

CONTRACTOR EXCAVATION SHORING REQUIREMENTS

GENERAL

These shoring requirements are to be used by the contractor's competent person in establishing the required shoring for Metropolitan Utilities District employees to enter and perform work in an excavation established and made safe by the contractor. A competent person is able to recognize hazards with a task and has the ability to mitigate those hazards. The competent person shall be experienced and knowledgeable in trenching and excavation procedures, and the shoring and/or protective systems herein. It is the responsibility of the contractor's competent person to adequately protect all workers in an excavation by installing shoring and/or protective systems, or other protective methods described herein, when necessary, according to these shoring requirements. Although compliance with Federal, State, and local laws is expected, the methods described in this standard shall be used at a minimum, regardless of soil classification within the District service area.

EXCAVATION SAFETY

The contractor's competent person will adhere to the following in executing responsibilities. Although the following are provided as guidelines, they are not intended to specifically cover all hazardous situations which may exist.

1. The depth of the excavation used to determine shoring requirements shall be measured from **the top ground surface to the lowest point of excavation in the bottom of the trench.** If this depth is 5' or greater, the protective measures described herein shall be implemented. Where any excavation is next to an embankment or otherwise described land elevation above grade, consider the height of the embankment added to excavated depth as the depth for which shoring must be provided.
2. Whenever it is necessary for any employee to enter any excavation, shoring shall be considered first and benching secondary.
4. **At no time** shall job completion time or economy have priority over the safety of any worker.
5. All materials and equipment will be kept as far back from the edge of the excavation as practicable. Excavated materials (spoil pile) should not be placed closer than 24" from the edge of any excavation. Spoil piles should be kept as low as possible. Efforts should be made to place the spoil pile so that it channels run-off water away from the excavation and cannot accidentally run, slide, or fall back into the excavation.

In restricted spaces with excavations greater than 4' in depth, if the spoil pile cannot be placed 2' away from the excavation then a) include the full height of the spoil pile when measuring the depth of excavation and b) use retaining devices, such as a trench shield, to prevent spoil pile or other material from falling into the trench.

6. In excavations that are 4' or more in depth, a ladder is required to be used for access and egress. It must be within 25' of lateral travel for all workers and extend at least 3' above the top of the trench. The ladder must also be located within the shored area.
7. Cracks in the surface of the soil roughly parallel to the excavation and adjacent to it, from 1' to 6' from the edge, indicate the soil in the banks has already failed and if not shored, a cave-in is imminent. **The full earth load will be on the shoring.**

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8. If material is being dug out under the main to attach equipment for tapping purposes, the “dig out” cannot extend past the excavation walls or be more than twice the width of the pipe, to not be considered part of the excavation depth.
9. Small, localized dugouts, such as sump holes, bell holes, or hand-dug test holes for utility verification, shall not be considered when determining the overall excavation depth, provided they do not increase the height of any trench wall or create additional wall exposure. These features are temporary and limited in scope and must be kept as small as practicable to perform the intended task.

SITUATIONS WHERE SHORING MUST BE PROVIDED

1. Excavation in sandy, black, organic or other unstable soils, or in or near previously disturbed soils.
2. Excavation revealing ground water.
3. Excavation near vibration-producing devices, heavy traffic movement, railroad tracks or other such disturbances.
4. Construction equipment required within 4’ of the trench.
5. Ditch depth of 5’ or more in stable soil, less if the soil is unstable.
6. Any excavations that closely parallel or intersect previous trenches, including those of existing underground lines. At the intersection of previous trenches, the entire width of previous trench and adjacent walls will be shored with consideration of the angle of intersection.
7. Any excavations where District employees have to be in a position that is seated, lying or kneeling on two knees in an excavation over 4’ in depth, install shoring a minimum distance of 3’ each way from the point of work. **Example: Water main tap for service line connection.**

HYDRAULIC VERTICAL SHORING

Sheeting (commonly referred to as FinnForm, is ¾” thick, 14-ply, Arctic White Birch plywood) is used only to prevent local raveling or sloughing of the trench face between the vertical shores. Sheeting is not intended as a structural member.

Single shores may be used in place of multiple cylinder shores, provided that proper horizontal and vertical spacing is maintained.

1. In excavations 6’ deep or less, only 1 hydraulic cylinder is required in each vertical plane. The cylinder shall be no more than 4’ above the bottom of the excavation and no more than 2’ below the top of the excavation. The horizontal spacing shall be as shown in Table 1. See Fig. 1.

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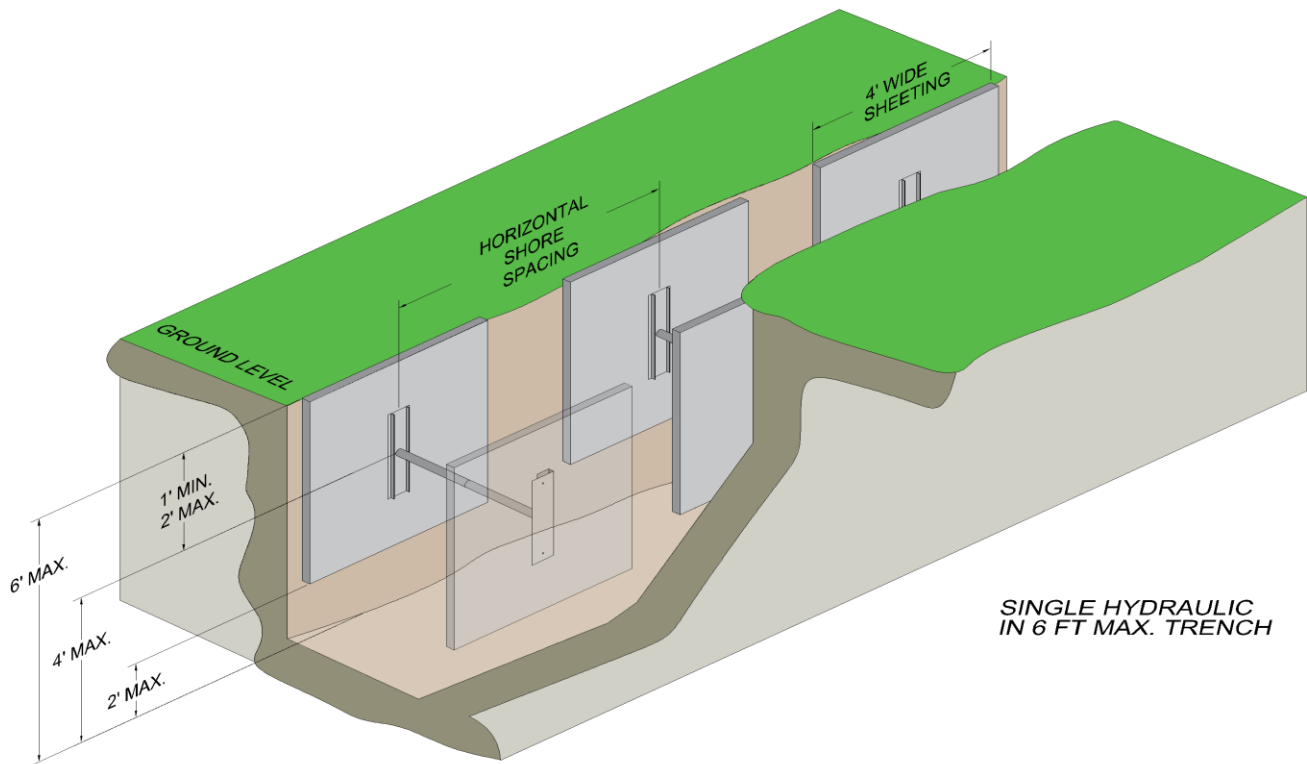


Fig. 1

In excavations greater than 6', but no more than 10' deep, there shall be a minimum of 2 hydraulic cylinders in each vertical plane. Hydraulic cylinders in the same vertical plane should be installed as close to above one another as practical, provided that all other requirements within this construction standard are met. See Fig. 2 below. The horizontal spacing shall be as shown in Table 1.

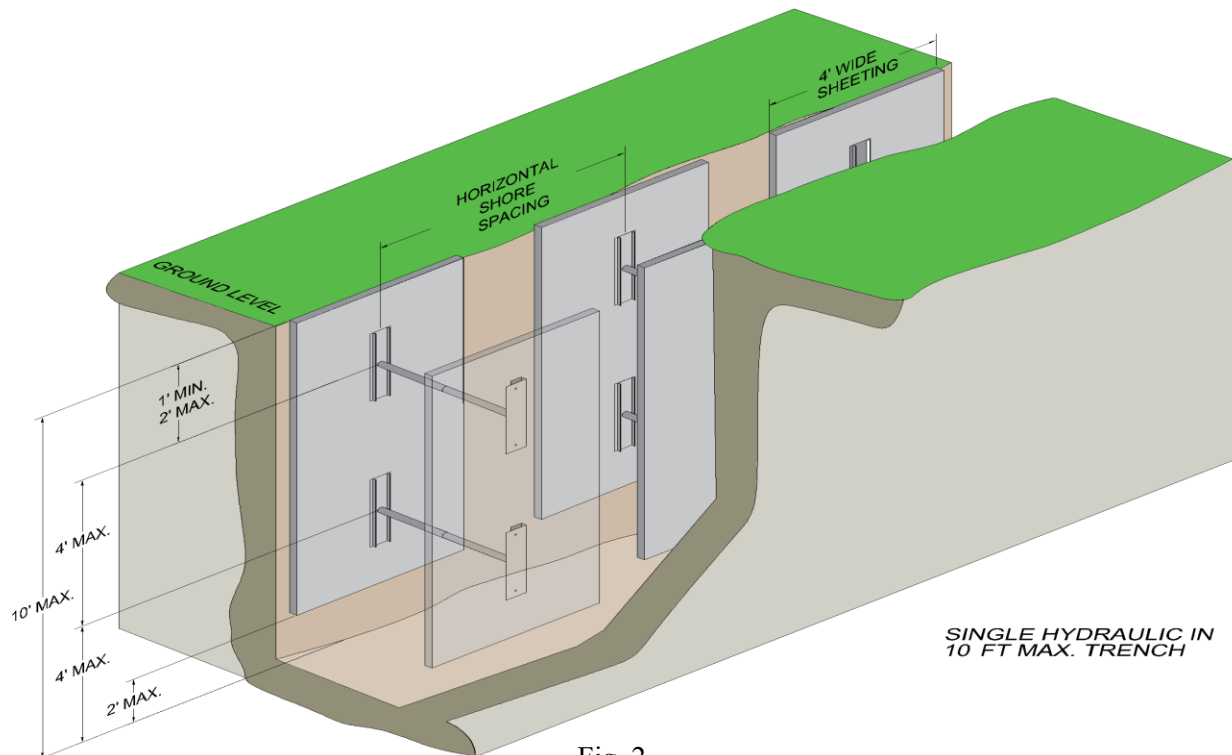


Fig. 2

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1. The vertical rails must have firm soil or a solid and stable filler behind the sheeting to bear on and distribute the cylinder load to the face of the excavation. Do not butt rails back-to-back across an excavation.
2. The aluminum rails on most hydraulic shoring systems are designed to be used vertically, however, they may be orientated horizontally or diagonally if all other provisions herein are satisfied.
3. The maximum vertical spacing between center lines of hydraulic cylinders is 4'.
4. The faces of the excavation must be cut near vertical and straight.
5. For excavations that are too short to place 3 or 4 vertical shores at the required spacing, the shores shall be placed at the required spacing from end to end of the excavation with a minimum of two (2) shores horizontally. There shall be a shore (or pair of shores for depths greater than 6') within 2' of each end of the excavation. If trench width is 4' or less, and excavation depth is 10' or less, no end protection is required. See Fig. 3.

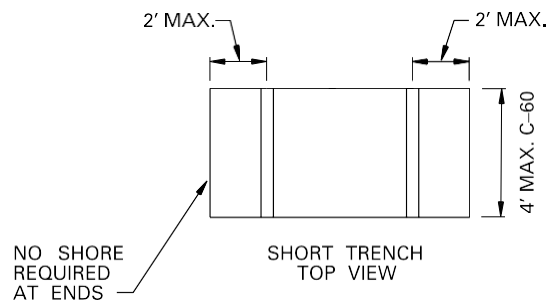


Fig. 3

Trench End Protection

When working in a trench wider than 4' and 10' or less in depth, end wall protection is required whenever District employees are within a horizontal distance from the end wall equal to or less than the trench depth.

Example: In a trench 20' long, 54" wide and 6' deep, end protection is required if work occurs within 6' of the end wall.

Acceptable End Protection Methods: End protection may be provided through various methods such as driven sheet piling, benching, sloping or other engineered protective systems.

6. No vertical or lateral loads shall be applied to the cylinders.
7. If shores are installed on the seam between two adjacent sheets of FinnForm ($\frac{3}{4}$ " thick, 14-ply, Arctic White Birch plywood), each FinnForm sheet shall bear a minimum of four inches on each vertical rail.

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Table 1

Depth of Excavation	HYDRAULIC CYLINDERS					Sheeting (Note 2)
	Maximum Horizontal Spacing	Maximum Vertical Spacing (Note 4)	Width of Excavation			
			0' to 8'	>8' to 12'	>12' to 15'	
0' to10'	6' (Note 3)	4'	2'' dia.	2'' dia.	2'' dia.	(Note 1)
>10' to 20'	4'	4'	2'' dia.	2'' dia.	2'' dia.	(Note 5)

NOTES

1. The bottom of the sheeting shall extend within 2' of the bottom of the excavation. If there is an indication of a possible loss of soil from behind or below the support system, sheeting must extend to the bottom of the excavation.
2. 4' wide sheeting shall be used.
3. When 4' horizontal spacing is exceeded, the open spaces between the sheeting must be monitored for sloughing and raveling of the excavation face. If sloughing or raveling occurs 4' horizontal spacing must be used.
4. The bottom hydraulic cylinder shall be a maximum of 4' above the bottom of the excavation. **Every effort shall be made to provide enough working space for employees to conduct the necessary work on the relative infrastructure.**
5. Sheetting shall extend to the bottom of the excavation.

SHIELDING

In sloped excavations, the top of the shield (sidewall) must be a minimum of 18" above the bottom of the slope and the top struts/braces must be located below the bottom of the slope, see Fig. 4, below. In un-sloped excavations, the top of the shield (sidewall) may be flush with the ground surface, see Fig. 5, below, provided that the competent person determines that there is no hazard of objects rolling into the excavation. In either excavation, the trench may be no more than 12" wider or 12" longer than the shield.

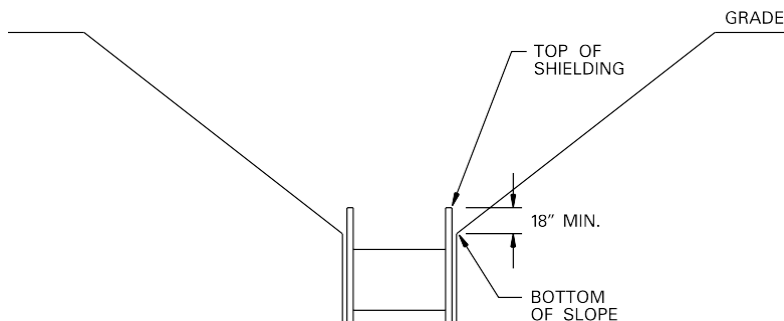


Fig. 4

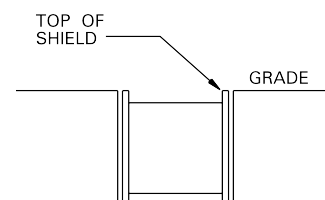


Fig. 5

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Speed Shore shielding

BUILD-A-BOX™ MODULAR TRENCH SHIELD SYSTEM OPTION (EXAMPLE)

1. BUILD-A-BOX™ Modular Trench Shield Systems shall be used with telescoping spreaders and static braces pinned in place with two (2) supplied $\frac{5}{8}$ " diameter pins at each end of the strut or brace.
2. BUILD-A-BOX™ Modular Trench Shield Systems shall be handled by using the lifting lugs installed in holes provided in each panel or corner post. Stacking Brackets shall be used when stacking modular systems.
3. The bottom of the BUILD-A-BOX™ Modular Trench Shield System shall be located no more than two feet from the bottom of the excavation as long as no loss of soil from behind or below the shield is encountered. Proper benching of trench wall is required.
4. The maximum depth of excavation in which a BUILD-A-BOX™ Modular Trench Shield System can be used in is 20'.

Two-Sided Configurations



With telescoping spreaders and full length corner posts



With full length corner posts and arches

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Three-Sided Configurations



With telescoping spreaders and removed bottom panel



With telescoping spreaders and end panels pinned 1' up in corner posts, allowing utility to run through

Four-Sided Configurations



With sectional corner posts and removed bottom panel



Stacked BUILD-A-BOX™
Modular Trench Shield System

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BENCHING

Benching will be allowed in cohesive soil only; if benching is to be used in lieu of the protection methods described above, the first bench width shall be twice the height of the first bench depth, for all benched excavation 4' to 20' in depth. See Fig. 6, below for detail, and see Fig. 7 and Fig. 8, below, for other acceptable benching examples using this principle.

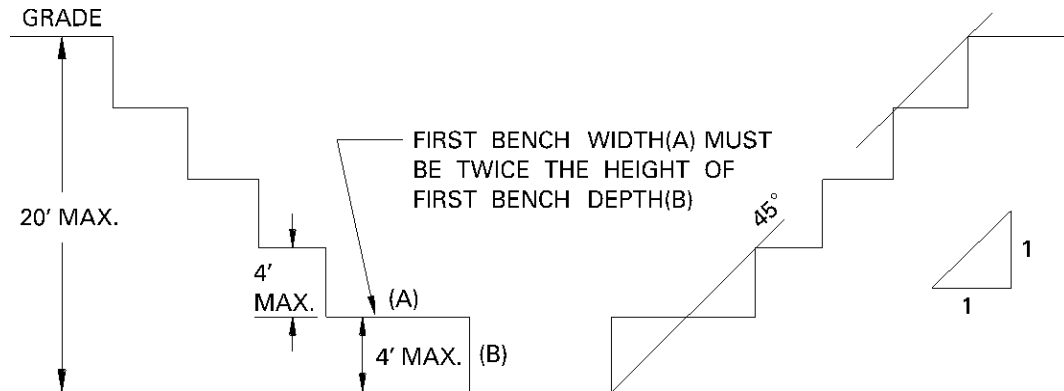


Fig. 6

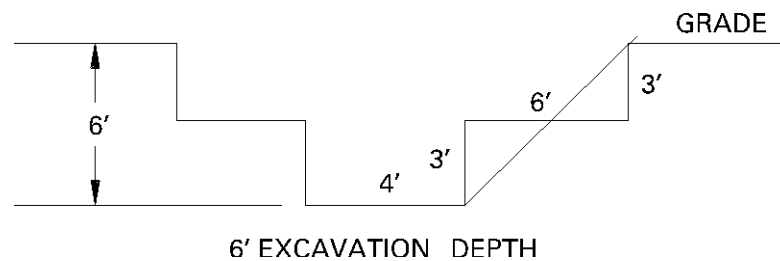


Fig. 7

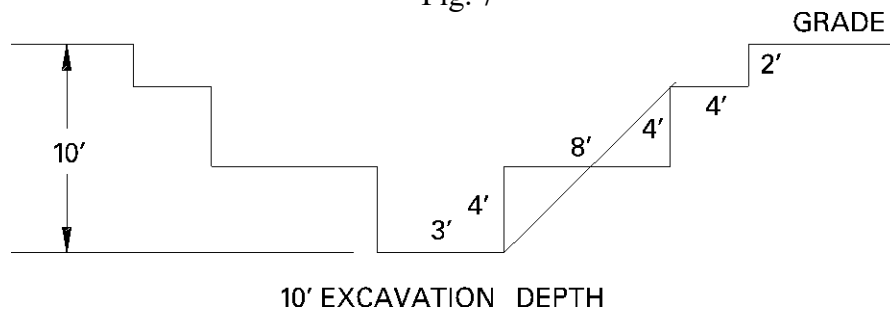


Fig. 8

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