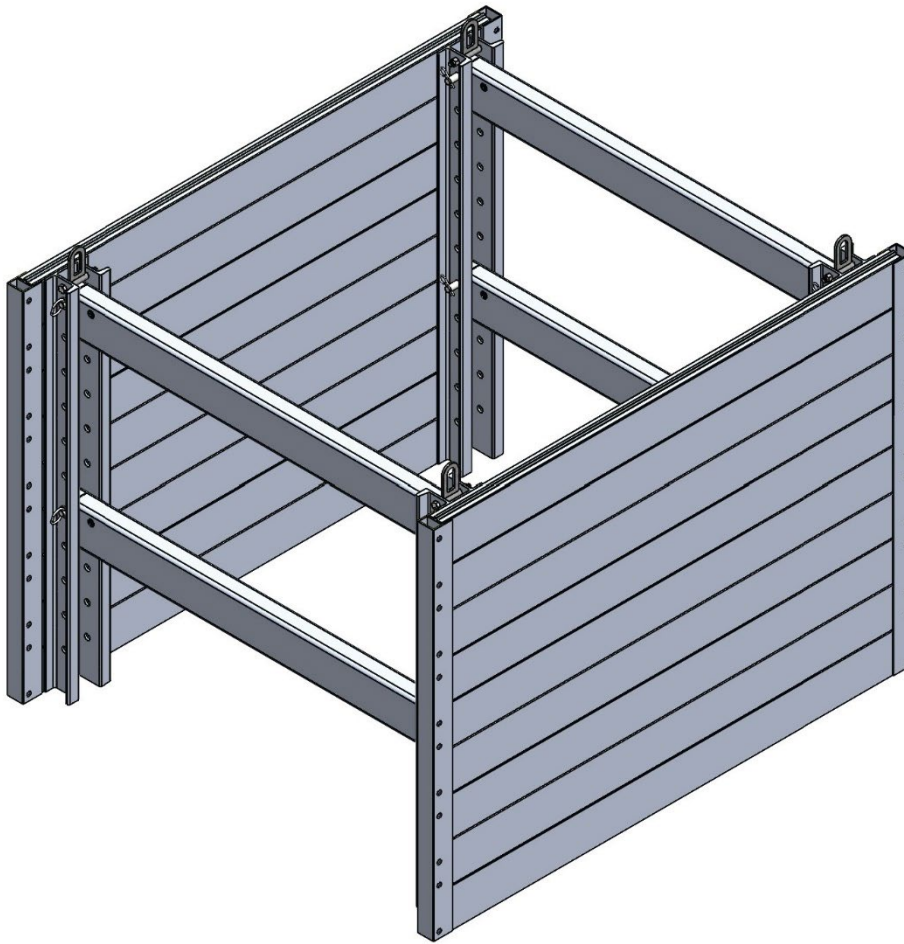


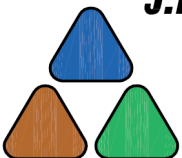
# ALUMINUM PANEL SHIELD SYSTEMS

**TABULATED DATA**  
**Effective September 29<sup>th</sup>, 2023**



**Pacific SHORING**  
Quality Driven, Lead Time Focused

**J.M. TURNER ENGINEERING, INC.**  
**CONSULTING ENGINEERS**



1325 COLLEGE AVE., SANTA ROSA, CA 95404  
(707) 528-4503 FAX (707) 528-4505



Signed on 9/29/2023

## Contents

|                                                                                             |    |
|---------------------------------------------------------------------------------------------|----|
| Cover Page.....                                                                             | 1  |
| Contents .....                                                                              | 2  |
| Description .....                                                                           | 2  |
| General Information for use of Pacific Shoring Products Aluminum Panel Shield Systems ..... | 2  |
| Classification of Soil Types.....                                                           | 4  |
| Geometric Properties for Engineering Design .....                                           | 5  |
| Allowable Depths for Standard APS Usage .....                                               | 6  |
| Allowable Depths for High Clearance APS Usage .....                                         | 7  |
| APS Usage with Modular Aluminum Panel Systems. ....                                         | 9  |
| APS Stacking Usage .....                                                                    | 10 |
| Allowable Sheeting .....                                                                    | 11 |
| Allowable Spreader Spans.....                                                               | 12 |
| Aluminum Panel Shield System Weights.....                                                   | 12 |
| Aluminum Panel Shield System Installation and Removal.....                                  | 13 |
| Safe Handling and Use of Aluminum Panel Shield System. ....                                 | 13 |

## Description

The Pacific Shoring Products Aluminum Panel Shield Systems are smooth wall, welded trench shield applications. They are modular and can be configured in a variety of different ways to accommodate different trench end conditions and pipe clearances. The system is made to be completely compatible with all components of either Red-Blue or Yellow Modular Aluminum Panel Systems. The lightweight system can easily be handled with a backhoe or light excavator.

Static adjustable struts available in both steel or aluminum, and aluminum hydraulic struts adjusting to a maximum of 12 ft. in width may be used with this system. Aluminum Panel Shield Systems may be used in static or dynamic configurations. 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 soil. 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 corners and therefore results in less pressure on the box 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.

Please refer to the following pages for diagrams and charts detailing the various approved methods of configuring these shields.

## General Information for use of Pacific Shoring Products Aluminum Panel Shield Systems

1. The Aluminum Panel Shield Systems 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, box wall, 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 box 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 shoring box. Soil conditions may change at a later date and require revaluation of the strength and allowable depth.
3. Aluminum Panel Shield Systems 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 depth and spacing given in **Tables 2-1 & 3-1** govern the use of Pacific Shoring Products Aluminum Panel Shield Systems and not tabulations given by other manufacturers. This tabulated data applies to smooth wall shields manufactured by Pacific Shoring Products, LLC.
5. Any alterations to the boxes or variance from this tabulated data shall be indicated in a site-specific plan prepared and approved by a registered professional engineer.
6. The faces of excavations shall be vertical and the shoring walls shall be within 6" of the excavation walls when the system is used in a static configuration. For hydraulic applications fill all voids between shield panel and excavation to ensure soil arching occurs.
7. Aluminum Panel Shield Systems may be stacked or longitudinally connected. Provided they are pinned together. Hydraulic shields are not required to be pinned, as long as they are fully pressurized against trench walls during use and periodically checked.
8. Aluminum Panel Shield Systems shall be installed and removed from outside the trench. **(See Installation and Removal procedure.)**
9. 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 shields.
10. Workers shall always enter, exit, and work inside the shored area of the trench.

11. Aluminum Panel Shield Systems may be used with wheel kits.
12. Aluminum Panel Shield Systems may be used with wheel kits, and may be set a maximum of 2 ft. from the bottom of the excavation. Provided there is no sloughing or raveling. The excavation depth is considered to be the full distance from the top to the bottom of the excavation.
13. If the excavation is combined with sloping or benching, the maximum excavation depth without a site-specific plan is 20 ft.
14. An adequate separately designed shoring system shall be used leading up to within 2 ft. of the Aluminum Panel Shield application. Systems such as Hydraulic Vertical Shores, End Shores, Modular Aluminum Panel Systems, and designs by a registered engineer may be used in conjunction with the Aluminum Panel Shield Systems.
15. When you are using Aluminum Panel Shields in conjunction with other Modular Systems, the weakest element will always govern the allowable depth.

## **Classification of Soil Types**

1. Soil classification shall be in accordance with OSHA Appendix A and classified just prior to installing Aluminum Panel Shield Systems. Soil conditions may change at a later date and require the competent person to check soil conditions periodically and adjust accordingly.
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 system.
4. Aluminum Panel Shield Systems may be used in "C-80" soil provided they are dug into the excavation and not driven into the soil.
5. In "C-80" soil it is recommended that this equipment be utilized with site-specific plans designed by a registered civil engineer.

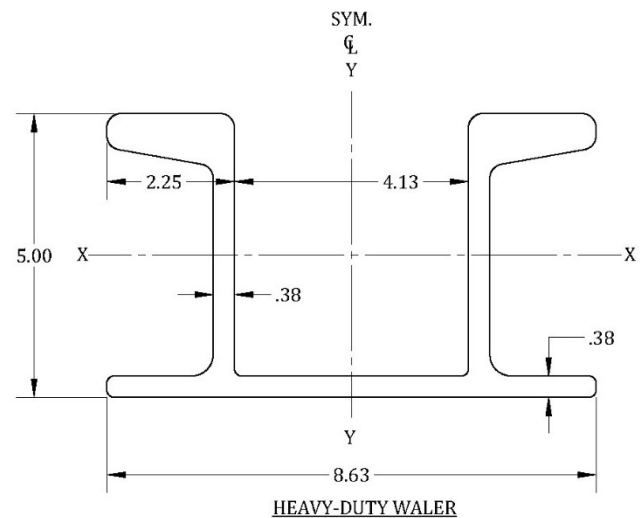
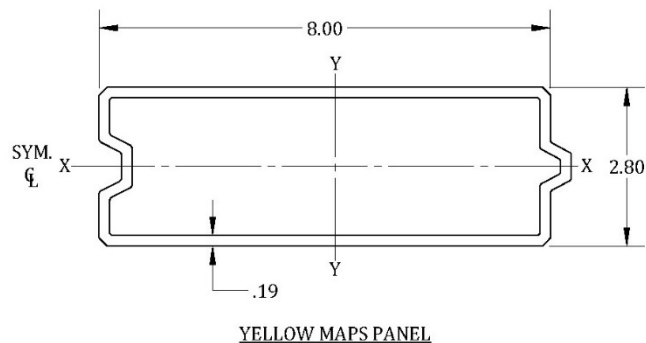
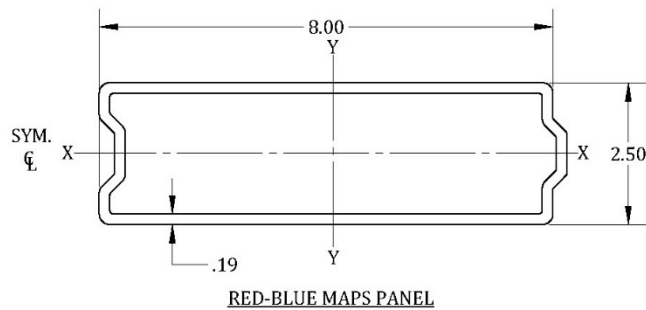
## Geometric Properties for Engineering Design

**Table 1. Material Properties (Extruded)**

| Aluminum Alloy            | 6061-T6    | 6005A-T61  |
|---------------------------|------------|------------|
| Ultimate Tensile Strength | 45,000 psi | 45,000 psi |
| Tensile Yield Strength    | 40,000 psi | 40,000 psi |
| Modulus of Elasticity     | 10,000 ksi | 10,000 ksi |

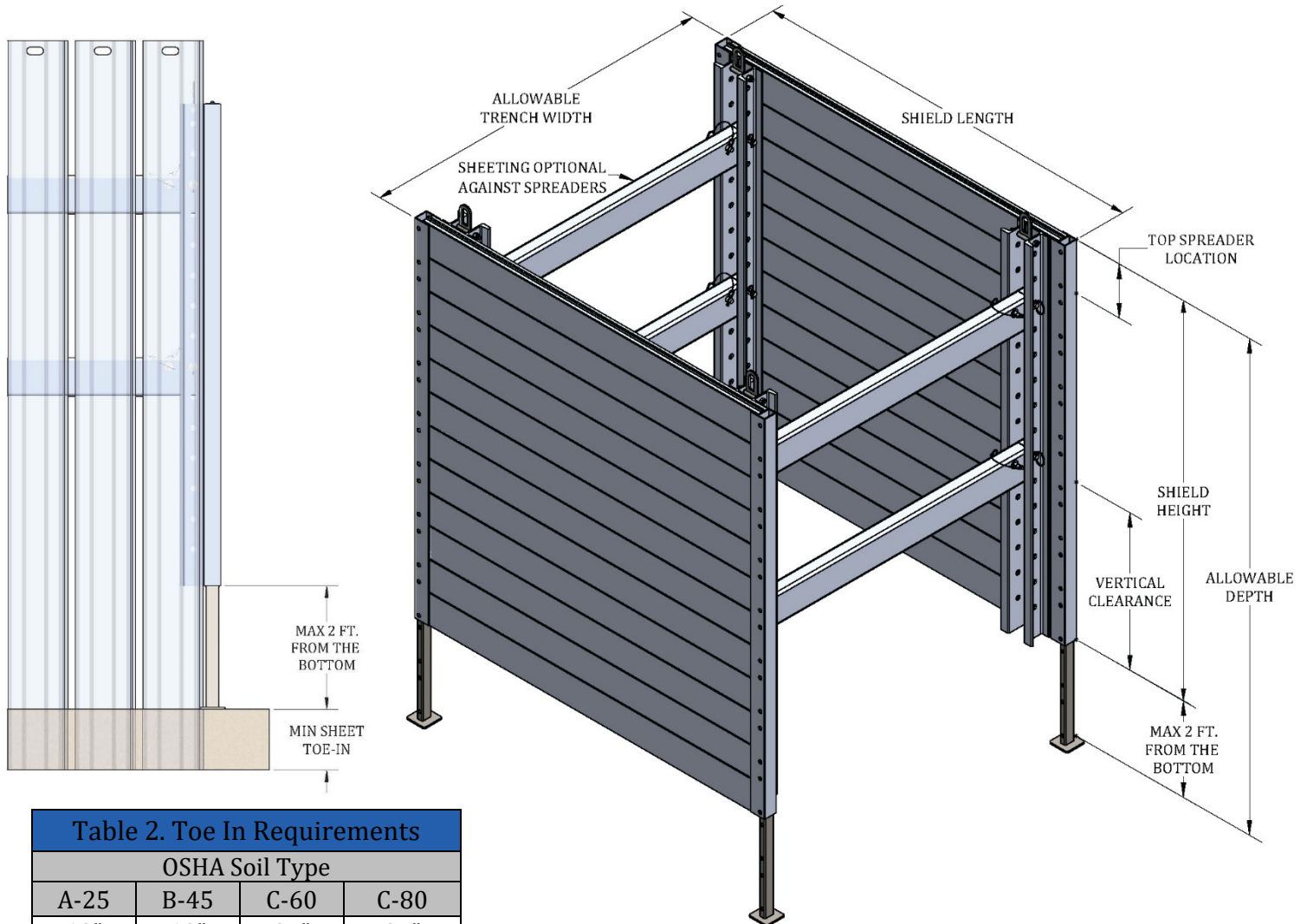
**Table 1-1 Extrusion Profile Properties**

| Section Properties | Red-Blue MAPS Panel  | Yellow MAPS Panel    | Heavy-Duty Waler      |
|--------------------|----------------------|----------------------|-----------------------|
| Area               | 5.83 in <sup>2</sup> | 6.04 in <sup>2</sup> | 9.57 in <sup>2</sup>  |
| Weight             | 4.51 lbs./ft.        | 4.84 lbs./ft.        | 11.5 lbs./ft.         |
| Moment of Inertia  | 6.94 in <sup>4</sup> | 8.25 in <sup>4</sup> | 36.34 in <sup>4</sup> |
| Section Modulus    | 5.38 in <sup>3</sup> | 5.89 in <sup>3</sup> | 15.1 in <sup>3</sup>  |





## Allowable Depths for Standard APS Usage



**Table 2. Toe In Requirements**

| OSHA Soil Type |      |      |      |
|----------------|------|------|------|
| A-25           | B-45 | C-60 | C-80 |
| 12"            | 12"  | 24"  | 24"  |

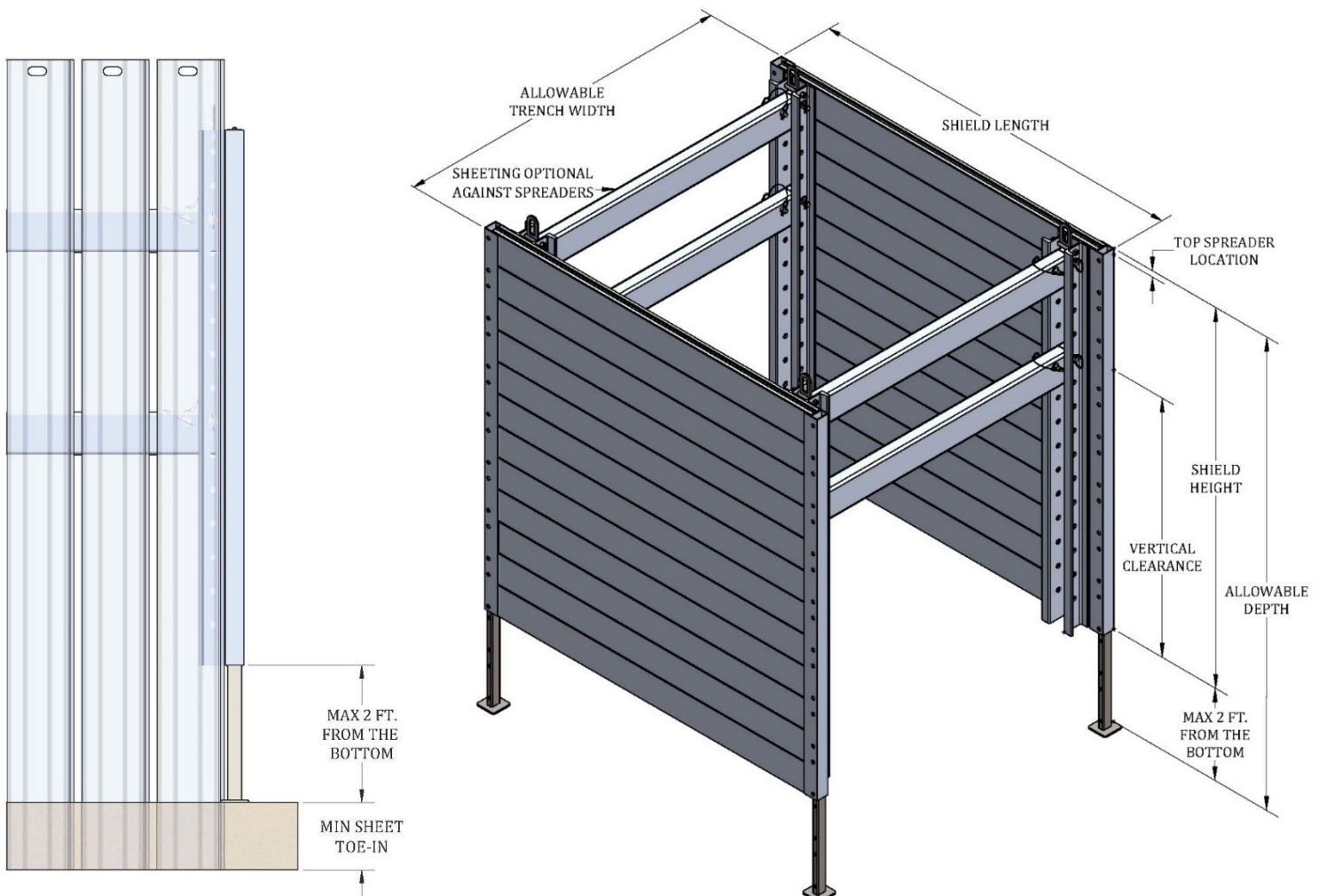
**Table 2-1. Allowable Depths for Standard APS Usage**

| Applicable For all 4', 6', 8', & 10' Shield Heights |                       |                       |      |      |      |                       |                  | Dimensions For Each Shield Height |         |         |          |                             |         |         |          |
|-----------------------------------------------------|-----------------------|-----------------------|------|------|------|-----------------------|------------------|-----------------------------------|---------|---------|----------|-----------------------------|---------|---------|----------|
| Shield Length (ft.)                                 | Shield Capacity (PSF) | Allowable Depth (ft.) |      |      |      | Allowable Width (ft.) |                  | Vertical Clearance (in.)          |         |         |          | Top Spreader Location (in.) |         |         |          |
|                                                     |                       | OSHA Soil Type        |      |      |      | Without End Loading   | With End Loading |                                   |         |         |          |                             |         |         |          |
|                                                     |                       | A-25                  | B-45 | C-60 | C-80 |                       |                  | 4 (ft.)                           | 6 (ft.) | 8 (ft.) | 10 (ft.) | 4 (ft.)                     | 6 (ft.) | 8 (ft.) | 10 (ft.) |
| 6'                                                  | 2,400                 | 25'                   | 25'  | 25'  | 25'  | 12'                   | 8'               | 14"                               | 26"     | 38"     | 38"      | 2"                          | 2"      | 14"     | 14"      |
| 8'                                                  | 1,800                 | 25'                   | 25'  | 25'  | 19'  |                       |                  |                                   |         |         |          |                             |         |         |          |
| 10'                                                 | 1,241                 | 25'                   | 25'  | 19'  | 15'  |                       |                  |                                   |         |         |          |                             |         |         |          |
| 12'                                                 | 830                   | 25'                   | 17'  | 13'  | 9'   |                       |                  |                                   |         |         |          |                             |         |         |          |
| 14'                                                 | 595                   | 21'                   | 12'  | 9'   | 6'   |                       |                  |                                   |         |         | N/A      |                             |         |         | N/A      |
| 16'                                                 | 447                   | 15'                   | 8'   | 6'   | 5'   |                       |                  |                                   |         |         | N/A      |                             |         |         | N/A      |

**Table 2 & 2.1 Notes**

1. This data applies to PSP Aluminum Panel Shields that use Aluminum Hydraulic & Static Power Struts or telescoping 3 1/2" x 3 1/2" x 3/16" & 3 x 3 x 3/16" adjustable steel spreaders.
2. The clearances above are based on the aluminum power strut design.
  - a. The steel adjustable spreaders have approximately 2 in. of more clearance.
3. Allowable sheeting can be found in **Table 4**.
  - a. **Note: Under end loading conditions the allowable excavation width is reduced.**
4. When shields are held 2 ft. off of the bottom of excavation, the end sheeting shall be embedded per the requirements outlined in **Table 2**.
5. End sheeting can only be used if the shield is fully confined by:
  - a. Backfilling the area between the shield outer walls and excavation walls with soil.
6. When Aluminum Panel Shield Systems are set in trenches that are sloped above, extend the box 18 in. above the hinge point. Slopes shall be in accordance with OSHA Appendix B sloping and benching. **(This note applies to all cases.)**

**Allowable Depths for High Clearance APS Usage**



**Table 3. Toe In Requirements**

| OSHA Soil Type |      |      |      |
|----------------|------|------|------|
| A-25           | B-45 | C-60 | C-80 |
| 12"            | 12"  | 24"  | 36"  |

**Table 3-1. Allowable Depths for High Clearance APS Usage**

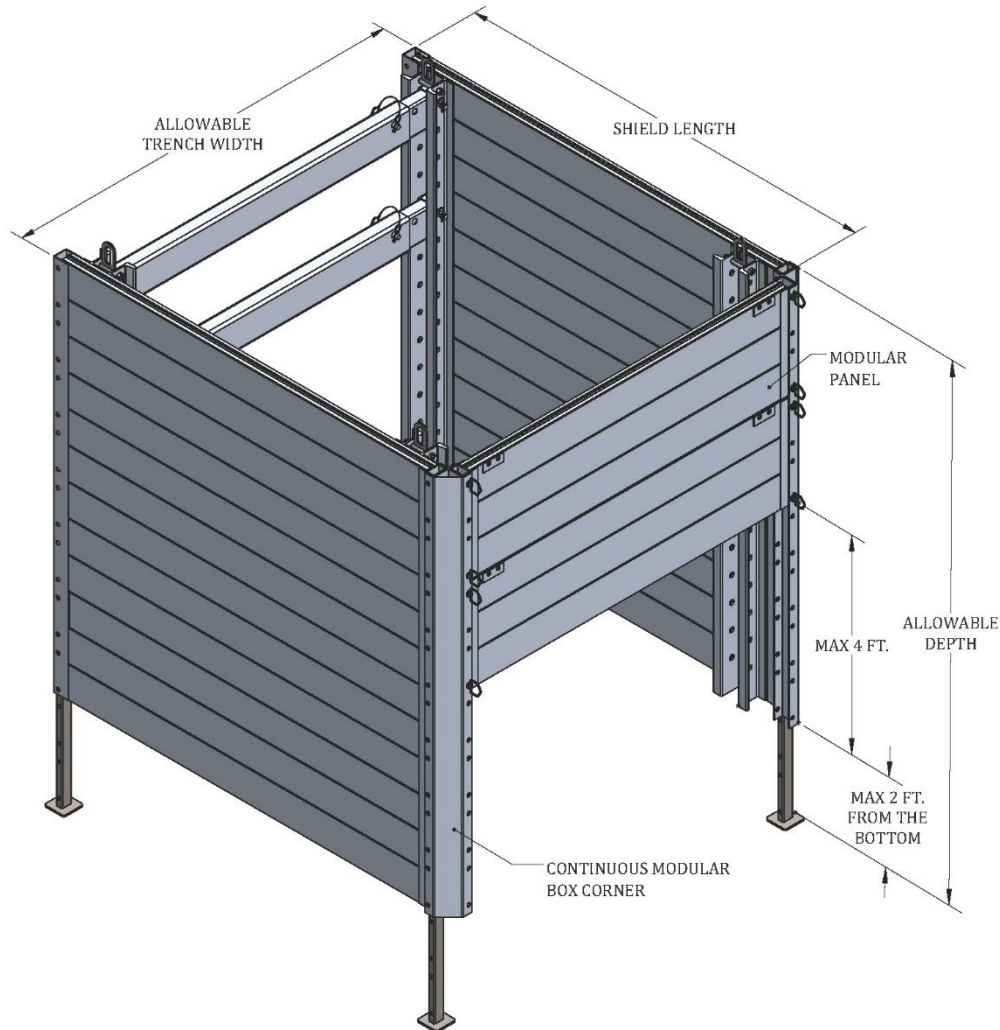
| Applicable For all 6', 8', & 10' Shield Heights |                       |                       |      |      |      |                       |                  | Dimensions For Each Shield Height |         |          |                             |         |          |
|-------------------------------------------------|-----------------------|-----------------------|------|------|------|-----------------------|------------------|-----------------------------------|---------|----------|-----------------------------|---------|----------|
| Shield Length (ft.)                             | Shield Capacity (PSF) | Allowable Depth (ft.) |      |      |      | Allowable Width (ft.) |                  | Vertical Clearance (in.)          |         |          | Top Spreader Location (in.) |         |          |
|                                                 |                       | OSHA Soil Type        |      |      |      | Without End Loading   | With End Loading | 6 (ft.)                           | 8 (ft.) | 10 (ft.) | 6 (ft.)                     | 8 (ft.) | 10 (ft.) |
|                                                 |                       | A-25                  | B-45 | C-60 | C-80 |                       |                  |                                   |         |          |                             |         |          |
| 6'                                              | 2,400                 | 20'                   | 20'  | 14'  | 12'  | 12'                   | 10'              | 50"                               | 62"     | 62"      | 2"                          | 2"      | 2"       |
| 8'                                              | 1,800                 | 20'                   | 18'  | 12'  | 10'  |                       |                  |                                   |         |          |                             |         |          |
| 10'                                             | 1,241                 | 20'                   | 16'  | 10'  | 8'   |                       |                  |                                   |         |          |                             |         |          |
| 12'                                             | 830                   | 20'                   | 12'  | 8'   | 6'   |                       | 8'               |                                   |         |          |                             |         |          |

**Table 3 & 3.1 Notes**

- This data applies to PSP Aluminum Panel Shields that use Aluminum Hydraulic Power Struts.
  - Note: The data outlined above only applies to shields in hydraulic configuration.**
- The clearances above are based on the aluminum power strut design.
- Allowable sheeting can be found in **Table 4**.
  - Note: Under end loading conditions the allowable excavation width is reduced.**
- When shields are held 2 ft. off of the bottom of excavation, the end sheeting shall be embedded per the requirements outlined in **Table 3**.
- The maximum cantilever allowed on 3/4" plywood or finnform end sheeting elements without embedment is 38 in. provided the end sheeting extends to the top of the excavation.
- The maximum cantilever allowed on all other end sheeting elements listed in **Table 4**. without embedment is 4 ft. provided the end sheeting extends to the top of the excavation.
- End sheeting can only be used if the shield is fully confined by:
  - Backfilling the area between the shield outer walls and excavation walls with soil.
- When Aluminum Panel Shield Systems are set in trenches that are sloped above, extend the box 18 in. above the hinge point. Slopes shall be in accordance with OSHA Appendix B sloping and benching. **(This note applies to all cases.)**



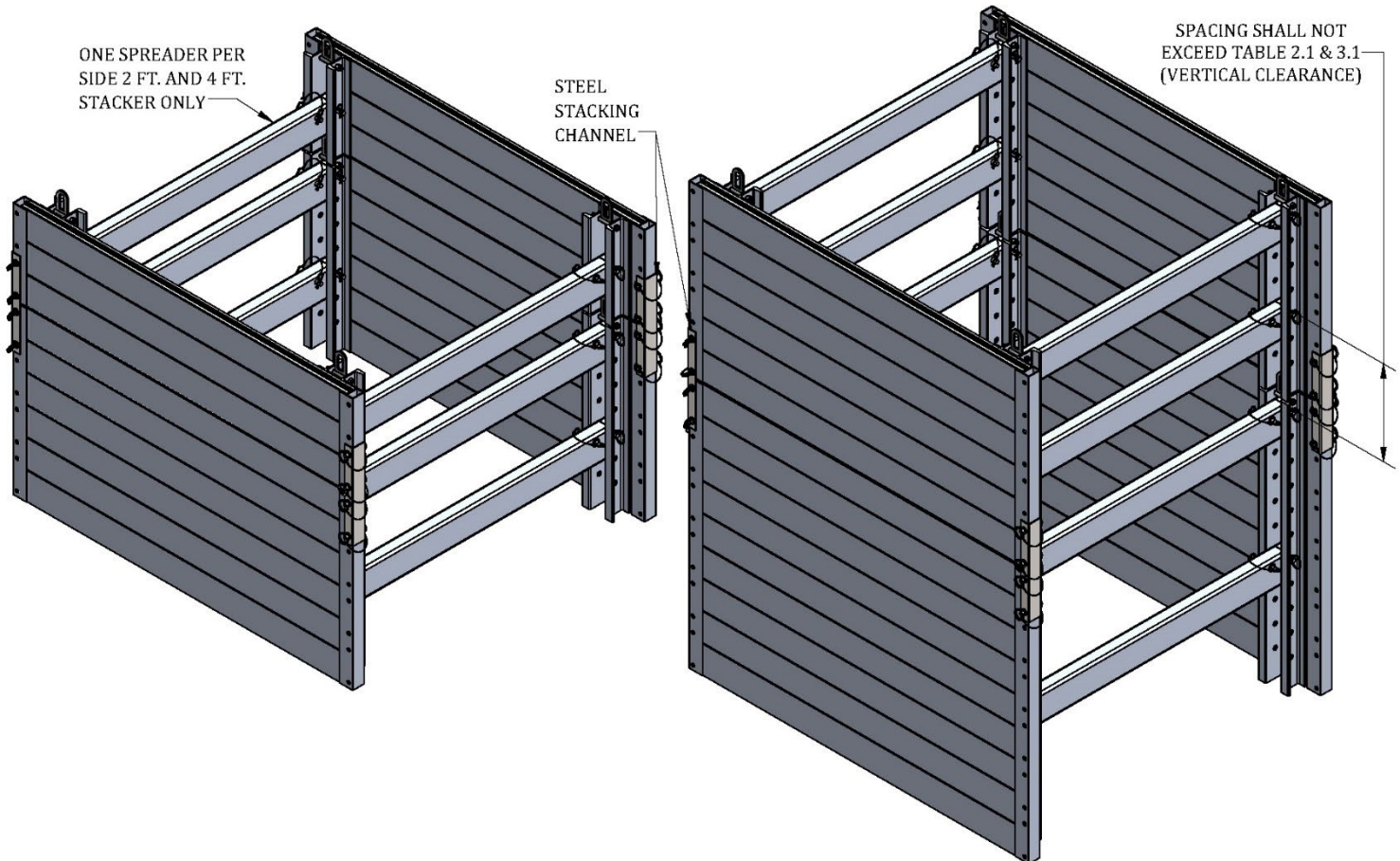
## APS Usage with Modular Aluminum Panel Systems.



### Notes

1. Modular Aluminum Panels and Corners can be used in lieu of spreaders.
  - a. **When configuring a shield this way the maximum clearance allowed is 48 in. from the bottom of the shield.**
2. Modular Panels and Corners can be added to the top of the shield to extend the overall height.
  - a. **You must refer to the corresponding Modular Aluminum Panel Systems tabulated data and examine the depth rating for the resulting size shield.**
  - b. Compare this depth rating of the added modular panel to the depth rating listed in either **Table 2-1 or 3-1**, depending on your application. The smaller of the two rated depths is the correct depth rating for this configuration.
3. If hydraulic struts are used with this configuration, they must be extended to the correct length to match the Modular Aluminum Panel, and is required to be pinned.
  - a. **Using hydraulic struts that are not pinned with this configuration can result in damage to the shield.**

## APS Stacking Usage



### Notes

1. Pacific Shoring Aluminum Panel Shield Systems may be stacked.
2. When shields are stacked, it is required for them to be pinned together with a steel stacking bracket along the shield end cap.
3. The strut spacing of the stacked shield must not exceed the measurement for **“Vertical clearance” on Tables 2-1 & 3-1.**
4. When 2 ft. & 4 ft. stackers are used, only one strut is required per end (2 struts total). All other stacked shields require at least 2 spreaders per end (4 struts total).
5. When Aluminum Panel Shield Systems are set in trenches that are sloped above, extend the box 18 in. above the hinge point. Slopes shall be in accordance with OSHA Appendix B sloping and benching. **(This note applies to all cases.)**

## Allowable Sheeting

Acceptable sheeting to be used in conjunction with Aluminum Panel Shield Systems is as follows.

| Table 4. Allowable Sheeting for Aluminum Panel Shield Systems                               |  |
|---------------------------------------------------------------------------------------------|--|
| Material                                                                                    |  |
| Two sheets of 3/4" thick CDX Plywood placed back-to-back                                    |  |
| 1 1/8" thick CDX Plywood                                                                    |  |
| 3/4" thick 14 ply Arctic White Birch (Finland Form)                                         |  |
| 3/4" thick Plyform - APA B-B Class I Exterior                                               |  |
| 3/4" thick Combi Exterior Plywood                                                           |  |
| 3/4" thick HDO-American Plywood Association, high density overlay exterior                  |  |
| 3/4" thick Omni Form                                                                        |  |
| Pacific Shoring Products Aluminum Sheeting                                                  |  |
| Timber Lagging, Douglas Fir # 1, S4S Nominal Dimension, 1 1/2" x 7 1/2" and 2 1/2" x 7 1/2" |  |
| Timber Lagging, Mixed Oak, Rough Cut, 2" x 8", 3" x 8" and 4" x 8"                          |  |
| Minimum 1/2" thick steel plates                                                             |  |

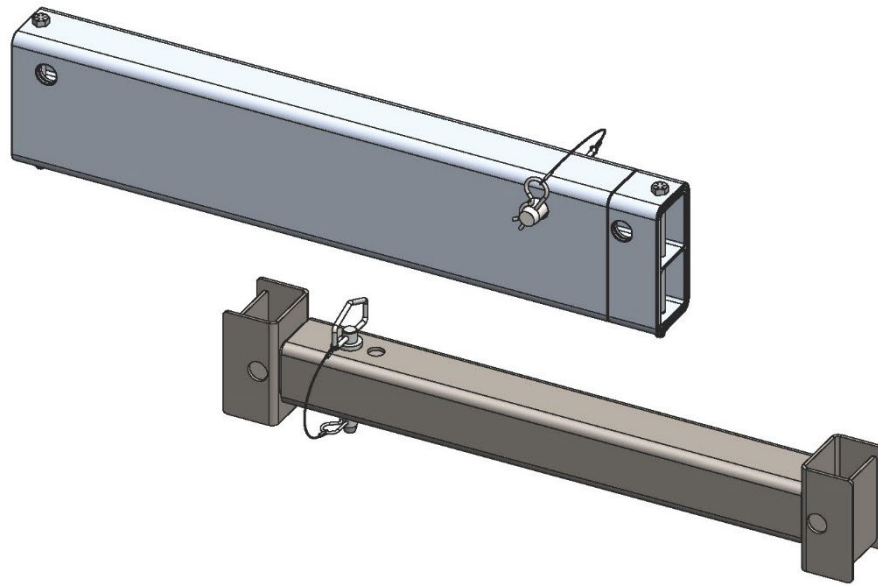
## Allowable Sheeting Notes

- When sheeting is used, it must extend to the top of the excavation.
- Sheeting shall never exceed the maximum allowable trench width specified in **Table 2-1 & 3-1**.
- If the soil face is greater than 6 In. backfill the void at least 2/3 of its height with excavated soil or crushed rock securing the sheeting.
- Sheeting may be skipped a maximum of 6 in. provided the soil does not slough or ravel.
  - If sloughing or raveling occurs reduce or close the gap until it is prevented.**
- Sheeting can rest against or can hang over the spreaders that are placed inside the Heavy-Duty Waler Profile.
  - Note: If you are using corner posts and running regular MAPS spreaders, the end loading scenarios outlined in Table 2-1 & 3-1 do not apply.**
- Under end loading conditions the allowable excavation width is reduced.**
- The maximum cantilever allowed on 3/4" plywood or finnform end sheeting elements without embedment is 38 in. provided the end sheeting extends to the top of the excavation.
- The maximum cantilever allowed on all other end sheeting elements listed in **Table 4**. without embedment is 4 ft. provided the end sheeting extends to the top of the excavation.

## Allowable Spreader Spans

The Table below gives the maximum allowable spreader length allowed to be used in conjunction with Aluminum Panel Shield System configuration.

| Table 5. Allowable Spreader Spans         |                       |
|-------------------------------------------|-----------------------|
| Spreader Type                             | Spreader Length (ft.) |
| Steel Adjustable Spreader (Static)        | 12'                   |
| Aluminum Power Strut (Hydraulic & Static) | 12'                   |



## Aluminum Panel Shield System Weights

| Table 6-1. (4' High Shields) |                     |               |
|------------------------------|---------------------|---------------|
| Shield Height (ft.)          | Shield Length (ft.) | Weight (lbs.) |
| 4'                           | 6'                  | 554           |
| 4'                           | 8'                  | 668           |
| 4'                           | 10'                 | 781           |
| 4'                           | 12'                 | 894           |
| 4'                           | 16'                 | 1,121         |

| Table 6-2. (6' High Shields) |                     |               |
|------------------------------|---------------------|---------------|
| Shield Height (ft.)          | Shield Length (ft.) | Weight (lbs.) |
| 6'                           | 6'                  | 821           |
| 6'                           | 8'                  | 991           |
| 6'                           | 10'                 | 1,161         |
| 6'                           | 12'                 | 1,331         |
| 6'                           | 16'                 | 1,671         |

| Table 6-3. (8' High Shields) |                     |               |
|------------------------------|---------------------|---------------|
| Shield Height (ft.)          | Shield Length (ft.) | Weight (lbs.) |
| 8'                           | 6'                  | 1,087         |
| 8'                           | 8'                  | 1,314         |
| 8'                           | 10'                 | 1,541         |
| 8'                           | 12'                 | 1,767         |
| 8'                           | 16'                 | 2,220         |

| Table 6-4. (10' High Shields) |                     |               |
|-------------------------------|---------------------|---------------|
| Shield Height (ft.)           | Shield Length (ft.) | Weight (lbs.) |
| 10'                           | 6'                  | 1,354         |
| 10'                           | 8'                  | 1,637         |
| 10'                           | 10'                 | 1,920         |
| 10'                           | 12'                 | 2,204         |
| 10'                           | 16'                 | 2,770         |

---

## **Aluminum Panel Shield System Installation and Removal**

### **Installation Procedure**

1. Use cables and slings for lifting that have a 5:1 factor of safety. A competent person is to determine the total lift weight.
2. Shields will be assembled and properly rigged for lifting prior to setting inside the excavation
3. Set shield inside the trench. Workers are not allowed under moving loads at any time.
4. If trench walls are more than 6" from the wall of the shield, back fill the void with crush rock or excavated soil a minimum of  $\frac{1}{2}$  the shield wall area.
5. If the shield is held 2 ft. off the bottom of the trench, the bottom of the shield shall rest on a bench or be otherwise supported so that it cannot fall to the bottom of the trench.

### **Removal Procedure**

1. If shields are stacked, attach lifting equipment to the bottom shield prior to removing the top shield.
2. If the shield is wedged by soil, the additional pulling force may exceed the strength of the lifting harness or the connection of the lifting eyes. **Use extreme caution when forcing shields out of an excavation.**

### **Safe Handling and Use of Aluminum Panel Shield System.**

The competent person shall inspect the shield on a daily basis while it is in use.

Check for:

1. Lift hooks are properly connected and holes are not rounded or bent.
2. Check for broken welds at all weld locations.
3. Check strut pins for safety lock pin in place, and for excessive wear.
4. Check strut pin holes for elongation and tearing.
5. Check strut to make sure it is not bent or unreasonably dented.
6. Check hydraulic hoses for damage, replace if there is significant damage.
7. Workers should not be under or near the shield when it is being lifted or set into place.
8. Provide safe access such as ladders for workers to enter and exit the shoring system.
9. Use cables and slings for lifting that have a 5:1 factor of safety. A competent person is to determine the total lift weight.
10. Workers shall stay back a minimum of 10 ft. when a shield wedged in an excavation is being forced out. In some cases, an increased distance may be appropriate to protect workers from flying lift cables if one were to break under load.
11. If shields need repairs, the shield shall be taken out of service until it is re-certified by a Registered Civil Engineer.