PSH

**PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS**

**CORRUGATED SHIELD
TABULATED DATA
SPECIAL**

1

CORRUGATED SHIELD

SPECIAL-6 STRUT 8X16
SPECIAL-4 STRUT 8X16
SPECIAL-3 WALE 8X16

TABULATED DATA
Effective July 8, 2011

8 FT X 16 FT X 3 WALE
CORRUGATED SHIELD

PSH

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

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

PSH

PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

2

Contents

Description

The Pacific Shoring Corrugated Shield is a lightweight aluminum shoring shield that is intended for use in utility installation and repair applications. These shields are available in hydraulic and static modes. They are constructed from corrugated aluminum sheets, heavy duty waler rails, and 2" aluminum hydraulic cylinder struts with a spring loaded contraction system. The struts can be used in a hydraulic mode or pinned to width. These shields can usually be handled with rubber tired backhoes. Shields may be stacked and have allowed depths to 25 ft. Additional depths may be achieved thru design by a registered engineer.

Shields are available in;
- 6 ft, 8 ft, and 10 ft heights
- 6 ft, 8 ft, 10 ft, and 12 ft lengths
- 3 ft to 10 ft allowable trench widths
- 2 ft to 5 ft pipe clearance (depending on soil type)
- Special 8 ft x 16 ft

These shields may be used in a static or dynamic configuration. A static configuration assumes that the box wall does not necessarily touch the sides of the excavation and that there is no pressure being exerted on the trench wall from the shield. A dynamic configuration requires that the shield walls are pressurized against the soil. Pressurization sets up soil arching and delivers some of the soil pressure directly to the ends of the shield and therefore results in less pressure on the shield walls. With this configuration slightly longer wall lengths can be achieved and the possibility of shoring wall collapse and surrounding existing facility damage can be prevented.

PSH PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

3

General Information for use of Pacific Shoring Corrugated Shields

1.   The corrugated shield shoring system 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 trench depth, 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 shield applications.

2.   Use of this tabulated data is dependent on first classifying the soil in accordance with OSHA Appendix A, Soil Classification. Classification shall be just prior to installing the shield and on a continuing basis as required by OSHA. Soil conditions may change at a later date and require revaluation of the strength and allowable depth.

3.   Corrugated aluminum shoring shields are tabulated based on the effect of a 20,000 lb surcharge load set back 2 ft from the edge of the trench and the equivalent weight effect of the OSHA soil type, see classification of soil types, 2.

4.   The shield rating and allowable depth given in **Table1** governs the use of Pacific Shoring Corrugated Shields and not tabulations given by other manufacturers. This tabulated data applies to Corrugated Shoring Shields manufactured by Pacific Shoring LLC; however, all parts are interchangeable with Speed-Shore Aluminum Shoring Shields of the same type. Speed-Shore shoring shield parts may be interchanged and used with Pacific Shoring Corrugated Shields under this tabulated data. Any alterations to the shields or variance from this tabulated data shall be indicated in a site specific plan prepared and approved by a registered engineer.

5.   Faces of excavations shall be vertical and the shoring walls shall be within 12" of the excavation wall.

6.   Corrugated Shoring Shields may be stacked as long as they are pinned together.

7.   Corrugated Shoring Shields shall be installed and removed from outside the trench, see installation and removal procedure.

8.   The competent person shall continually monitor the shored excavation for changed conditions such as water seepage, soil movement cracks at the surface, sloughing or raveling, proper surcharge load weight less than 20,000 lbs and setback a minimum of 2 ft that may damage the shores.

PSH

PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

4

9.   Workers shall always enter, exit, and work inside the shored area of the trench.

10.   Corrugated Shoring Shields may set a maximum of 2 ft from the bottom of the excavation. The trench depth is the full distance to the bottom of the excavation.

PSH

PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

5

Classification of Soil Types

1.   Soil classification shall be in accordance with OSHA Appendix A and classified just prior to installing hydraulic vertical 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**
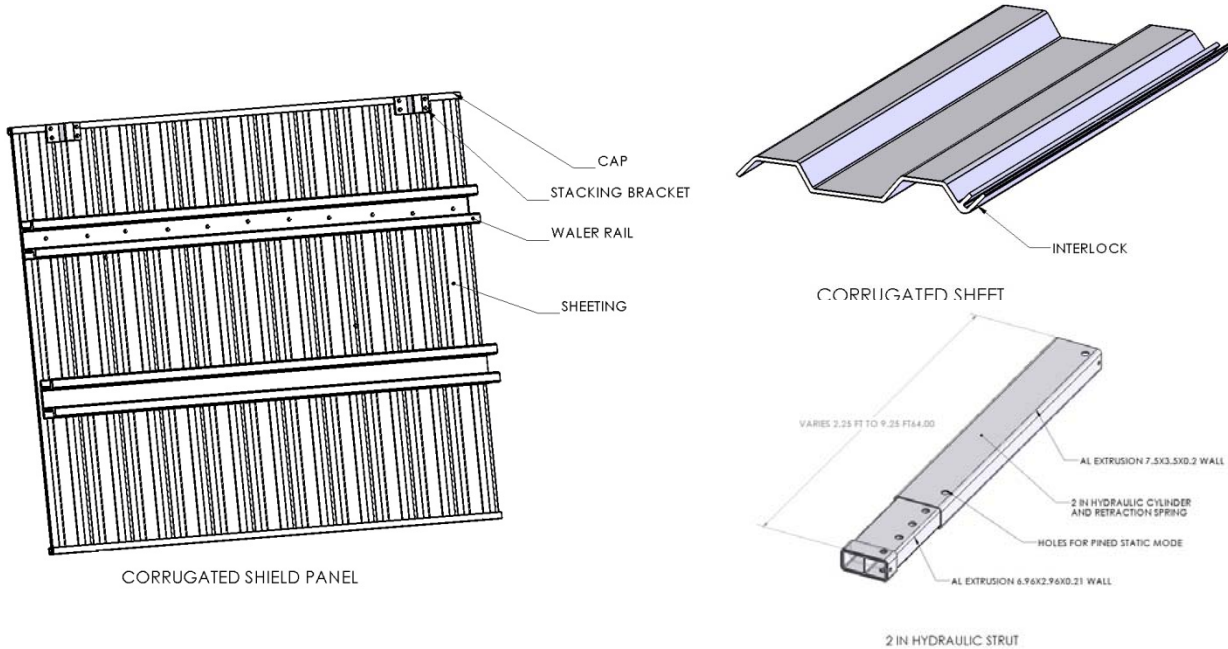- OSHA Type "C" Soil   80 PSF per ft of depth

   *   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 A

3.   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.

4.   Corrugated shields may be used in C-80 soil provided they are dug into the excavation and not driven into the soil. Shields shall be set to the bottom of the excavation.

PSH

PACIFIC SHORING, LLC
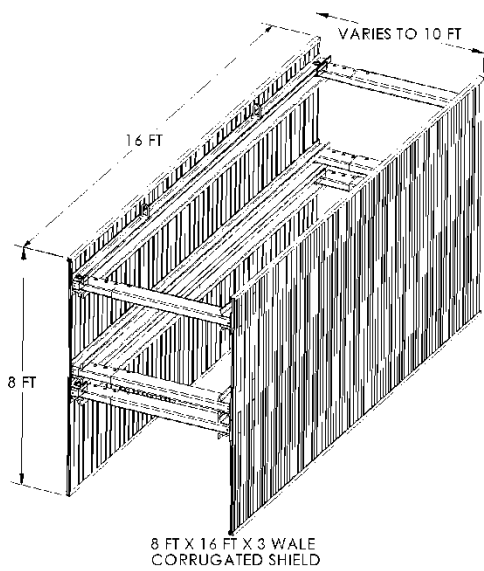**ALUMINUM SHORING**
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

6

Corrugated Shield Components

CAP
STACKING BRACKET
WALER RAIL
SHEETING

CORRUGATED SHIELD PANEL

INTERLOCK
CORRUGATED SHEET

VARIES 2.25 FT TO 9.25 FT64.00
AL EXTRUSION 7.5X3.5X0.2 WALL
2 IN HYDRAULIC CYLINDER AND RETRACTION SPRING
HOLES FOR PINED STATIC MODE
AL EXTRUSION 6.96X2.96X0.21 WALL

2 IN HYDRAULIC STRUT

Corrugated Shields are manufactured in several different sizes as
follows:

SHIELD LENGTH
C
B
SHIELD HEIGHT
A
WIDTH

Table 1	PACIFIC SHORING CORRUGATED SHIELD								
Description			Wale Location			Pipe Clearance		Weight	
Model	Height (ft)	Length (ft)	A (in)	B (in)	C (in)	TB (ft)	TB+2 ft (ft)	(lbs)	
PSC-8-16-3Wale	8	16	36	44	15	2.66	4.56	3590	
PSC-8-16-2 Wale-6 Strut	8	16	36	44	15	2.66	4.56	3095	
PSC-8-16-2 Wale-4 Strut	8	16	36	44	15	2.66	4.56	2944	

NOTES
1 TB = Shield at Trench Bottom
2 Trench Width varies from 2.5 ft to 10 ft depending on strut lengths
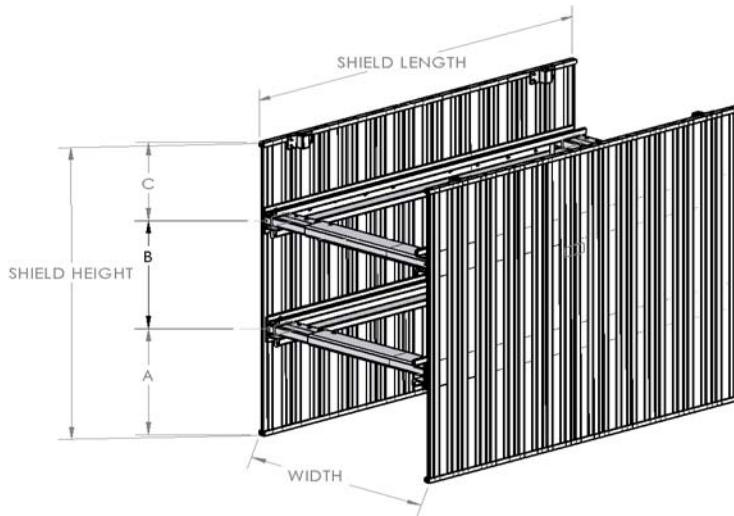3 Weight includes two sides and longest struts
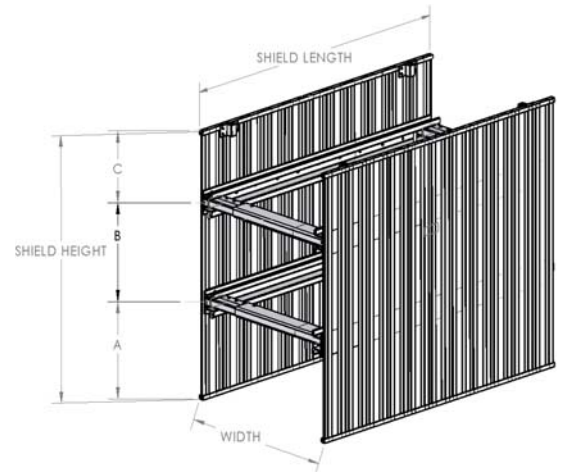
Custom shield sizes and wale locations are available on request.

PSC-816-3 WALE
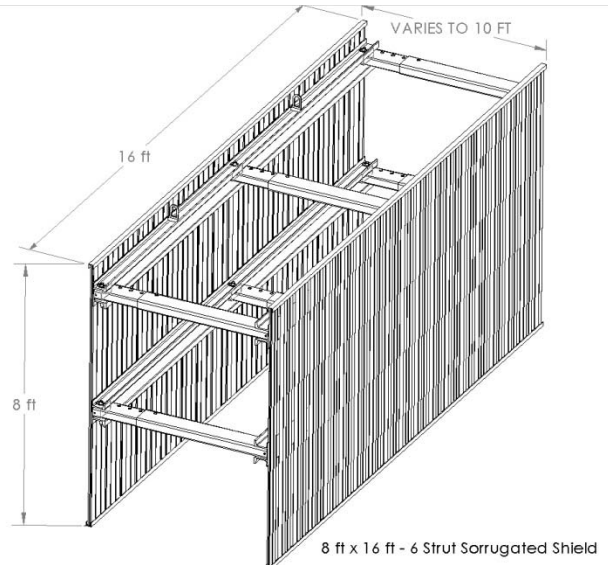
PSC-8-16-2 WALE-6 STRUT

PSC-8-16-2 WALE-4 STRUT

PSH PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

8

Accessories

In addition to the standard corrugated shield the following accessories are available;

- End Sheeting Guide - The sheeting guide mounts on the end of the shield and holds end sheeting in place. Sheets may be placed after the shield is set in place. The guides prevent sheets from falling sideways and backward. Two guides are required for each end of the shield being sheeted. Guides are optional not required for end sheeting use.

- Wall Cut Out With Door - Cut outs with pin-able doors for pipe entry through the wall are available. The maximum height is the lower edge of the bottom wale.

Geometric Properties for Engineering Design
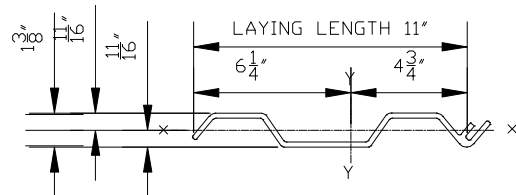
Sheeting

Material
    Extruded Aluminum 6061-T6
    Ultimate Tensile Strength F_{tu} = 45,000 psi
    Tensile Yield Strength F_{ty} = 40,000 psi
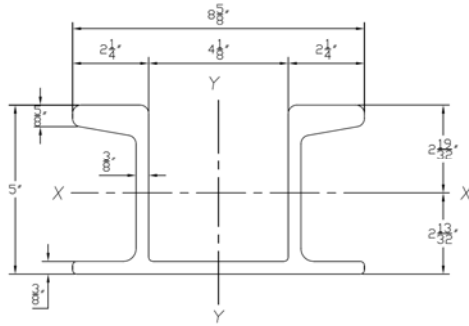   Modulus of Elasticity = 10,000 ksi

Corrugated Shield Panel Properties per foot
    AREA =   3.27 IN^2
    WEIGHT =   3.95 LB/LF
    MOMENT OF INERTIA =   0.7 IN^4
    SECTION MODULUS =   1.13 IN^3

```
                    LAYING LENGTH 11"
      13"/8  11"/16  11"/16    6 1/4"        4 3/4"

AREA                          =3.0 in^2
MOMENT OF iNERTIA X-X          =0.65 IN^4
SECTION MODULUS X-X            =1.04 IN^3
WEIGHT                        =3.624 LBS/FT
```

Waler Rail


```
AREA                   = 9.57 IN^2
WEIGHT                 =11.5 PLF
MOMENT OF INERTIA      =36.34 IN^4
SECTION MODULUS TOP    =14.0 IN^3
SECTION MODULUS,BOTTOM =15.1 IN^3
RADIUS OF GYRATION     = 1.95 IN
```

Rail Material	6061-T6 Aluminum
Ultimate Strength	F_u = 42 ksi
Yield Strength	F_y = 42 ksi

Hydraulic Cylinders

	Allowable Load	Oversleeve
2" cylinders	21,000 lbs	7.5" x 3.5" x 0.2" wall tube

PSH

**PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS**

**CORRUGATED SHIELD
TABULATED DATA
SPECIAL**

10

Allowable Corrugated Shield Depth

To determine the allowable depth for a corrugated shield use **Table 2** below.

Example - If an 8 ft deep x 16 ft long corrugated shield with a 6 strut configuration is to be used in hydraulic mode in B-45 soil, from Table 1 the shield may be used to a depth of 20 ft.
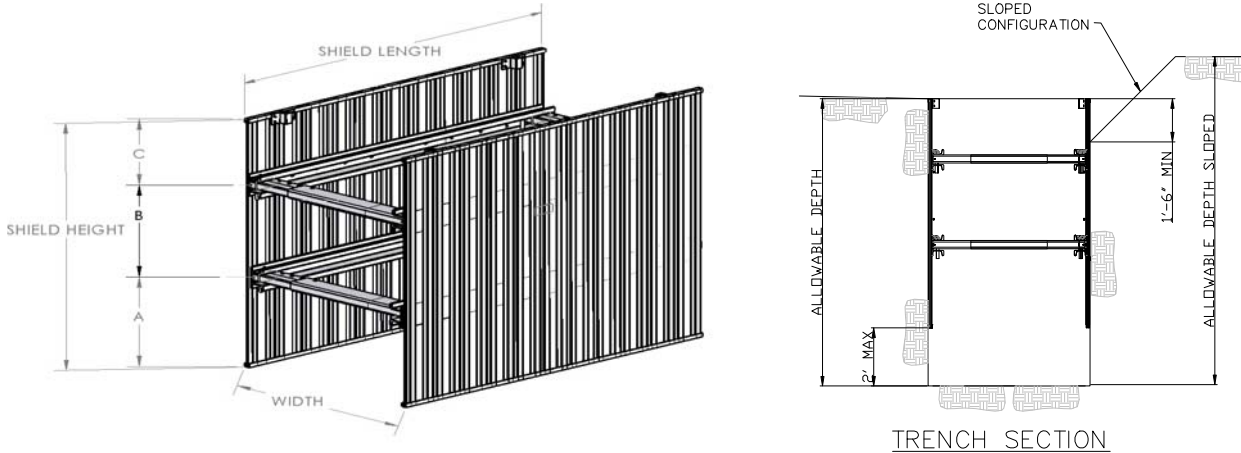

TRENCH SECTION

Table 2						LOAD CAPACITY and ALLOWABLE DEPTH													
Description			Wale Location			Hydraulic Mode					Static Mode					End Loading			
						Rating	Allowable Depth (ft)				Rating	Allowable Depth (ft)				Rating	Allowable Depth (ft)		
Model	Height	Length	A	B	C		Soil Type					Soil Type					Soil Type		
	(ft)	(ft)	(in)	(in)	(in)	(psf)	A-25	B-45	C-60	C-80	(psf)	A-25	B-45	C-60	C-80	(psf)	A-25	B-45	C-60	C-80
PSC-8-16-3Wale	8	16	36	44	15	900	20	20	14	8	800	20	16	12	8	540	18	10	7	6
PSC-8-16-2 Wale-6 Strut	8	16	36	44	15	1021	20	20	15	12	1021	20	18	13	12	540	18	10	7	6
PSC-8-16-2 Wale-4 Strut	8	16	36	44	15	300	12	8	8	0	226	12	8	8	0	540	18	10	7	6

Table 2 Notes

1. Soils must first be classified in accordance with OSHA Subpart P, Appendix A Soil Identification, prior to using this table.
2. When the shield walls are set firmly against the trench wall and the struts are pressurized to a minimum of 750 psi the corrugated shield is considered to be in hydraulic mode.
3. Setback spoil piles and equipment weighing less than 20,000 lbs back a minimum of 2 ft. A competent person shall determine surcharge load setbacks for equipment weighing over 20,000 lbs.
4. The trench wall shall be a minimum of 12" from the shield wall.
5. Custom shield lengths or wale and strut locations are available on request. Tabulated data for special configurations will be provided when the shields are constructed.
6. Shields may be stacked. In static conditions the stacked shields shall be pinned together.

PSH PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

11

7. Tabulated Depths are limited to 20 ft deep. Additional depth may be achieved when the design is by a registered civil engineer.
8. When corrugated shields are used in C soil they shall be set at the bottom of the trench.

Allowable Corrugated Shield Trench Width

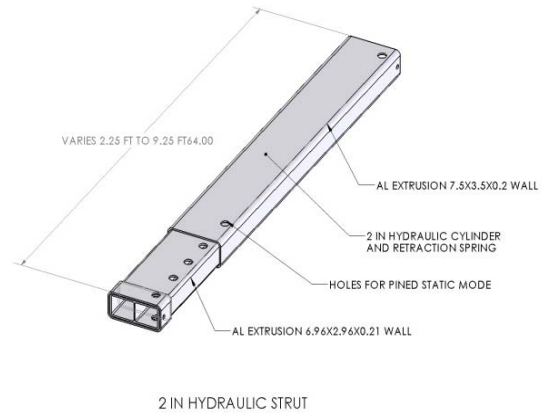| TABLE 3	HYDRAULIC STRUTS					
Model	Strut Size			Trench Width	Allowable Axial Load	Weight
	from	to	Stroke			
	(in)	(in)	(in)	(ft)	(lbs)	(lbs)
PS-31	21	31	10	3	21000	40
PS-40	26	40	14	4	21000	50
PS-50	32	50	18	5	21000	61
PS-59	38	59	21	5	21000	76
PS-68	44	68	24	6	21000	92
PS-92	56	92	36	8	18000	110
PS-112	76	112	36	10	18000	130

2 IN HYDRAULIC STRUT

Table 3 Notes

1. The allowable load capacity and trench depth given in **Table 1** are within the allowable axial load limits given in **Table 2**.
2. Struts may be used in a static mode by pining to width. Cylinders and retraction springs are not required in this configuration.

PSH PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

12

Corrugated Shield Installation and Removal

Installation and Removal Procedure

Corrugated Shields must be constructed prior to setting inside the trench.

Hydraulic Installation

Step 1 Prior to setting shield connect hydraulic hose to shield hydraulic connection so that it can be pressurized from outside the excavation.

Step 2 Set shield inside excavation using adequate strength lifting devices and equipment.

Step 2 Pressurize hydraulic cylinders to minimum 750 psi.

Step 3 Stacked shields may be set on top of the bottom shield while it is set in the trench and then pinned to the bottom shield.

Hydraulic Removal

Step 1 Rig all shields, including stacked shield, and connect hydraulic hoses prior to releasing hydraulics.

Step 2 Release hydraulics when lifting equipment is attached and leads lines are snug. Lifting without releasing hydraulics and retracting the shield may result in damage to the shield and worker exposure to rebound of broken cable and attached parts.

Step 3 Remove the shield using equipment operated from outside the trench. Workers are not allowed inside the shield when it is being set, moved, or removed from the trench.

Static Installation

Step 1 Static installation requires trench walls to stand long enough to set the shield inside the excavation. Prior to setting shield connect lift cable assembly.

Step 2 Set shield inside excavation using adequate strength lifting devices and equipment.

Step 2 Set shield in center of excavation. Excavation walls shall be within 12" of shield walls. If there are larger than 12" voids fill with excavated soil between the trench wall and shield wall to eliminate voids.

Step 3 Stacked shields may be set on top of the bottom shield while it is set in the trench and then pinned to the bottom shield.

PSH

PACIFIC SHORING, LLC
ALUMINUM SHORING
PRODUCTS

CORRUGATED SHIELD
TABULATED DATA
SPECIAL

13

Static Removal

Step 1 Rig all shields, including stacked shield, prior to lifting.

Step 2 If shield wall is loaded with soil use caution when lifting. Excavation behind shield wall may be requires to release pressure. Lifting without loosening the shield from the soil may result in damage to the shield and worker exposure to rebound of broken cable and attached parts.

Step 3 Remove the shield using equipment operated from outside the trench. Workers are not allowed inside the shield when it is being set, moved, or removed from the trench.

Safe Handling and Use of Corrugated Shield Shoring System

- When Corrugated Shields are set in trenches that are sloped above, extend the box 18" above the hinge point. Slopes shall be in accordance with OSHA Appendix B sloping and benching.

- When there is sloping beyond the top of the shield depth of the excavation is limited to 20 ft without a design by a registered engineer.

- Workers are not allowed inside the shield when it is being set, moved, or removed from the trench.

- Provide safe access such as ladders for workers to enter and exit the shoring system.

- Use cables and slings for lifting that have a 5:1 factor of safety. A competent person is to determine the total lift weight.