General Information for Using Hydraulic Aluminum Shoring

A. The hydraulic aluminum shoring system tabulated data is based on the OSHA Safety requirements defined in 29 CFR, Part 1926, Subpart P - Excavations and Trenches.

B. This data is to be used by a soils engineer, or a competent person. The competent person shall be experienced and knowledgeable of trenching and excavation procedures, these of hydraulic shoring systems, soils identification, and the OSHA standards.

C. The competent person shall continually monitor the excavation for signs of deterioration such as seepage of water or flowing soil into the excavation. Promptly dewater any accumulated water and reassess the trench for safety. Changing soil conditions may require adjustments to the shoring system.

D. The tabulated data shall only be used for those soil conditions indicated. The data is not considered adequate when loads imposed by structures, equipment, traffic, or stored materials adjacent to the trench exceed the assumed design surcharge loads of 20,000 pounds, or the imposed load of a 2 ft. spoil pile located less than 2 ft. from the edge of the excavation. An engineered shoring design is required for conditions other than those assumed in the tables.

E. When only the lower portion of a trench is to be shored and the remaining portion is benched or sloped at an angle steeper than three horizontal to one vertical (3H:1V), the shoring members shall be selected from the tabulated data for use at a depth which is determined from the top of the overall trench and not the toe of the sloped portion.

F. The faces of the excavation shall be straight and near vertical. Shoring members must bear on firm soil or solid filler.

G. Trenches shall be kept dry and free of water at all times.

H. Vertical and/or horizontal lateral loads shall not be applied to the hydraulic cylinders..

I. Once cylinders are pressurized between 750 - 1500 PSI, the soil should not give and reduce the pressure within the cylinder.

J. Plywood sheeting shall be 1.125" thick CDX or .75" thick, 14 ply, arctic birch. Note that the plywood is not intended as a structural member, but only for the prevention of local raveling or sloughing of the trench face between the shores.

K. When plywood sheeting is used, it shall extend to the top of the excavation and to within 2 ft. of the bottom of the excavation in Type A & B soils, and to the bottom of the trench in Type C-60 soils. See typical installation diagrams.

L. Plywood sheeting, as referenced throughout this tabulated data may be substituted with other engineered sheeting, such as (1) 0.75 in. thick, 14 ply, white birch - Finland Form; also known as Metsaform, Wisaform and Chudoform, (2) 1.125 in. thick soft plywood, (3) 0.25 in. thick steel plate, with a min. yield strength (fy) of 50,000 psi., (4) 0.3125 in. thick steel plate, with a min. yield strength (fy) of 36,000 psi., (5) 0.75 in. thick, 13 ply, plywood consisting of both hardwood and soft wood veneers, known as OMNI FORM, (6) Efficiency 2-3/4" thick or 4-9/16" thick extruded aluminum Build-A-Box or XLAP panels, (7) 0.75 in. thick Sentry Panel.

Classification of Soil Types

A. The soil descriptions for OSHA Type "A", "B", & "C" Soils are based on Appendix A to OSHA Subpart P of 29CFR Part 1926, "Excavations and Trenches". The Type "C-60" Soil referred to in Efficiency's Tabulated Data represents a more stable soil condition than the Type "C" described in Appendix A.

B. **Type "A" Soil** - Equivalent weight effect of **25 PSF** per foot of depth.

Description: Cohesive soil (i.e.. slay, silty clay, sandy clay, clay loam) with an unconfined compressive strength of 1.5 TSF (tons per square foot) or greater; or cemented soils such as caliche and hardpan. No soil is Type A if the soil is fissured; subject to vibration from heavy traffic, pile driving or similar effects; has been previously disturbed; or part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater.

C. **Type "B" Soil** - Equivalent weight effect of **45 PSF** per foot of depth.

Description: Cohesive soil with an unconfined compressive strength greater than .5 TSF but less than 1.5 TSF; and granular cohesionless soils including angular gravel, silt, silt loam, sandy loam, and in some cases, silty clay loam and sand clay loam; previously disturbed soils except those which would otherwise be classed as Type C; soil that meets requirements for Type A, but is fissured or subject to vibration; dry rock that is unstable; and material that is part of a layered system where layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

D. **Type "C-60" Soil** - Equivalent weight effect of **60 PSF** per foot of depth.

Description: Soft cohesive to moist soil with an unconfined compressive strength less than .5 TSF; moist cohesive soil or moist dense sand which is not flowing or submerged. When cut with near vertical side walls, soil can stand with unsupported vertical sidewalls long enough for shoring installation. (see "1.c.")

E. **Type "C-80" Soil** - Equivalent weight effect of **80 PSF** per foot of depth.

Description: Cohesive soil with an unconfirmed compressive strength of .5 TSF or less; granular soils including gravel, sand, and loamy sand; submerged soil or soil from which water is freely seeping; submerged rock that is not stable; and material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H : 1V) or steeper.

Vertical Hydraulic Shoring System:

A. Trenches exceeding 8 ft. in length will have a minimum of 3 shores spaced according to the tables. In trenches shorter than 8 ft. in length, 2 sets of vertical shores are required at the horizontal spacing indicated in the tables.

B. For trenches 6 ft. in depth, vertical shoring shall consist of a minimum of one single cylinder rail. The bottom or single cylinder shall be positioned no more than four ft. from the bottom of the trench and there shall be no more than two ft. from the top of the trench to the top or single cylinder. See typical installation diagrams.

C. For trenches 6 to 10 ft. in depth, vertical shoring shall consist of a minimum of two hydraulic cylinders in each vertical plane. See typical installation diagrams.

D. Two single shores may be substituted for one vertical shore.

E. Do Not butt rails back to back across an excavation.

F. This standard applies to both standard and rescue shores

Hydraulic Waler Shoring System:

A. Timber sheeting shall be #1 Douglas Fir with a minimum Fb = 1,500 psi, or equivalent.

B. When timber sheeting is used in Type C soil, the maximum distance from the bottom of the excavation to the bottom wale shall be 2' - 6" unless the sheeting is over-driven into the bottom of the trench a minimum of 1 ft. If over-driven, the maximum distance to the bottom wale shall be 4 ft.. See typical installation diagrams.

C. A minimum of 2 sets of waler rails shall be used, one above the other. A single set of waler rails does not provide adequate protection.

D. When double hydraulic cylinders are required at one location, both cylinders must be pressurized the same to prevent the possible failure of a single cylinder.

E. Walers shall be placed end to end where more than one is used in the horizontal direction.

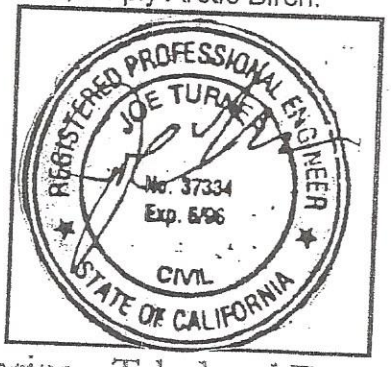
This tabulated data is applicable to any vertical hydraulic shoring system or hydraulic waler shoring system manufactured by Efficiency Production, Inc. or Safe-T-Shore.

Selection Guide

Depth of Trench (ft.) (5)	Max. Horizontal Shoring Spacing (ft.) (6)	Maximum Vertical Cylinder Spacing (ft.) (1)	Max. Width of Trench (ft.) (2)	Sheeting
TYPE "A" SOIL				
Up To 10'	8'	4'	12'	(3)
11' To 15'	8'	4'	12'	(3)
16' To 20'	8'	4'	12'	(3)
21' To 25'	8'	4'	12'	(3)
TYPE "B" SOIL				
Up To 10'	8'	4'	12'	(3)
11' To 15'	7'	4'	12'	(3)
16' To 20'	6'	4'	12'	(3)
21' To 25'	5'	4'	12'	(3)
TYPE "C-60" SOIL				
Up To 10'	6'	4'	12'	(3)
11' To 15'	5'	4'	12'	(4)
16' To 20'	4'	4'	12'	(4)
21' To 25'	3'	4'	12'	(4)
TYPE "C-80" SOIL				
N/A (SEE NOTE 5)				

NOTES:

1. Utilize Efficiency's 2 in. diameter hydraulic cylinders with standard or heavy duty extension system as required for desired excavation width. Trenches wider than 9'-4" (112") require Efficiency's Steel Oversleeves extending the full, collapsed length.
2. Plywood sheeting shall consist of 1.125 in. CDX plywood or .75 in., 14 ply Arctic Birch.*
3. Plywood sheeting required if raveling or sloughing is likely to occur. (see installation diagrams)*
4. Plywood sheeting shall be used.*
5. Material can stand with unsupported vertical sidewalls long enough for shoring installation.
6. Vertical shoring shall be Efficiency's standard or heavy duty vertical rail sections. (see pg 6).

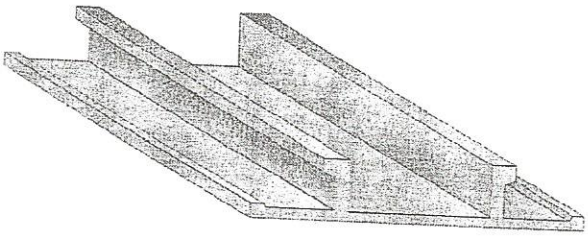


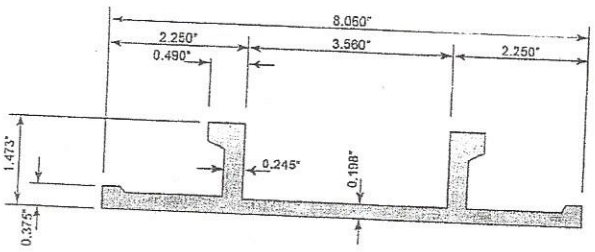
* See "L." of "General Information" for alternate sheeting.

Vertical Rail Specification Sheet

Section Properties	Standard Rail	Heavy Duty Rail
Material	Aluminum	Aluminum
Alloy	6061-T6	6061-T6
Area	2.45 in.	3.47 in.^{2}
Weight	2.94 plf	4.17 plf
Section Modulus - Top (leg side)	0.44 in.^{3}	1.25 in.^{3}
Section Modulus - Bottom (blade side)	1.29 in.^{3}	2.38 in.^{3}
Equivalent Timber Size * (#2 Douglas Fir)	3x10 (flat)	4x10 (flat)

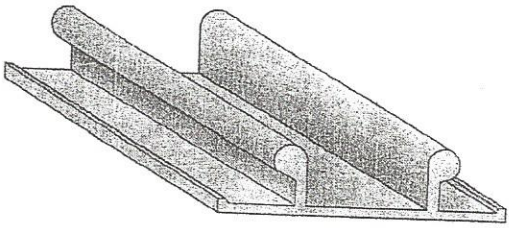
Standard Vertical Rail

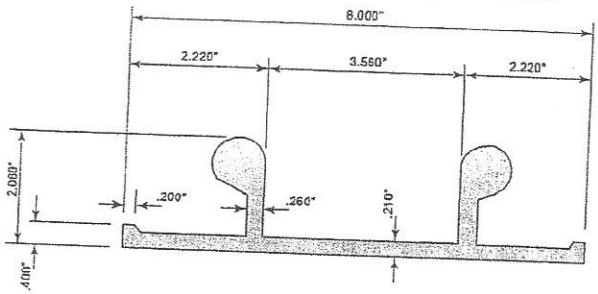




Cross Section of
Standard Vertical Rail

Heavy-Duty Vertical Rail





Cross Section of
Heavy-Duty Vertical Rail