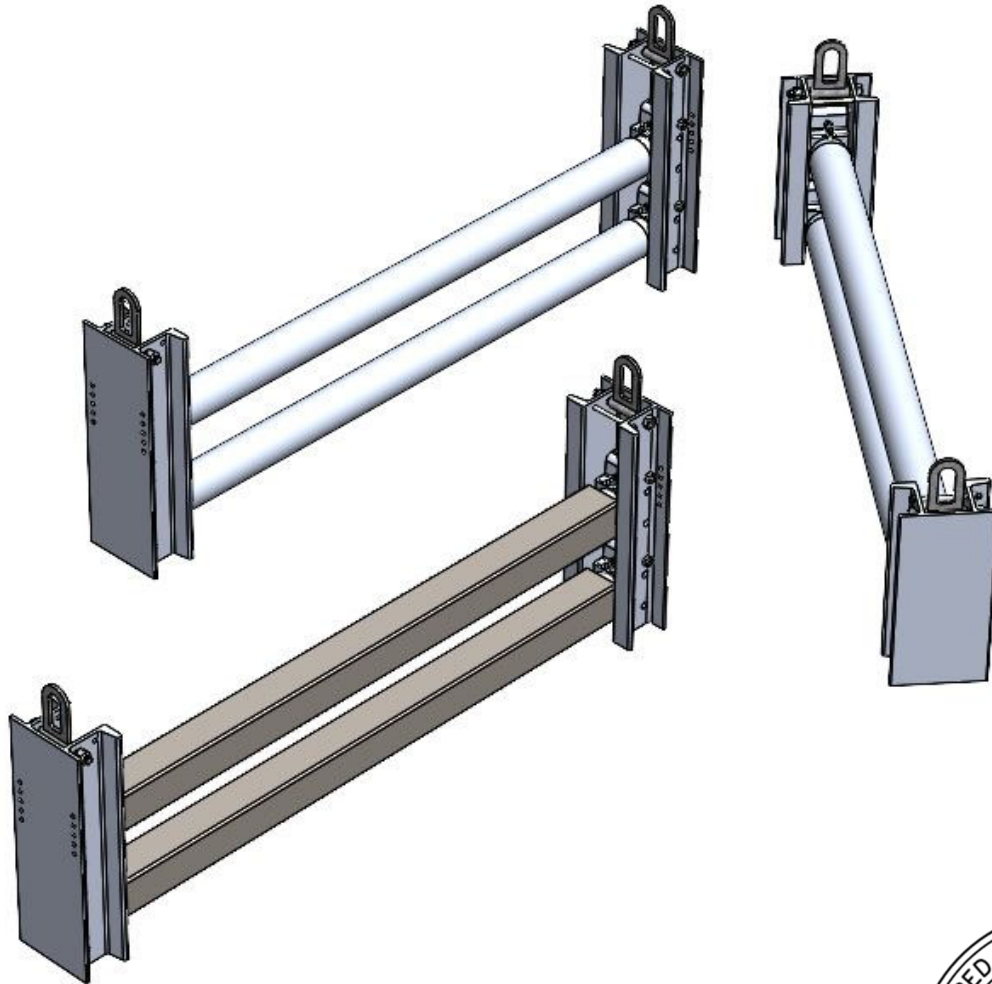


DUAL 3-INCH END SHORES

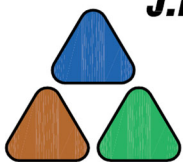
TABULATED DATA
Effective April 9, 2021



Pacific SHORING
Quality Driven, Lead Time Focused

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Description

The Pacific Shoring Products Dual 3-Inch End Shores are composed of two 3-inch hydraulic cylinders mounted on 18- or 24-inch heavy-duty rails. Each of the 3-inch cylinders provides a 40,000 lb. safe working load and can extend from 18 in. to 120 in., cylinder extensions can be used to obtain larger spans. Dual 3-Inch End Shores are designed to work in trenches from 4 ft. to 20 ft. in depth and 2 ft. to 16 ft. wide spans. Sheeting is set behind the Dual 3-Inch End Shore against the trench wall to prevent trench wall collapse and raveling. This end shore application must be used in conjunction with independent linear shoring systems that protect the trench walls. The Pacific Shoring Dual 3-Inch End Shores are used when more pressure is needed in a concentrated area of an excavation wall. One application of this is for shoring the ends of a trench.

General Information on Usage of the Pacific Shoring Products Dual 3-Inch End Shores

1. The Dual 3-Inch End Shores 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, trench length and vertical spacing. 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 Dual 3-Inch End Shore applications.

2. Use of this tabulated data is dependent on first classifying the soil in accordance with OSHA Appendix A, Soil Classifications. Classification shall be determined just prior to installing Dual 3-Inch End Shore Systems. Soil conditions may change at a later date and require revaluation of the strength and allowable depth.
3. Dual 3-Inch End Shores Systems are tabulated based on the effect of a 20,000 lbs., 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, note 2.
4. The depth and spacings given in **Tables 2 – 9** govern the use of Pacific Shoring Products Dual 3-Inch End Shore System and not tabulations given by other manufacturers. This tabulated data applies to Dual 3-Inch End Shore Systems manufactured by Pacific Shoring Products, LLC. Any alterations to the system or variance from this tabulated data shall be indicated in a site-specific plan prepared and approved by a registered engineer.
5. An adequate separately designed shoring system shall be used leading up to within 2 ft. of the Dual 3-Inch End Shore application. Systems such as Timber, Vertical Hydraulic Shores, Waler Systems, Shoring Shields, and designs by an engineer may be used in conjunction with the Dual 3-Inch End Shore system.
6. The faces of the end and corner of the excavations shall be vertical and the end wall shall be within 6" of the sheeting. If the soil face is greater than 6" backfill the void with excavated soil or crushed rock.
7. Dual 3-Inch End Shore Systems 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 shoring equipment.
9. Workers shall always enter, exit, and work inside the shored area of the trench.
10. The lowest element, either the sheeting or the center line of the Dual 3-Inch End Shore System must be 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.
11. Tabulated depths are limited to 20 ft. Additional depth may be achieved when the design is by a registered civil engineer.

Classification of Soil Types

1. Soil classification shall be in accordance with OSHA Appendix A and classified just prior to installing the Dual 3-Inch End Shores. Soil conditions may change at a later date and require Dual 3-Inch End Shore Systems 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 Dual 3-Inch End Shore Systems.

Allowable Sheeting

Sheeting must be used on the end face of the excavation. Sheeting along the trench shall follow the sheeting requirements of the tabulated data used for shoring of the entire trench. Allowable sheeting is as follows:

| Table 1: Allowable Sheeting | | |
|--------------------------------|----------------------|-------------------------------|
| Material | Grade / Yield Stress | Effective Section Modulus, KS |
| 1-1/8" – 2.4.1 Int APA Plywood | S-2 | 0.840 in ³ /ft |
| 3/4" Finland Form | S-1 | 0.4826 in ³ /ft |
| 1" Steel Plate | ASTM A-36 | 2.0 in ³ /ft |
| Steel Sheet Pile | ASTM A-328 | 2.5 in ³ /ft |
| Aluminum Sheet Pile | 6061-T6 | 1.13 in ³ /ft |

Allowable Depth & Vertical Spacing for Dual 3-Inch End Shores (Aluminum Over Sleeves)

The following tables govern the usage of the Pacific Shoring Products Dual 3-Inch End Shore Systems using 4" ϕ x 3/16" aluminum pipe over sleeves (6061-T6):

| Table 2: Vertical Spacing (in.) | | | | |
|---------------------------------|--------------------|----|----|------|
| Soil Type | | | | A-25 |
| Depth (ft.) | Trench Width (ft.) | | | |
| | 4 | 6 | 8 | 10 |
| 6 | 48 | 48 | 48 | 48 |
| 7 | 48 | 48 | 48 | 44 |
| 8 | 48 | 48 | 48 | 40 |
| 9 | 48 | 48 | 48 | 36 |
| 10 | 48 | 48 | 48 | 34 |
| 11 | 48 | 48 | 48 | 31 |
| 12 | 48 | 48 | 45 | 29 |
| 13 | 48 | 48 | 43 | 27 |
| 14 | 48 | 48 | 40 | 26 |

| Table 3: Vertical Spacing (in.) | | | | |
|---------------------------------|--------------------|----|----|------|
| Soil Type | | | | B-45 |
| Depth (ft.) | Trench Width (ft.) | | | |
| | 4 | 6 | 8 | 10 |
| 6 | 48 | 48 | 48 | 32 |
| 7 | 48 | 48 | 44 | 28 |
| 8 | 48 | 48 | 39 | 25 |
| 9 | 48 | 48 | 35 | 23 |
| 10 | 48 | 48 | 32 | 21 |
| 11 | 48 | 48 | 30 | 19 |
| 12 | 48 | 48 | 28 | NA |
| 13 | 48 | 46 | 26 | NA |
| 14 | 48 | 43 | 24 | NA |

| Table 4: Vertical Spacing (in.) | | | | |
|---------------------------------|--------------------|----|----|------|
| Soil Type | | | | C-60 |
| Depth (ft.) | Trench Width (ft.) | | | |
| | 4 | 6 | 8 | 10 |
| 6 | 48 | 48 | 39 | 25 |
| 7 | 48 | 48 | 34 | 22 |
| 8 | 48 | 48 | 31 | 20 |
| 9 | 48 | 48 | 28 | NA |
| 10 | 48 | 45 | 25 | NA |
| 11 | 48 | 41 | 23 | NA |
| 12 | 48 | 38 | 21 | NA |
| 13 | 48 | 35 | 20 | NA |
| 14 | 48 | 33 | 19 | NA |

| Table 5: Vertical Spacing (in.) | | | | |
|---------------------------------|--------------------|----|----|------|
| Soil Type | | | | C-80 |
| Depth (ft.) | Trench Width (ft.) | | | |
| | 4 | 6 | 8 | 10 |
| 6 | 48 | 48 | 31 | 20 |
| 7 | 48 | 47 | 27 | NA |
| 8 | 48 | 42 | 24 | NA |
| 9 | 48 | 38 | 21 | NA |
| 10 | 48 | 34 | 19 | NA |
| 11 | 48 | 32 | NA | NA |
| 12 | 48 | 29 | NA | NA |
| 13 | 48 | 27 | NA | NA |
| 14 | 48 | 25 | NA | NA |

Allowable Depth & Vertical Spacing for Dual 3-Inch End Shores (Steel Over Sleeves)

The following tables govern the usage of the Pacific Shoring Products Dual 3-Inch End Shore Systems using HSS 4" x 4" x 3/16" tube steel oversleeves:

| Table 6: Vertical Spacing (in.) | | | | | |
|---------------------------------|--------------------|----|----|----|------|
| Soil Type | | | | | A-25 |
| Depth (ft.) | Trench Width (ft.) | | | | |
| | 8 | 10 | 12 | 14 | 16 |
| 6 | 48 | 48 | 48 | 48 | 38 |
| 7 | 48 | 48 | 48 | 44 | 34 |
| 8 | 48 | 48 | 48 | 40 | 31 |
| 9 | 48 | 48 | 48 | 37 | 28 |
| 10 | 48 | 48 | 46 | 34 | 26 |
| 11 | 48 | 48 | 43 | 32 | 24 |
| 12 | 48 | 48 | 40 | 30 | 23 |
| 13 | 48 | 48 | 38 | 28 | 21 |
| 14 | 48 | 48 | 35 | 26 | 20 |
| 15 | 48 | 48 | 33 | 25 | 19 |
| 16 | 48 | 46 | 32 | 23 | NA |
| 17 | 48 | 43 | 30 | 22 | NA |
| 18 | 48 | 41 | 29 | 21 | NA |
| 19 | 48 | 39 | 27 | 20 | NA |
| 20 | 48 | 38 | 26 | 19 | NA |

| Table 7: Vertical Spacing (in.) | | | | | |
|---------------------------------|--------------------|----|----|----|------|
| Soil Type | | | | | B-45 |
| Depth (ft.) | Trench Width (ft.) | | | | |
| | 8 | 10 | 12 | 14 | 16 |
| 6 | 48 | 48 | 44 | 32 | 25 |
| 7 | 48 | 48 | 39 | 28 | 22 |
| 8 | 48 | 48 | 35 | 25 | 19 |
| 9 | 48 | 45 | 31 | 23 | NA |
| 10 | 48 | 41 | 29 | 21 | NA |
| 11 | 48 | 38 | 26 | 19 | NA |
| 12 | 48 | 35 | 24 | NA | NA |
| 13 | 48 | 33 | 23 | NA | NA |
| 14 | 48 | 31 | 21 | NA | NA |
| 15 | 45 | 29 | 20 | NA | NA |
| 16 | 42 | 27 | 19 | NA | NA |
| 17 | 40 | 26 | NA | NA | NA |
| 18 | 38 | 24 | NA | NA | NA |
| 19 | 36 | 23 | NA | NA | NA |
| 20 | 35 | 22 | NA | NA | NA |

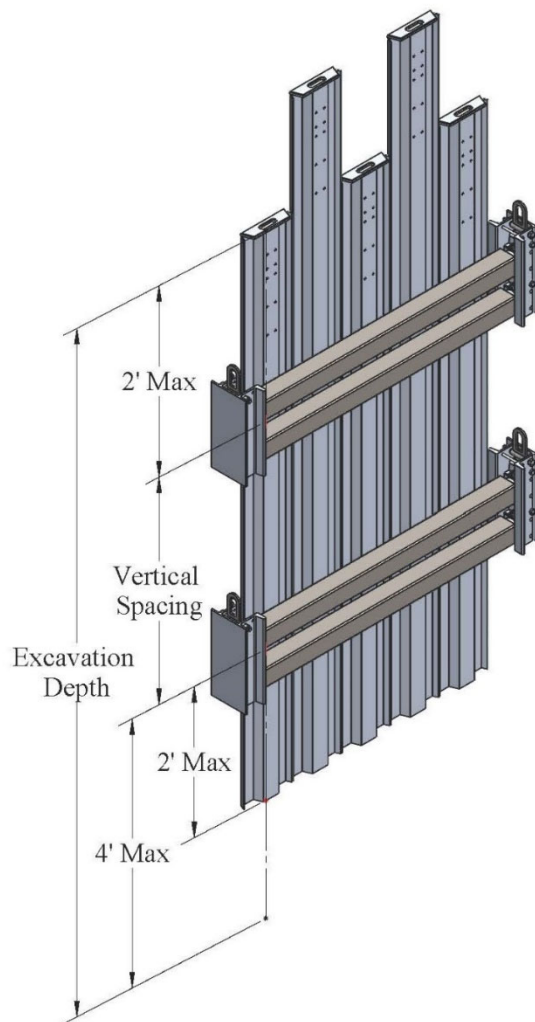
| Table 8: Vertical Spacing (in.) | | | | | |
|---------------------------------|--------------------|----|----|----|------|
| Soil Type | | | | | C-60 |
| Depth (ft.) | Trench Width (ft.) | | | | |
| | 8 | 10 | 12 | 14 | 16 |
| 6 | 48 | 48 | 35 | 25 | 19 |
| 7 | 48 | 44 | 30 | 22 | NA |
| 8 | 48 | 39 | 27 | 20 | NA |
| 9 | 48 | 35 | 24 | NA | NA |
| 10 | 48 | 32 | 22 | NA | NA |
| 11 | 46 | 29 | 20 | NA | NA |
| 12 | 42 | 27 | 19 | NA | NA |
| 13 | 39 | 25 | NA | NA | NA |
| 14 | 37 | 24 | NA | NA | NA |
| 15 | 35 | 22 | NA | NA | NA |
| 16 | 33 | 21 | NA | NA | NA |
| 17 | 31 | 20 | NA | NA | NA |
| 18 | 29 | 19 | NA | NA | NA |
| 19 | 28 | NA | NA | NA | NA |
| 20 | 26 | NA | NA | NA | NA |

| Table 9: Vertical Spacing (in.) | | | | | |
|---------------------------------|--------------------|----|----|----|------|
| Soil Type | | | | | C-80 |
| Depth (ft.) | Trench Width (ft.) | | | | |
| | 8 | 10 | 12 | 14 | 16 |
| 6 | 48 | 39 | 27 | 20 | NA |
| 7 | 48 | 34 | 24 | NA | NA |
| 8 | 47 | 30 | 21 | NA | NA |
| 9 | 42 | 27 | 19 | NA | NA |
| 10 | 39 | 25 | NA | NA | NA |
| 11 | 35 | 23 | NA | NA | NA |
| 12 | 33 | 21 | NA | NA | NA |
| 13 | 30 | 19 | NA | NA | NA |
| 14 | 28 | 18 | NA | NA | NA |
| 15 | 26 | NA | NA | NA | NA |
| 16 | 25 | NA | NA | NA | NA |
| 17 | 23 | NA | NA | NA | NA |
| 18 | 22 | NA | NA | NA | NA |
| 19 | 21 | NA | NA | NA | NA |
| 20 | 20 | NA | NA | NA | NA |

Allowable Depth and Vertical Spacing Table Notes:

1. Vertical spacing dimensions are in inches. Measurements shall be taken from the centerline of each Dual 3-Inch End Shore assembly and shall never exceed 4 ft. (48 in.).
2. 4" x 4" x 3/16" high strength steel over sleeves **MUST** be used when end shoring spans exceed 10 ft. in trench width with the Dual 3-Inch End Shores.
3. Tabulated spacing assumes at least 1 shore assembly at the bottom of excavation under any pipeline work, and 1 shore directly above pipe. Pipe diameter shall not exceed 36 in.
4. Spacing between the centerline of the top shore and the top of excavation shall never exceed 2 ft.
5. The Dual 3-Inch End Shores must be used in conjunction with a shoring system designed for the remaining trench walls.
6. Calculations are based on material strength, not deflection criteria.

Figure 1. Dual 3-Inch End Shore System Parameters



Dual 3-Inch End Shore System Installation and Removal

Installation Procedure

A competent person trained in installation and safe use of the system shall be present during installation. Prior to start of the excavation the sheeting and Dual 3-Inch End Shore Systems should be at the site and assembled so that the shoring equipment can be installed immediately following the excavation work. The excavation walls should be vertical, straight, and square. The sheeting may be placed prior to setting the frames or after they set in place.

Step 1 Assemble the Dual 3-Inch End Shores on the surface.

Step 2 Attach lifting harness and hydraulic hose to hydraulic fitting on shore, open valve on the pump so that the shore cannot be pressurized.

Step 3 Set plywood, finform or steel plates if required and not attached to the shore into trench.

Step 4 Lower shore into trench with properly situated and adequately sized lifting equipment such as backhoe, boom truck, excavator, or crane.

Step 5 Close the valve on the pump and pressurize hydraulics to a minimum of 1000 psi. Pressure gauge should hold at pressure and not indicate loss of pressure.

Step 6 Set end sheeting in place through the sheeting guide across the end of the trench.

Step 7 The end sheeting must be within 6" of the trench end. If the spacing is greater than 6", backfill between the sheeting and the trench wall with excavated soil or crushed rock.

Removal procedure

Step 1 Attach lifting harness to the Dual 3-Inch End Shore prior to releasing pressure.

Step 2 Place release tool over hydraulic fitting and release fluid and pressure.

Step 3 Lift shore out of trench with properly situated and adequately sized lifting equipment such as backhoe, boom truck, excavator, or crane.

Note

Depending on the length of the shore and width of the trench different installation procedures may be used. It is the responsibility of the contractor and his competent person to establish a safe installation and removal procedure for each application. All trench shore installers shall be instructed in the procedure prior to installing the shores.

Installation Support

Dual 3-Inch End Shore components are assembled, rigged, and set from outside the excavation

Figure 2. Dual 3-Inch End Shore Components

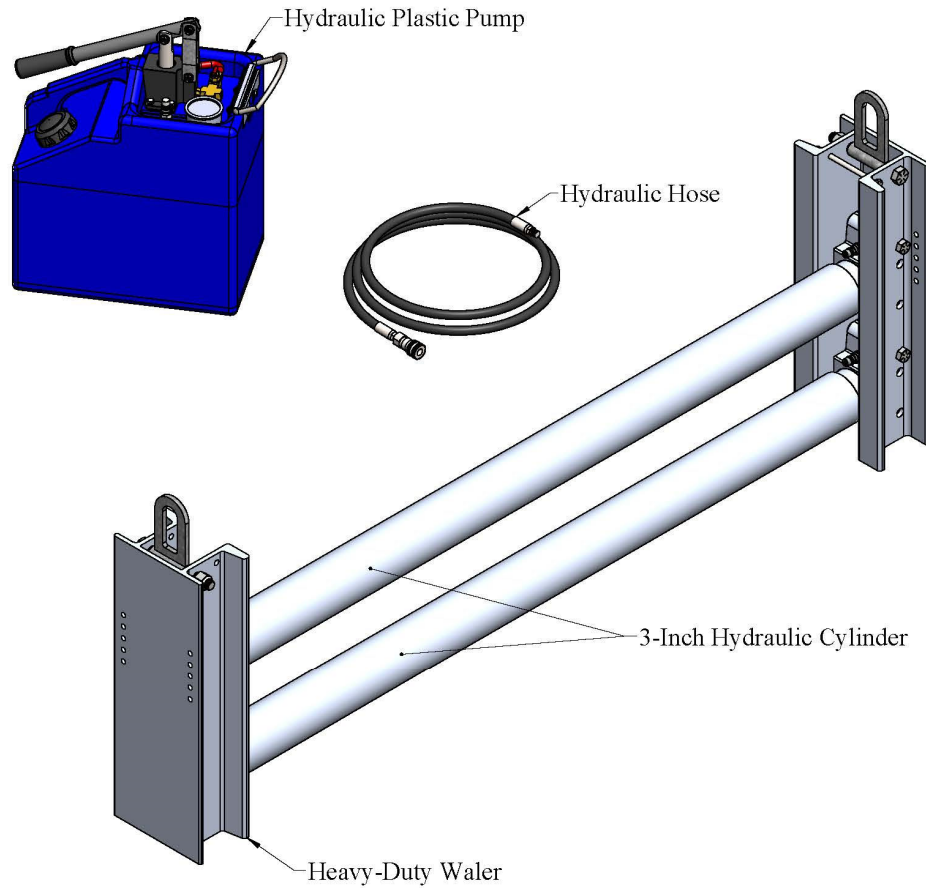
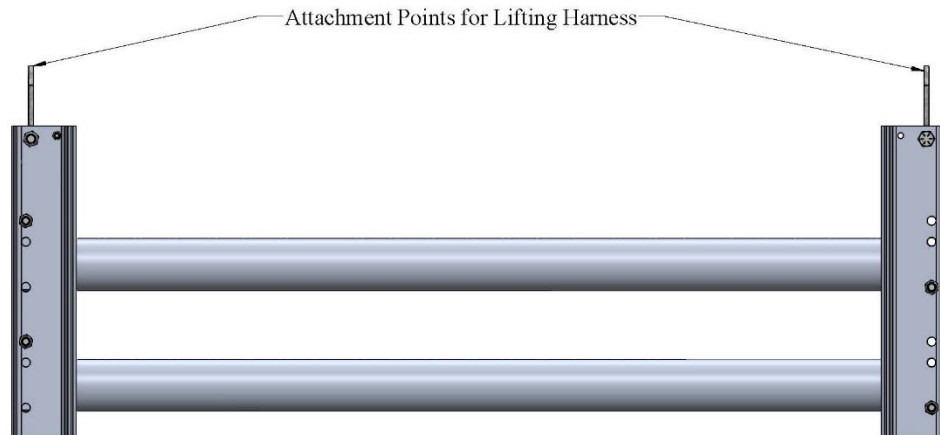


Figure 3. Side Profile View



Safe Handling the Dual 3-Inch End Shore System

- Most shoring related accidents happen while setting and removing shoring equipment. There should always be a competent person trained and familiar with the shoring system being used at the site during installation.
- Prior to starting the excavation work at the shoring location, the competent person should verify that all components and their attachments, bolts, pins, hydraulic pumps, assembly equipment, etc. is present at the site.
- Develop an installation plan and hazard analysis prior to starting the work.
- Check the adequacy and condition of all lifting and rigging equipment.
- 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.
- Confirm that dewatering is to the bottom of the excavation and that if there is a potential for water inside the excavation there is adequate pumping equipment available at the site.
- There should not be voids behind the sheeting. Backfill all voids with excavated material or small 3/8" minus rock. If the retained soil runs out from behind the sheeting it may be required to use flowable grout to seal it up.
- Check hydraulics at the start of every shift to be sure that they have not bled off.
- Monitor surcharge loading throughout the life of the shoring system installation. A competent person shall determine the proper setback for all surcharge loads over 20,000 lbs.