required for trenching and excavations pertaining to the service provided by Hurt & Proffitt, Inc.; hereafter referred to as “The Company”.

DEFINITIONS

Aluminum hydraulic shoring- 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 - a method of protecting workers 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 - 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 -one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to workers, 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:

- Training, experience, and knowledge of:
 - soil analysis
 - use of protective systems
 - requirements of 29 CFR 1926 Subpart P
- Ability to detect:
 - conditions that could result in cave-ins
 - failures in protective systems
 - hazardous atmospheres
 - 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 -any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

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

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Shield (shield system) -a structure that can withstand the forces imposed on it by a cave-in and thereby protect workers 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) -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) - a method of protecting workers from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation 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) -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 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.

PROCEDURES

All excavations shall be made in accordance with the rules, regulations, requirements, and guidelines set forth in 29 CFR 1926.650, .651, and .652; the Occupational Safety and Health Administration's standard on excavations, except where otherwise noted below.

Training


The Company will ensure all workers and associates are trained in trenching and excavation safety and specific work-related practices. The Company requires all subcontractors whose work does not include trenching/excavations, but are in close proximity, to provide a basic awareness program that addresses all job scope activities. The awareness program shall include information regarding safe access and egress and protective measures associated with trenching.

A competent person shall be placed in charge of all excavations. Underground utilities must be located and marked before excavation begins. Before digging, driving equipment into the ground, or engaging in earth moving activities are conducted, the appropriate one-call center will be contacted. Workers are not allowed in the excavation while heavy equipment is digging.

Inspections

The competent person shall conduct inspections:

- Daily and before the start of each shift by using the DAILY EXCAVATION CHECKLIST found at the end of this chapter.

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- As dictated by the work being done in the trench.
- After every rainstorm.
- After other events that could increase hazards, such as snowstorm, windstorm, earthquake, dramatic change in weather, etc.
- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur.
- When there is a change in the size, location, or placement of the spoil pile.
- When there is any indication of change or movement in adjacent structures.

(For excavations 4 feet or greater in depth, a trench inspection form shall be filled out for each inspection.) If problems are found, provisions should be made for immediate personnel removal.

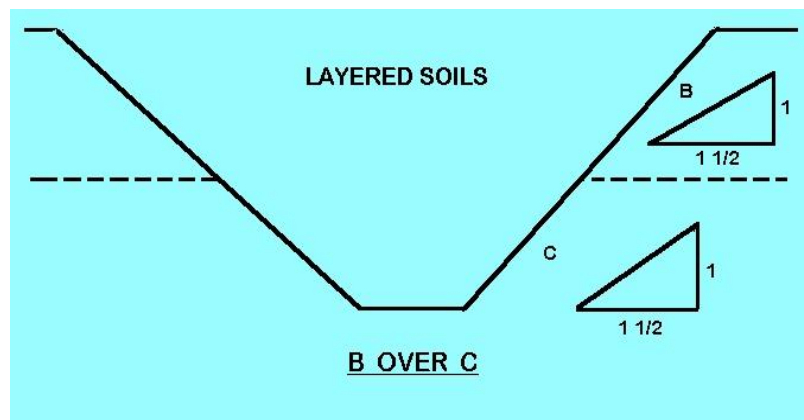
Soil Types:


Type A - Most stable: clay, silty clay, and hardpan (resists penetration). No soil is Type A if it is fissured, is subject to vibration of any type, has previously been disturbed, or has seeping water.

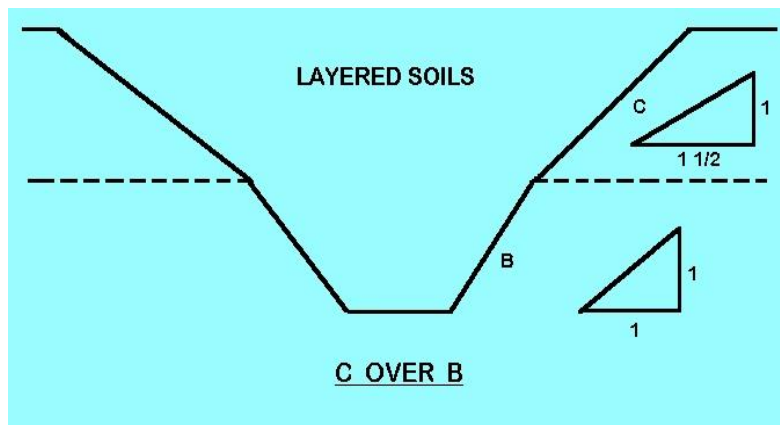
Type B - Medium stability: silt, sandy loam, medium clay, and unstable dry rock; previously disturbed soils unless otherwise classified as Type C; soils that meet the requirements of Type A soil but are fissured or subject to vibration.

Type C - Least stable: gravel, loamy sand, soft clay, submerged soil or dense, heavy unstable rock, and soil from which water is freely seeping.

Layered geological strata (where soils are configured in layers) - The soil must be classified based on the soil classification of the weakest soil layer. Each layer may be classified individually if a more stable layer lies below a less stable layer, i.e., where a Type C soil rests on top of stable rock.



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Testing Methods

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

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.

The competent 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

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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.

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, shear vane, or torvane may also be used to determine the unconfined compression strength of soils.

Spoil

Temporary spoil shall 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 workers 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 and be fitted with standard rails and extend a minimum of 24 inches past the surface edge of the trench.

Access and Egress

Trenches 4 feet or more in depth shall be provided with a fixed means of egress.

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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.

Any structural ramps used solely for worker access or egress must be designed by a competent person.

Exposure to Vehicles

Workers exposed to vehicular traffic shall be provided with and required to wear reflective vests or other suitable garments marked with or made of reflectorized or high-visibility materials.

Trained flag persons, signs, signals, and barricades shall be used when necessary.

Exposure to Falling Loads

All workers on an excavation site must wear hard hats.

Workers are not allowed to work under raised loads.

Workers are not allowed to work under loads being lifted or moved by heavy equipment used for digging or lifting.


Workers are required to stand away from equipment that is being loaded or unloaded to avoid being struck by falling materials or spillage.

Equipment operators or truck drivers may remain in their equipment during loading and unloading if the equipment is properly equipped with a cab shield or adequate canopy.

Warning Systems for Mobile Equipment

The following steps should be taken to prevent vehicles from accidentally falling into the trench:

- Barricades must be installed where necessary when:
 - Hand or mechanical signals must be used as required
 - Stop logs must be installed if there is danger of vehicles falling into the trench

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- Soil should be graded away from the excavation; this will assist in vehicle control and channeling of run-off water
- Trenches left open overnight shall be fenced and barricaded

Hazardous Atmospheres and Confined Spaces

Workers shall not be permitted to work in hazardous and/or toxic atmospheres. Such atmospheres include those with:

- less than 19.5% oxygen
- a combustible gas concentration greater than 20% of the lower flammable limit
- concentrations of hazardous substance that exceed those specified in the Threshold Limit Values for airborne contaminants established by the ACGIH

All operations involving such atmospheres must be conducted in accordance with OSHA requirements for occupational health and environmental controls for personal protective equipment and for lifesaving equipment. Engineering controls (such as ventilation) and respiratory equipment may be required.

Testing for Atmospheric Contaminants

If there is any possibility that the trench or excavation could contain a hazardous atmosphere, atmospheric testing must be conducted prior to entry. Conditions that might warrant atmospheric testing would be if the excavation was made in a landfill area or if the excavation was crossed by, was adjacent to, or contained pipelines containing a hazardous material (for example, natural gas lines).


Testing should be conducted before workers enter the trench and should be done regularly to ensure that the trench remains safe. The frequency of testing should be increased if equipment is operating in the trench.

Testing frequency should also be increased if welding, cutting, or burning is done in the trench.

Workers required to wear respiratory protection must be trained, fit-tested, and enrolled in a respiratory protection program.

Some trenches qualify as confined spaces. When this occurs, compliance with The Company's Confined Space Program is also required.

Standing Water and Water Accumulation

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Methods for controlling standing water and water accumulation must be provided and should consist of the following if workers must work in the excavation:

- Use of special support or shield systems approved by a registered professional engineer
- Water removal equipment, such as well pointing, used, and monitored by a competent person
- Safety harnesses and lifelines used in conformance with 29 CFR 1926.104
- Workers removed from the trench during rainstorms
- Trenches carefully inspected by a competent person after each rain and before workers are permitted to re-enter the trench

Benching, Sloping, Shoring, and Shielding Requirements

All excavations or trenches 4 feet or greater in depth shall be appropriately benched, shored, or sloped according to the procedures and requirements set forth in OSHA's Excavation standard, 29 CFR 1926.650, .651, and .652.

Excavations or trenches 20 feet deep or greater must have a protective system designed by a registered professional engineer.


Excavations under the base of footing of a foundation or wall require a support system designed by a registered professional engineer.

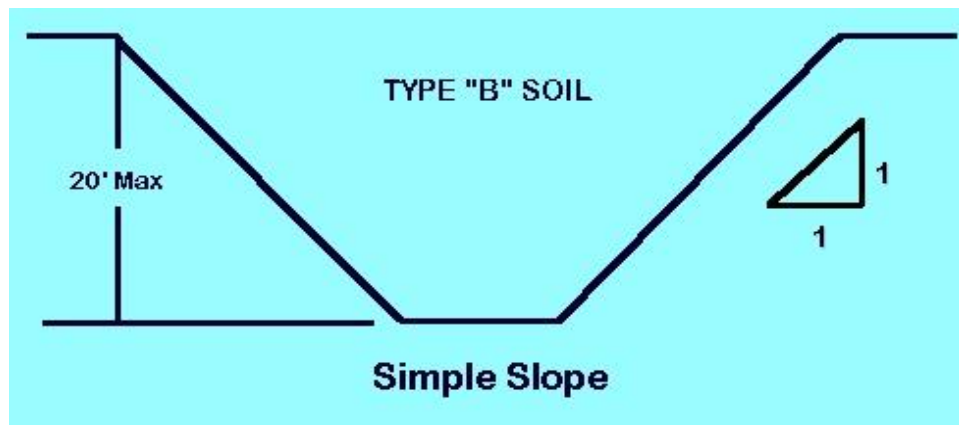
Sidewalks and pavement shall not be undermined unless a support system or another method of protection is provided to protect workers from their possible collapse.

Sloping

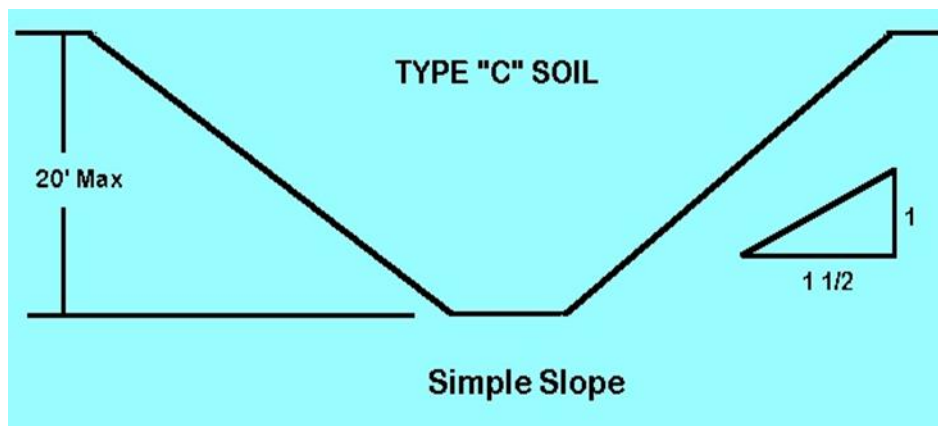
Maximum allowable slopes for excavations less than 20' based on soil type and angle to the horizontal are as follows:

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

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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 shall have a maximum allowable slope of 1 1/2:1.




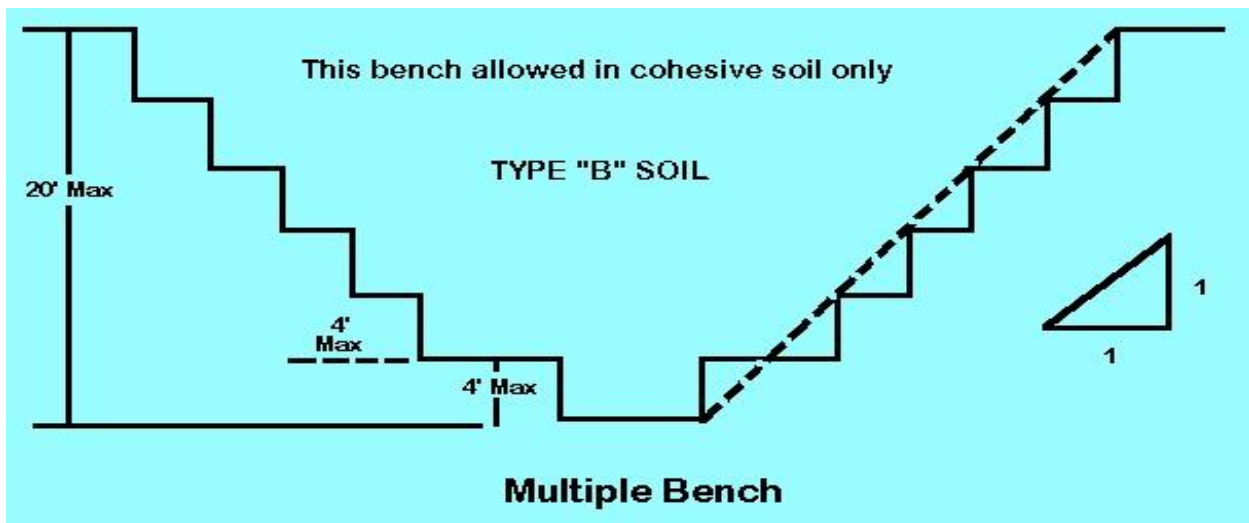
Benching

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 shall 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 a maximum of a 45-degree angle.

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Benching is not allowed in Type C soil.

Shoring

Shoring or shielding is used when the location or depth of the cut makes sloping back to the maximum allowable slope impractical. There are two basic types of shoring, timber, and aluminum hydraulic.


Hydraulic shoring provides a critical safety advantage over timber shoring because workers do not have to enter the trench to install them. They are also light enough to be installed by one worker; they are gauge-regulated to ensure even distribution of pressure along the trench line; and they can be adapted easily to various trench depths and widths. However, if timber shoring is used, it must meet the requirements of 29 CFR 1926.650, .651, and .652.

All shoring shall be installed from the top down and removed from the bottom up. Hydraulic shoring shall be checked at least once per shift for leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, and any other damaged or defective parts.

The top cylinder of hydraulic shoring shall be no more than 18 inches below the top of the excavation.

The bottom of the cylinder shall be no higher than four feet from the bottom of the excavation. (Two feet of trench wall may be exposed beneath the bottom of the rail or plywood sheeting, if used.)

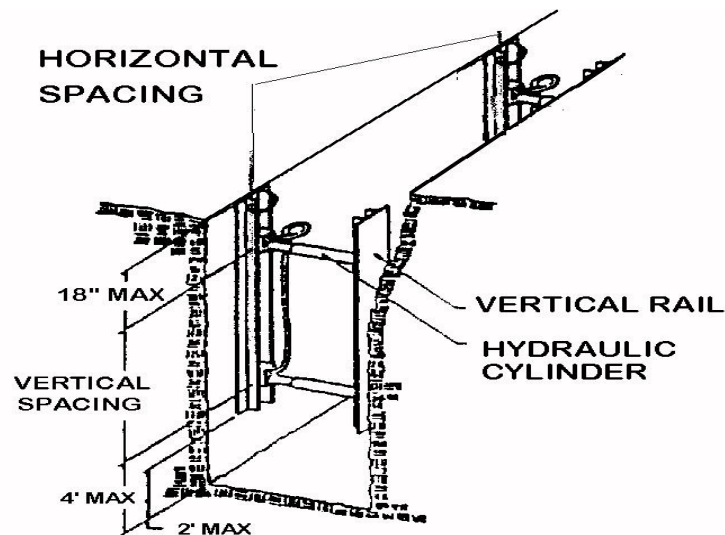
Three vertical shores, evenly spaced, must be used to form a system.

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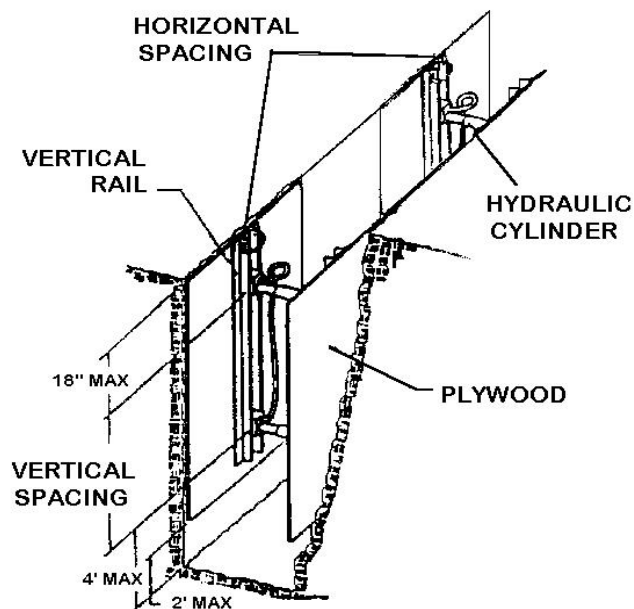
Wales are installed no more than two feet from the top, no more than four feet from the bottom, and no more than four feet apart, vertically.


Typical installations of aluminum hydraulic shoring:

- **Vertical aluminum hydraulic shoring (spot bracing)**

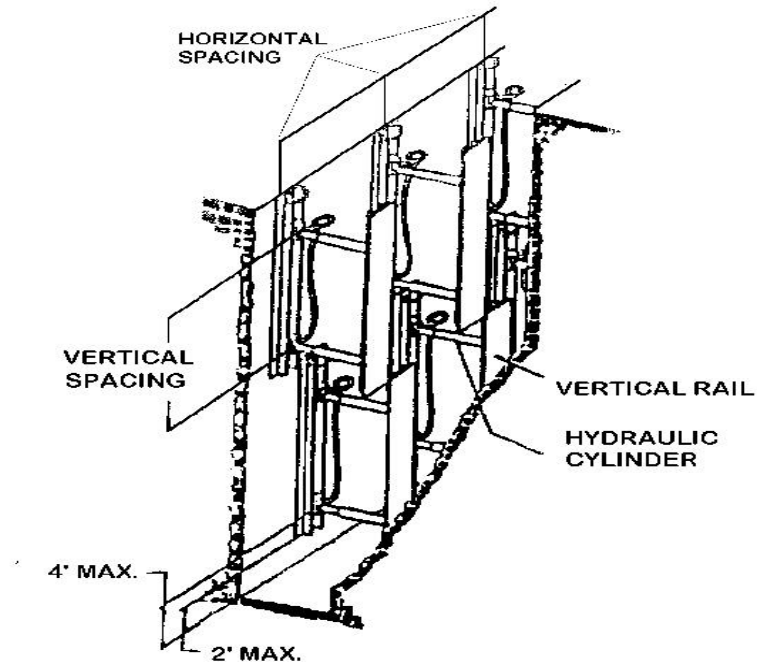


- **Vertical aluminum hydraulic shoring (with plywood)**

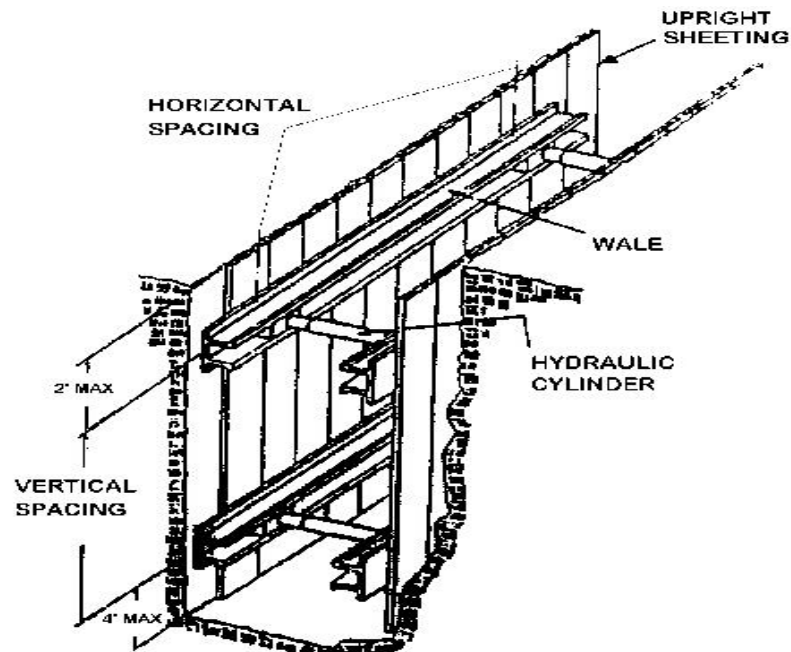



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- Vertical aluminum hydraulic shoring (stacked)



- Aluminum hydraulic shoring waler system (typical)



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Shielding

Trench boxes are different from shoring because, instead of shoring up or otherwise supporting the trench face, they are intended primarily to protect workers from cave-ins and similar incidents.

The excavated area between the outside of the trench box and the face of the trench should be as small as possible. The space between the trench box and the excavation side must be backfilled to prevent lateral movement of the box. Shields may not be subjected to loads exceeding those which the system was designed to withstand.

Trench boxes are generally used in open areas, but they also may be used in combination with sloping and benching.

The box must extend at least 18 inches above the surrounding area if there is sloping toward the excavation. This can be accomplished by providing a benched area adjacent to the box.

Any modifications to the shields must be approved by the manufacturer.

Shields may ride two feet above the bottom of an excavation, provided they are calculated to support the full depth of the excavation and there is no caving under or behind the shield.

Workers must enter and leave the shield in a protected manner, such as by a ladder or ramp.

Workers may not remain in the shield while it is being moved.


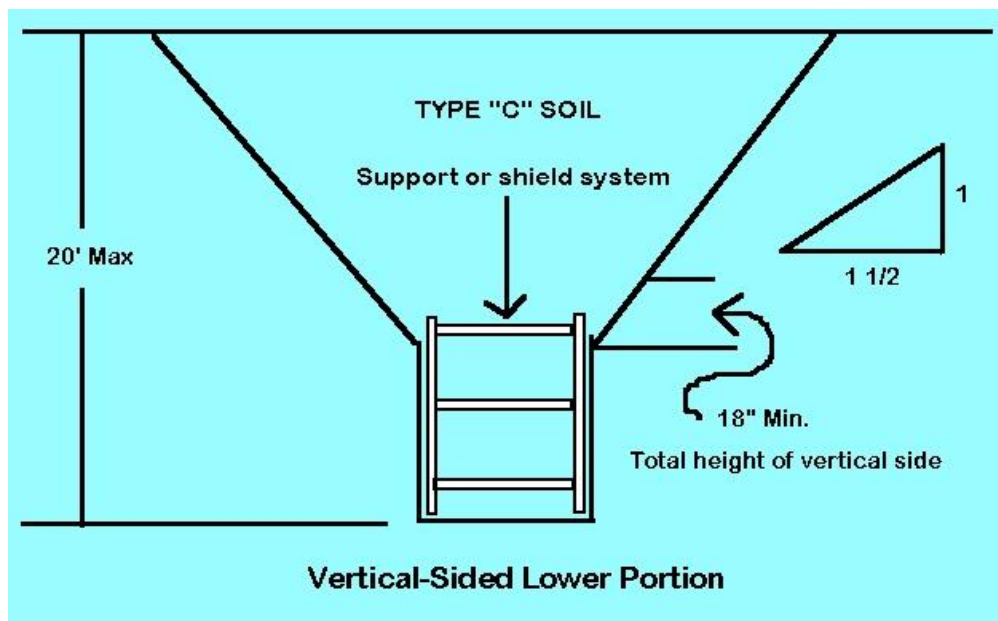
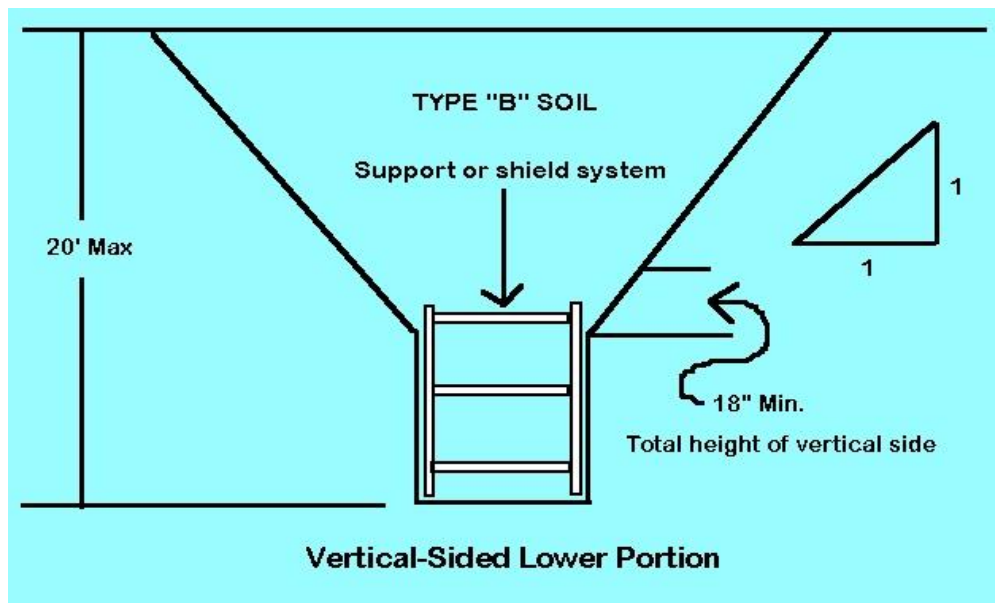

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Illustration of shielding systems in B and C type soils.



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DAILY EXCAVATION CHECKLIST

Client		Date	
Project Name		Approximate Temp.	
Project Location		Approximate Wind Direction	
Job Number		Safety Rep	
Excavation Depth and Width		Soil Classification	
Protective System Used			
Activities in Excavation			
Competent Person			


Excavation > 4 feet deep? ____ Yes ____ No.

If YES, fill out a Confined Space Permit PRIOR to ANY person entering the excavation.

NOTE: Trenches over 4 feet in depth are considered excavations. Any items marked NO on this form MUST be remediated prior to any workers entering the excavation.


YES	NO	N/A	DESCRIPTION
			GENERAL
			Workers protected from cave-ins & loose rock/soil that could roll into the excavation
			Spoils, materials & equipment set back at least 2 feet from the edge of the excavation
			Engineering designs for sheeting &/or manufacturer's data on trench box capabilities on site
			Adequate signs posted and barricades provided
			Training (toolbox meeting) conducted w/ workers prior to entering excavation

YES	NO	N/A	UTILITIES
			Utility company contacted & given 24 hr. notice &/or utilities already located & marked
			Overhead lines located, noted, and reviewed with the operator

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			Utility locations reviewed with the operator, & precautions taken to ensure contact does not occur
			Utilities crossing the excavation supported, and protected from falling materials
			Underground installations protected, supported, or removed when excavation is open
			WET CONDITIONS
			Air in the excavation tested for oxygen deficiency, combustibles, other contaminants
			Ventilation used in atmospheres that are oxygen rich/deficient &/or contains hazardous substances
			Ventilation provided to keep LEL below 10 %
			Emergency equipment available where hazardous atmospheres could or do exist
			Safety harness and lifeline used
			Supplied air necessary (if yes, contact safety department)
			ENTRY & EXIT
			Exit (i.e., ladder, sloped wall) no further than 25 feet from ANY worker
			Ladders secured and extended 3 feet above the edge of the trench
			Wood ramps constructed of uniform material thickness, cleated together @ the bottom
			Workers protected from cave-ins when entering or exiting the excavation


*KEEP 1 COPY OF EACH DAILY EXCAVATION CHECKLIST ON SITE FOR THE PROJECT DURATION,
AND FORWARD THE ORIGINAL TO THE SAFETY MANAGER*

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SOIL ANALYSIS CHECKLIST

Client		Date	
Project Name		Job #	
Project Location		Weather	
Competent Person			
Where was the sample taken from			
Excavation length, depth, and width	L:	D:	W:

VISUAL TEST						
Particle type	Fine Grained (Cohesive)			Granular (sand/silt or gravel)	Other:	
Water Conditions		Wet	Dry	Seeping Water	Surface Water present	Submerged
Notes						
Yes	No	N/A	Description			
			Layered Soils Dipping Into excavation? If yes, describe:			
			Excavation exposed to vibrations. If yes, describe:			
			Previously disturbed soils?			
			Crack like openings or sprawling observed?			
			Underground utilities? If yes, what type:			
			Layered soils? (Note: the least stable layer controls the soil type)			
MANUAL TEST						
Plasticity	Cohesive	Non-cohesive	Dry Strength	Cohesive (broken w/ difficulty)	Granular	
Wet Shake	Water comes to surface (granular material)				Surface remains dry (clay material)	
THUMB TEST Note: Used to estimate unconfined compression strength of cohesive soil.						
Test Performed	Yes	No	N/A, Explain:			
Soil indented by thumb with very great effort?						Type A
Soil indent by thumb with some effort?						Type B
Soil easily penetrated several inches by thumb with little or no effort. NOTE: If soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting.						Type C
PENETROMETER or SHEARVANE TEST Note: Used to estimate unconfined compressive strength of cohesive soils.						

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Test Performed	Yes	No	Device Used / Serial Number:
Soil with unconfined compressive strength of 1.5 tsf or greater			Type A
Soil with unconfined compressive strength of greater than 0.5 tsf and less than 1.5 tsf.			Type B
Soil with unconfined compressive strength of 0.5 tsf or less. Note: if the soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting.			Type C

No soil is Type A if fissured, subject to vibration, previously disturbed, layered dipping into excavation on a slope of 4h: 1v

SOIL CLASSIFICATION			
Stable Rock	Type A	Type B	Type C
SELECTION OF PROTECTIVE SYSTEM (Refer to Appendix F of 29CFR1926)			
Sloping (Appendix B) Specify angle:	Timber Shoring (Appendix C)	Trench Shield Max depth in this soil:	Hydraulic Shoring (Appendix D)

Keep one copy of each Soil Analysis Checklist on site for project duration –
Forward original to the Safety Director at the Main Office