

2" Hydraulic Shoring Tab Data

DPNicolli
 Superior Piling & Shoring Solutions
 www.dpnicolli.com

Oregon
 19600 SW Cipole Road
 Tualatin, OR 97062
 Phone: (503)692.6080
 Fax: (503)692.1799

California
 266 Harbor Way
 San Francisco, CA 94080
 Phone: (650)873.2999
 Fax: (650)873.2988

Washington
 3700 6th Avenue
 South Seattle, WA 98134
 Phone: (206)767.6080
 Fax: (206)763.4088

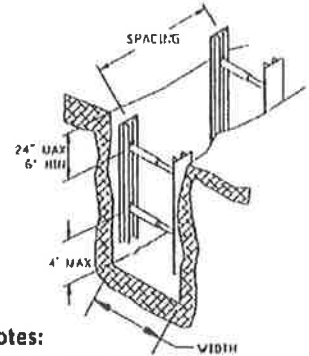
Bay Point
 1666 Willowpass Road
 Bay Point, CA 94565
 Phone: (925)432.6080
 Fax: (925)432.6099

TABULATED DATA FOR HYDRAULIC SHORING

Table 1 Hydraulic Shore Selection Guide ⁽¹⁾

Depth of Trench (ft)	Number of Cylinders	Hydraulic Cylinder Requirements					Sheeting
		Maximum Horizontal Spacing (ft)	Maximum Vertical Cylinder Spacing (ft)	Cylinder Size Width of Excavation (ft)			
				to 8	8 to 12	12 to 15	
Type "A" Soil							
to 10'	2	8'	4'	2"	2"	2" + OS2	Note 2
10' to 14'	3						
14' to 18'	4						
18' to 22'	5						
22' to 25'	6	7'-6"			2" + OS1		
Type "B" Soil							
to 10'	2	8'	4'	2"	2"	2" + OS2	Note 2
10' to 14'	3	7'					
14' to 18'	4	5'-6"					
18' to 22'	5	4'-6"			2" + OS1		
22' to 25'	6						
Type "C-60" Soil							
to 10'	2	6'-6"	4'	2"	2"	2" + OS2	Note 3
10' to 14'	3	5'					
14' to 18'	4	4'					
18' to 22'	5	3'-6"			2" + OS1		
22' to 25'	6						

OS1 = 3" x 3/16" Wall Aluminum Oversleeve
 OS2 = 3.5" x 3.5" x 3/16" Wall Steel Oversleeve

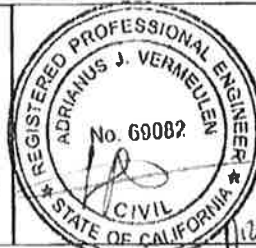


Notes:

- Soil shall first be classified in accordance with OSHA Appendix A Soil Classification for use with this selection guide. Type C-60 soil is OSHA Appendix A Type C soil that will stand up long enough to install the hydraulic shores.
- Sheeting is required at any depth whenever sloughing or raveling occurs. If sloughing or raveling occurs between sheeting, decrease spacing until it is prevented. See Table 2 for allowable sheeting. Sheetting may be attached to jack or set into trench separately.
- Sheeting is required at this depth.
- Sheeting must extend to the bottom of the excavation.
- This tabulation includes lateral loading from equipment weighing 20,000 lbs or less and a maximum 3 ft high spoil pile set back a minimum of 2 ft. The competent person shall determine the effect of all other surcharge loads and reduce hydraulic shore spacing as required to resist those loads.
- This Tabulated Data has been prepared by a Registered Professional Engineer as required to comply with the OSHA standard 29 CFR Part 1926 Subpart P, which assumes a 72 psf surcharge load.

Table 2 Allowable Sheetting

Plywood		Other Materials		
3/4" Finn Form		1" Thick steel plate 4' min wide x depth		
3/4" Omni Form		Steel sheet piling		
3/4" Plyform, APA B-B Class 1 Exterior		Aluminum Sheet piling		
3/4" HDO, APA High Density Overlay Exterior		Buildable box panels		
3/4" 14 Ply Arctic White Birch (Finland Form)				
1 1/8" CDX				
2 Sheets of 3/4" CDX (back to back)				
3/4" Combo Exterior Plywood				
Timber Lagging Set Horizontal				
Thickness	Soil Type/ Span			
	A	B	C-60	
2"	4 ft			
3"	5 ft	4 ft		
4"	8 ft	6 ft	4 ft	
DF#2 or Oak				



J.M. TURNER ENGINEERING, INC.
 CONSULTING ENGINEERS

1325 COLLECT AVT., SANIA ROSA, CA 95401
 (707) 528-4503 FAX (707) 528-4505

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QUICK USE GUIDE
HYDRAULIC SHORING
TABULATED DATA

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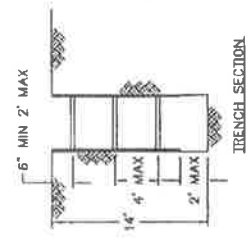
J.M. TURNER ENGINEERING, INC.
CONSULTING ENGINEERS
125 COLLEGE AVE., SUITE 105A, CA 95040
(925) 528-4503 FAX (925) 528-4505

SCALE: 1/8" = 1'
DATE: 12/20/14
DRAWN BY: A.B.B.
CHECKED BY: A.B.B.
DRAWING NO.: 14157-1/51
SHEET: 1 OF 2

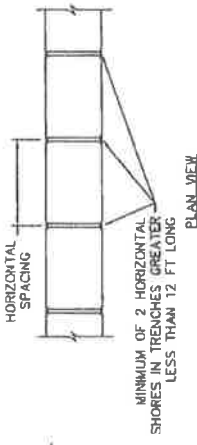
THIS TABULATED DATA APPLIES TO ALL HYDRAULIC SHORING AND PARTS MANUFACTURED BY CERDA INDUSTRIES INC., SPEED SHORE CORPORATION, EFFICIENCY PRODUCTION, INC., PACIFIC SHORING LLC, PRO-TEC EQUIPMENT, CANTEL, INC., ALLIED SHORING, SAFE-T-SHORE AND GME CORPORATION. PARTS MAY BE INTERMIXED ON THE SHORE.

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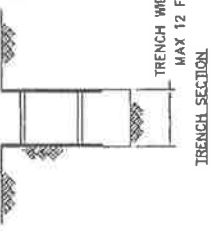
① VERTICAL SPACING



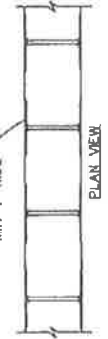
② HORIZONTAL SPACING



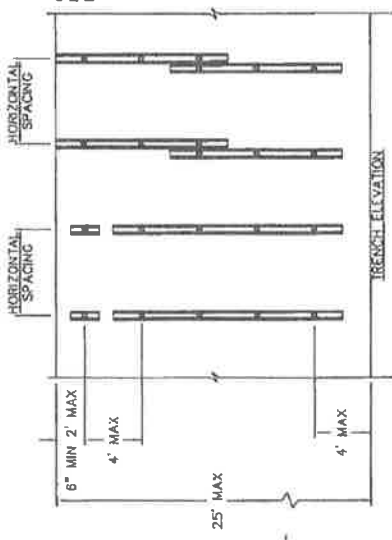
③ TRENCH WIDTH



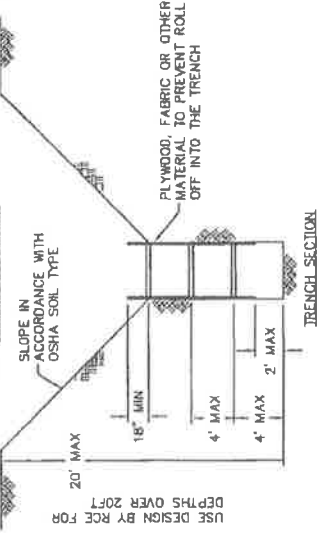
④ SHEETING MIN 4" WIDE



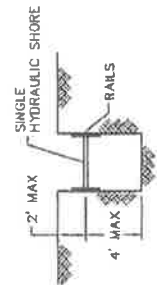
⑤ STACKED SHORES



⑦ SLOPED TRENCH WITH HYDRAULIC SHORES

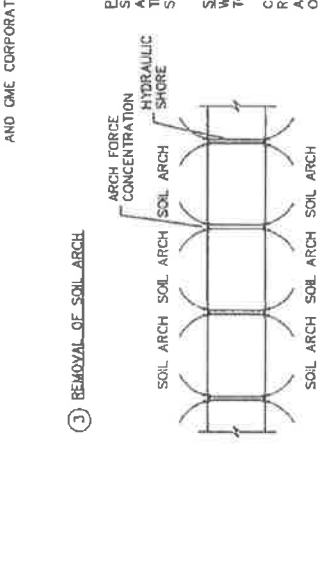
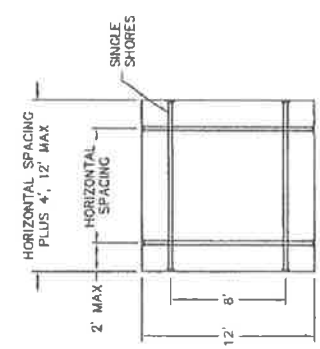
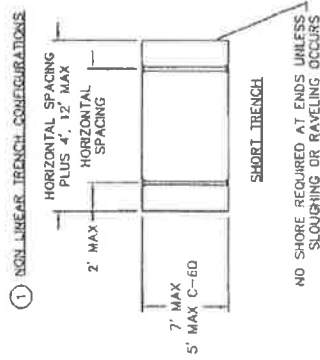


⑥ SINGLE SHORE IN 6FT TRENCH



THIS TABULATED DATA APPLIES TO ALL HYDRAULIC SHORING AND PARTS MANUFACTURED BY CERDA INDUSTRIES INC., SPEED SHORE CORPORATION, EFFICIENCY PRODUCTION, INC., PACIFIC SHORING LLC, PRO-TEC EQUIPMENT, CANTEL, INC., ALLED SHORING, SAFE-T-SHORE AND ONE CORPORATION. PARTS MAY BE INTERMIXED ON THE SHORE.

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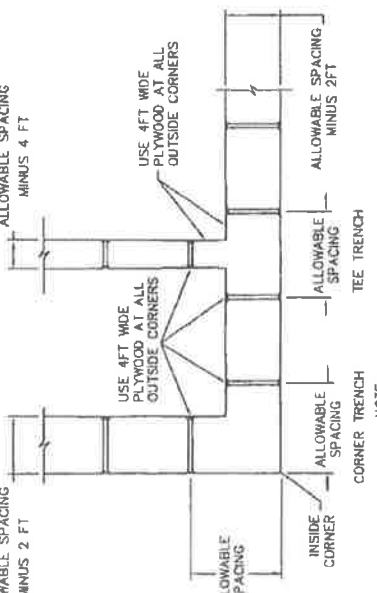


PROBLEM:
SOIL ARCHING IS ESTABLISHED WHEN SHORES ARE INSTALLED. TEMPORARY OR PERMANENT REMOVAL OF THE SHORE IS A POTENTIAL FOR IMMINENT COLLAPSE.

SOLUTION:
WHEN REMOVING SHORES, KEEP BACKFILL CLOSE TO SHORES BEING REMOVED. COMPETENT PERSON TO DETERMINE APPROPRIATE RE-INSTALLATION PROCEDURE WHEN REMOVING AND RESETTING SHORES TO ALLOW PLACEMENT OR PRODUCTION WORK.

NOTES:

- WORKERS ALLOWED BETWEEN SHORES ONLY
- SHEETING IS REQUIRED IF SLOUGHING AND/ OR RAVELING OCCUR
- IT IS ACCEPTABLE TO INSTALL THE TRENCH JACKS WITH PLYWOOD EITHER HORIZONTAL, VERTICAL OR DIAGONAL IN THE TRENCH AS LONG AS THE CYLINDER SPACING DOES NOT EXCEED THE MAXIMUM ALLOWABLE DISTANCE



NOTE:
OUTSIDE CORNERS HAVE A STRESS CONCENTRATION AND WILL CRACK AND FALL OFF USE PLYWOOD TO PROTECT WORKERS



SCALE: 1/8" = 1'-0"
DATE: 12/20/14
DRAWN BY: J. Vermeulen
CHECKED BY: J. Vermeulen
DRAWING NO.: 14152-1/52
SHEET: 2 OF 2

REVISIONS BY: [Table with 2 columns: Description, Date]

QUICK USE GUIDE
HYDRAULIC SHORING
TABULATED DATA

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TABULATED DATA FOR HYDRAULIC SHORING

CONDITIONS FOR USE OF TABULATED DATA:

1. This Tabulated Data has been prepared by a Registered Professional Engineer as required to comply with the OSHA standard 29 CFR Part 1926 Subpart P, which assumes a 72 psf surcharge load.
2. HYDRAULIC SHORING must be used in a manner consistent with safe working procedures, Federal, State and Local regulations.
3. A "competent person", who has trained in the proper use of hydraulic shoring, safe excavation practices and soil classification must direct and control the use of the vertical hydraulic shoring system according to the spacing required in the depth chart.
4. The "Competent Person" must be knowledgeable and capable of complying with all federal regulations, state and local laws and ordinances.
5. The Soil Types A-2S, B, 4S, are as defined in the OSHA standard. Soil Type C-60 is a moist, cohesive soil or a moist dense granular soil, which is not flowing or submerged. This soil can be cut vertically and will stand long enough to safely install the protective system.
6. The "competent person" must monitor the excavation for any signs of deterioration or condition change that may alter soil classifications.
7. "Competent person" is also one who is 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.
8. Any topic not covered by this data shall be governed by the OSHA Standard.
9. DP Nicolli shall not be liable for damage or injury resulting from improper use of the Hydraulic Shores. Improper use of, or modification to the Hydraulic Shores, or use of components not specifically authorized by DP Nicolli without the written consent of DP Nicolli shall void this data and all manufacturer's warranty.

DESIGN CRITERIA AND LIMITATIONS:

1. Depth and chart tables include a three-foot high spoil pile within a distance of 2' from the face of the excavation. Hydraulic Shores are not designed to support heavier surcharge loads, such as those imposed by building foundations. If Hydraulic Shores are used near building foundations, those foundations may need to be underpinned to prevent any settlement.
2. Hydraulic Shore struts are not designed to support any vertical loads and shall not be used as a ladder to provide access or egress to the trench.
3. The data is valid for Hydraulic Shores that are in structurally sound condition. Any significant damage will void this data, and all manufacturers' warranty. Any damaged Hydraulic Shores shall not be used.
4. The excavation and adjacent areas shall be monitored daily, after every rainstorm, and after every event that might change the stability of the excavation.
5. Surface water shall be diverted away from the excavation and water must be pumped out of the excavation bottom. The excavation shall be monitored in these conditions to prevent the water from generating excessive lateral pressure on the Hydraulic Shore.

NOTES FOR TABULATED DATA:

1. The top cylinder of the Hydraulic Shore shall be no less than six inches and no more than twenty-four inches below the top of the trench.
2. The lowest cylinder of a Hydraulic Shore shall be no more than forty-eight inches above the bottom of the excavation.
3. If sheeting is required, the sheeting shall extend from the top of the excavation to a maximum of two feet off the bottom of the excavation. Some soils may require that the sheeting be extended to the full depth of the excavation. (Maximum horizontal gap between sheets not to exceed 24").
4. When an Over sleeve is required, the Over sleeve shall extend the full collapsed length of the cylinder.
5. Trenches wider than 8' max require over sleeves. Utilize Efficiency's 2 in diameter hydraulic cylinders with standard or heavy duty extension system as required for desired excavation width. Trenches wider than 8 ft up to 12 ft (112 in - 144 in) require Efficiency's Steel Oversleeves that extend the full, collapsed width; or universal one-piece aluminum extension. Trenches 12 ft - 1 in up to 15 ft (145 in - 180 in) wide require Efficiency's Steel Oversleeves that extend the full, collapsed width.
6. If a Hydraulic Shore is positioned on a joint between two pieces of sheeting, the shore shall be spaced on the seam equally.
7. The Hydraulic cylinders shall be energized to maintain 750 psi. If the initial pressure cannot be maintained because the soil is too soft, another protective system will be required.
8. An approved shoring system shall consist of a minimum of two horizontally spaced Hydraulic Shores in trenches less than 12 ft long and 3 horizontally spaced shores in trenches greater than 12 ft long, spaced in accordance with this data, and the safe working area shall be 2 ft maximum beyond the last set of shores.
9. Trenches in Type A soil less than 7 ft wide do not require end shoring. Trenches in Type B soil less than 6 ft wide do not require end shoring. Trenches in Type C-60 soil less than 5 ft wide do not require end shoring. Workers shall stay in the safe working area which shall be between shores only. The competent person on-site is to address the condition at the ends of the trench and is to abide by the sheeting requirements if sloughing and/or raveling occur.
10. Soil shall be classified in accordance with OSHA Appendix A or by a registered Civil Engineer prior to installing this equipment.
11. Surcharge load shall be determined by a competent person or Registered Civil Engineer.
12. Cylinder shall be pinned at each end and the connecting points shall not be allowed to translate in any direction, except when using universal extensions (per universal extension tab data).
13. The hydraulic system including pumps, hoses, and fittings used to pressurize cylinders shall have a safe working capacity of 10,000 psi.
14. Minimum of two, horizontally spaced, hydraulic vertical shores must be in place to classify the trench as shored.

This tabulated data applies to all hydraulic shoring and parts manufactured by, Cerda Industries Inc., Speed Shore Corporation, Efficiency Production, Inc., Pacific Shoring LLC, Pro-Tec Equipment, Cantel, Inc., Allied Shoring, Safe-T-Shore and GME Corporation. Parts may be intermixed on the shore.

Oregon
19600 SW Cipole Road
Tualatin, OR 97062
Phone: (503)692.6080
Fax:(503)692.1799

California
266 Harbor Way
San Francisco, CA 94080
Phone: (650)873.2999
Fax:(650)873.2988

Washington
3700 6th Avenue
South Seattle, WA 98134
Phone: (206)767.6080
Fax:(206)763.4088

Bay Point
1666 Willowpass Road
Day Point, CA 94565
Phone: (925)432.6080
Fax:(925)432.6099



J.M. TURNER ENGINEERING, INC.
CONSULTING ENGINEERS
1325 COLLEGE AVE., SANTA ROSA, CA 95404
(707) 528-4503 FAX (707) 528-4505

Date: 12/30/14	Revised:	Job No: 14157-1	Sheet No.: 1 of 2
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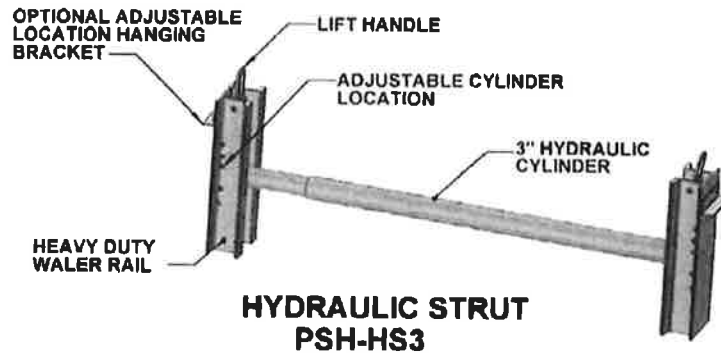


PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

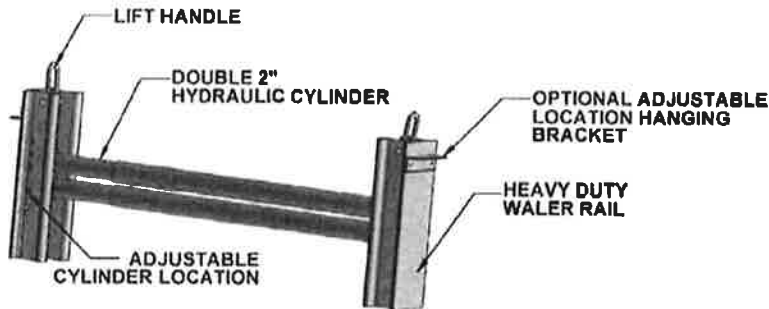
HYDRAULIC STRUT
TABULATED DATA

HYDRAULIC STRUT

TABULATED DATA
Effective February 2015



HYDRAULIC STRUT
PSH-HS3



HYDRAULIC STRUT
PSH-HS2



PACIFIC SHORING, LLC
265 Roberts Avenue
Santa Rosa, Ca. 95407
(707) 575-9014

Construction Engineering Resource
1837 Wright Street
Santa Rosa, Ca. 95404
jmtengr2@aol.com
(707) 484-4704





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Description

The Pacific Shoring Hydraulic Strut is a 3” aluminum hydraulic cylinder mounted on 18” to 24” long heavy-duty waler rails. The assembly also has an optional angle bracket so that the strut can be set on a wale and position the cylinder at the wale web. Lift brackets are attached to the assembly for the purpose of setting the strut and providing vertical safety support so that the strut cannot fall into the excavation. The waler rail has hole positions that allow the cylinder to be centered on different depth steel wales such as HP14”, HP12”, W12” and W14” beams. Strutting should be centered on wale webs so as to prevent development of eccentric moments in addition to the axial forces that the strut delivers to the wale.

This Hydraulic Strut is generally used on waled excavation support systems, and directly on piles in pile and plate shoring systems. The Pacific Shoring Hydraulic Strut can be used in any situation where hydraulic force is needed provided it is safely secured from kickout. In all situations, a competent person should determine that the strut is properly set and fixed into position.

General Information for use of Pacific Shoring 3” Hydraulic Strut

1. The Pacific Shoring Hydraulic Strut tabulated here is based on requirements of Federal OSHA 29CFR, Part 1926, Subpart P-Excavations and Trenches

1926.652(c)(2)-Option (2) - Designs Using Manufacturer's Tabulated Data.
 1926.652(c)(2)(i) -Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

All provisions of Subpart P apply when utilizing this tabulated data. The contractor’s competent person shall use this data to select allowable loading, allowable trench width and strut configuration. The competent person utilizing this tabulated data shall be experienced and knowledgeable of all requirements of Subpart P, and trained in the use and safety procedures for shoring applications.

2. Strut loading shall be determined by an engineer using acceptable excavation support design principals or a competent person that has determined the soil type and condition in accordance with OSHA Appendix A, Soil Classification. Classification shall be just prior to installing the strut. Soil conditions may change at a later date and require reevaluation of the strength and allowable depth.

3. After strut loads are determined, the engineer or competent person shall decide how to install the hydraulic shore so that the tabulated loads and trench widths for the strut are not exceeded.
4. The depth and spacing given in **Table 1** governs the use of Pacific Shoring Hydraulic Struts and not tabulations given by other manufacturers. This Tabulated data applies exclusively to Hydraulic Struts manufactured by Pacific Shoring LLC. Any alterations to the Hydraulic Struts or variance from this tabulated data shall be indicated in a site-specific plan prepared and approved by a registered engineer.
5. When used in excavations the faces of excavations shall be vertical so that the shoring piles and wales are vertical and horizontal to the strut.
6. Pacific Shoring Hydraulic Struts may be used in any situation where axial load strutting is needed. The strut shall be securely attached with the bearing surface of the strut in the same plane as the bearing surface it is being attached to.
7. The strut shall always be secured so that it cannot fall down vertically due to gravity forces. In addition to the angle bracket hanger, a secondary tie off cable or chain shall be used to prevent it from falling on workers below.

Classification of Soil Types

1. Soil classification shall be in accordance with OSHA Appendix A and classified just prior to installing hydraulic shores. Soil conditions may change at a later date and require hydraulic vertical shores to be reset at a different spacing.
2. The equivalent weight of OSHA soil types* is assumed to be as follows:
 - OSHA Type "A" Soil 25 PSF per ft of depth
 - OSHA Type "B" Soil 45 PSF per ft of depth
 - Type "C-60" Soil 60 PSF per ft of depth**
 - OSHA Type "C" Soil 80 PSF per ft of depth

* These equivalent weights were adapted from OSHA 1926 Subpart P App C, Timber Shoring for Trenches, Tables C-1.1, C-1.2, and C-1.3

** Type C-60 soil is not identified or classified in OSHA Appendix A3. Type C-60 soil is soil that does not qualify as OSHA Type A, or Type B, can be cut with vertical walls and will stand up long enough to safely insert and pressurize the hydraulic shore.

Hydraulic Strut Allowable Loading

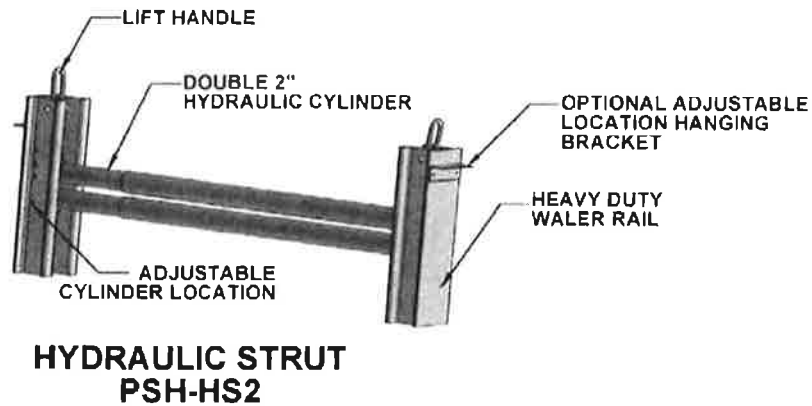
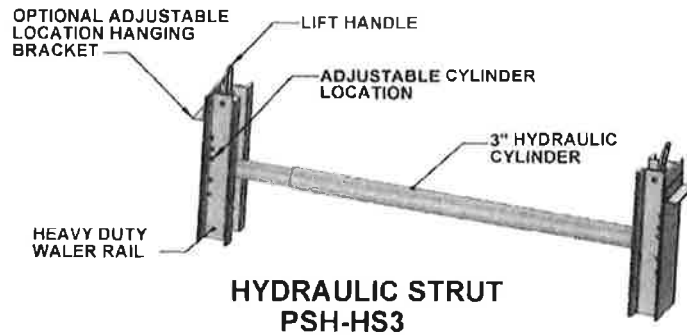


Table 1-ALLOWABLE LOADS FOR HYDRAULIC STRUT					
Model	Allowable Load (lbs)				
PSH-HS-3	3" cylinder				
	Oversleeve	Extension Range (ft)			
		8	12	15	18
	4" round x 0.188 aluminum oversleeve	40000	26000	20000	12000
	4" square x 0.188 aluminum oversleeve	40000	30000	22000	13000
4" square x 0.188 steel oversleeve	40000	40000	40000	30000	
PSH-HS-2	Double 2" Cylinder				
	Oversleeve	Extension Range (ft)			
		8	12	15	18
	3" round x 0.188 aluminum oversleeve	40000	24000	12000	8000
	3" square x 0.188 aluminum oversleeve	40000	40000	20000	10000
3" square x 0.188 steel oversleeve	40000	40000	30000	20000	
Rails	Heavy Duty Wale Rail 18" long				

Vertical Hydraulic Shore Selection Guide

Table 1 Vertical Hydraulic Shore Selection Guide ⁽¹⁾						
Depth of Trench (ft)	Hydraulic Cylinder Requirements					Sheeting
	Maximum Horizontal Spacing (ft)	Maximum Vertical Cylinder Spacing (ft)	Cylinder Size Width of Excavation (ft)			
			to 8	8 to 12	12 to 15	
TYPE "A" Soil						
to 10'	8'	4'	2"	2"	2"+OS2	NOTE 2 ↓
10' to 15'	↓	↓	↓	2"	2"+OS2	
15' to 20'				2"+OS1	2"+OS2	
20' to 25'				2"+OS1	2"+OS2	
TYPE "B" Soil						
to 10'	8'	4'	2"	2"	2"+OS2	NOTE 2
10' to 15'	7'	↓	↓	2"	2"+OS2	
15' to 20'	6'			2"+OS1	2"+OS2	NOTE 3, 4
20' to 25'	5'			2"+OS1	2"+OS2	
TYPE "C-60" Soil						
to 10'	6'	4'	2"	2"	2"+OS2	NOTE 3 ↓
10' to 15'	5'	↓	↓	2"	2"+OS2	
15' to 20'	4'			2"+OS1	2"+OS2	NOTE 3, 4
20' to 25'	3'			2"+OS1	2"+OS2	

OS1 = 3"x3/16" Wall Aluminum Oversleeve
OS2 = 3.5"x3.5"x3/16" Wall Steel Oversleeve

Notes

- Soil shall first be classified in accordance with OSHA Appendix A Soil Classification for use with this selection guide. Type C-60 soil is OSHA Appendix A Type C soil that will stand up long enough to install the hydraulic shores.
- Sheeting is required at any depth whenever sloughing or raveling occur. If sloughing or raveling occurs between sheeting, decrease spacing until it is prevented. See **Table 2** for allowable sheeting. Sheeting may be attached to jack or set into trench separately.
- Sheeting is required at this depth.

Table 2-ALLOWABLE SHEETING			
Plywood		Other Materials	
3/4" Finn Form 3/4" Omnl Form 3/4" plyform, Class 1 Exterior 3/4" HDO, High Debsity Overlay 3/4" HDO, High Density Overlay 3/4" 14 Ply Artic White Birch 1-1/8" CDX 2 sheets of 3/4" CDX		1/2" thick steel plate 4 ft wide x depth Steel sheet piling Aluminum sheet piling Bulldable box panels	
Timber Lagging Set Horizontal			
Thickness	Soil Type/Spaan		
	A	B	C-60
2"	4 ft		
3"	5 ft	4 ft	
4"	8 ft	6 ft	4 ft
DF#2 or Oak			



4. Sheeting must extend to the bottom of the excavation.
5. This tabulation includes lateral loading from equipment weighing 20,000 lbs or less and a maximum 2 ft high spoil pile set back a minimum of 2 ft. The competent person shall determine the effect of all other surcharge loads and reduce hydraulic shore spacing as required to resist those loads.

Typical Hydraulic Strut Applications

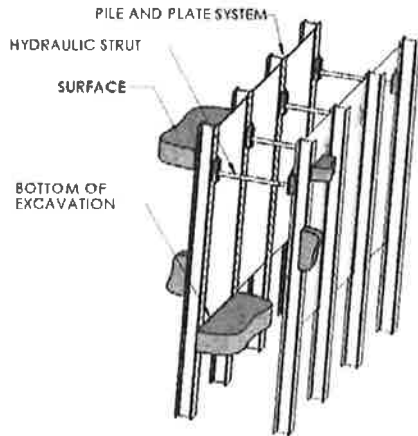


Figure 1 Pile and Plate System with Strutting at Piles

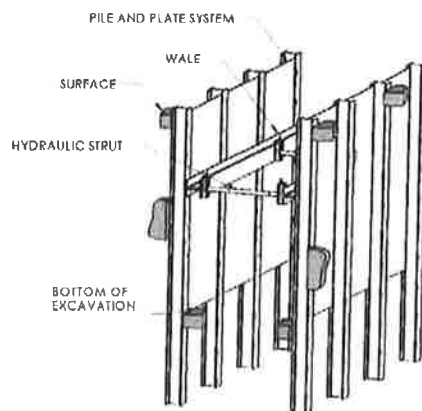


Figure 2 Pile and Plate with Wale and Strut



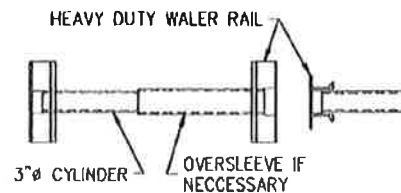
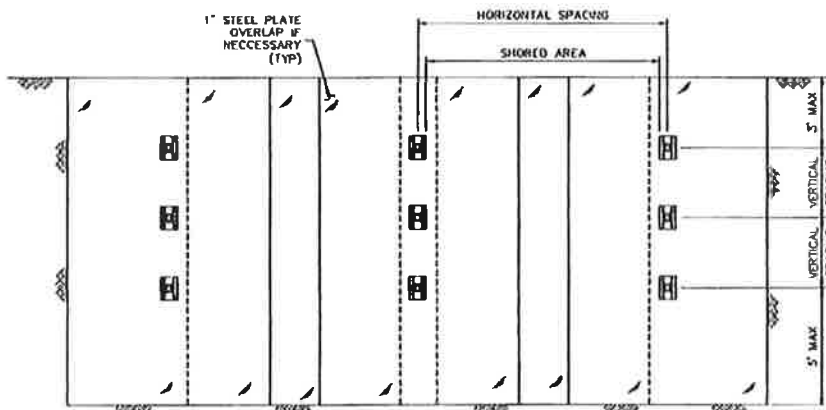
Figure 3 Waler Rail Systems

MANUFACTURERS TABULATED DATA SHEET

Single 3" Cylinder Hydraulic Strut

MAXIMUM CYLINDER SPACING (FEET)

Depth of Trench (ft)	TYPE A SOIL		TYPE B SOIL		TYPE C-60 SOIL	
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
10	10	10	10	10	8	8
15	10	10	8	8	6	6
20	8	8	6	6	6	6
25	8	8	6	6	-	-
Maximum Width of Trench (ft):	No Oversleeve		8			
	With Oversleeve		16			



Single 3" Cylinder Jack

NOTES:

- (a) Utilize 3-inch diameter hydraulic cylinders.
- (b) Sheeting shall consist of 1" steel plate, ASTM A36, Min. Fy = 36ksi.
- (c) Sheeting is required in all applications using this tabulated data.
- (d) Set sheeting and install shores prior to workers entering the trench.
- (e) Soil must be able to stand with unsupported vertical sidewalls, long enough for the shoring to be installed.
- (f) This tabulated data is adequate for normal surcharge loads such as HS20-44 traffic, a 3cy loader, and an excavator setback at 2 ft from the edge of the trench.
- (g) Use 4"x4"x3/16" tube steel oversleeves for trenches from 8 ft to 16 ft wide.
- (h) Workers shall work in shored areas between the shores only. In trenches over 10 ft deep and 10 ft long there shall be a minimum of two sets of plate shoring.
- (i) Contractor should have at least 2 shores in the vertical orientation.
- (j) End of the trench shall be shored or sloped out as required per OSHA.
- (k) Soils shall be classified per OSHA Subpart P.

DPNicolli
Superior Piling & Shoring Solutions



Single 3" Cylinder Hydraulic Strut

J.M. TURNER ENGINEERING, INC.
CONSULTING ENGINEERS
1325 COLLEGE AVE., SANTA ROSA, CA. 95404
(707) 528-4503 FAX (707) 528-4505

Date 3/31/2015	Sheet 1 OF 1	Job No. 14295-1
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