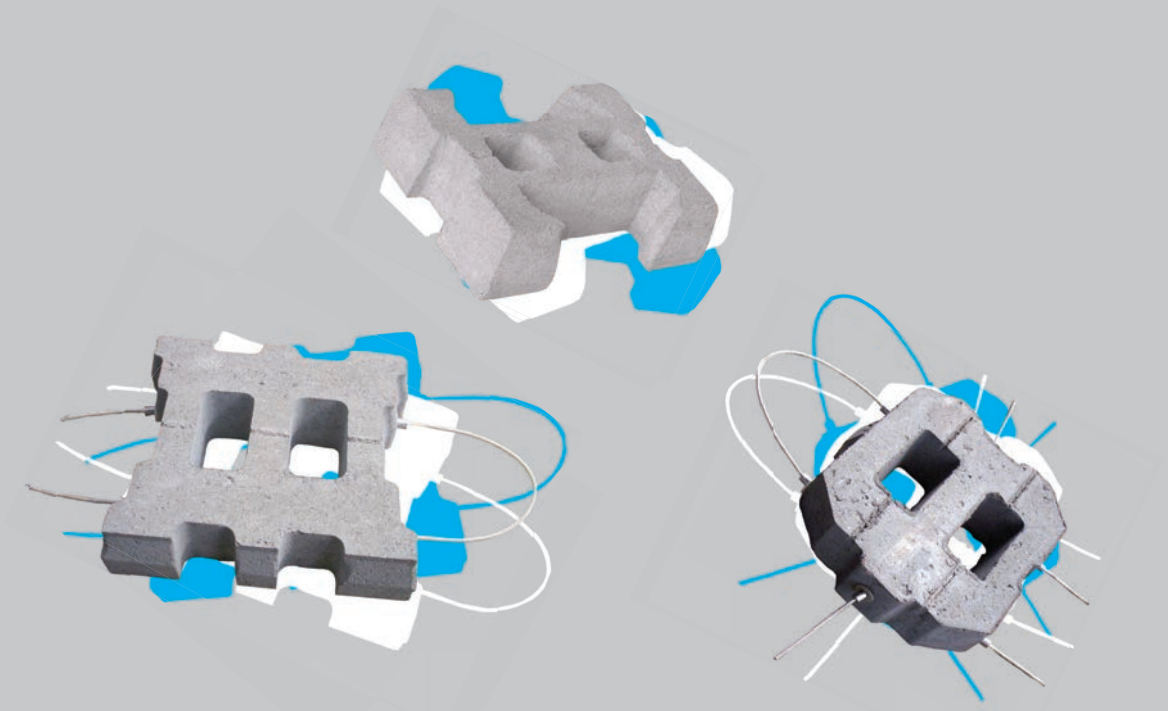
SHORETEC®

# Installation Guide

## PROTECTING OUR NATURAL RESOURCES

SHOREBLOCK BD®
SHOREBLOCK SD®
SHORELOC®

Concrete Revetment Block



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# Overview

This document is provided only as a guideline for installation of articulating concrete block systems. Final preparation and placement of the block is the responsibility of the end user.



The proper installation of an ACB revetment system is essential to achieve suitable hydraulic performance and maintain stability against the erosive force of flowing water during the design hydrologic event. These guidelines are intended to maximize the conformity between the design intent and the actual field-finished conditions of the project. Quality workmanship is important to the ultimate performance of the system. The following sections address the subgrade preparation, geotextile placement, block system placement, backfilling and finishing, and inspection. These guidelines apply to the installation of ACB revetment systems, whether hand-placed or placed as a mattress and comply with ASTM D6884, "Standard of Practice for the Installation of Articulating Concrete Block (ACB) Revetment Systems".

These guidelines do not purport to address the safety issues associated with installation of ACB revetment systems, including use of hazardous materials, mechanical equipment and operations. It is the responsibility of the contractor to establish and adopt appropriate safety and health practices. Also, the contractor shall comply with prevalent regulatory codes, such as OSHA (Occupational Health and Safety Administration) regulations, while using these guidelines.

# Spreader Bar

## Inspection and Offloading

The spreader bar is used for lifting and placing ACB mats. ACB mats can weigh 29,000 pounds on the high end and 4,200 pounds on the low end. Because of the wide spectrum in mat weight, the appropriate bar must be specified for each project. In some cases multiple spreader bars may be required to unload and place, simultaneously.



## Inspection

It is very important to inspect the spreader bar prior to lifting any loads. Diagram 1 below indicates what areas should be checked.

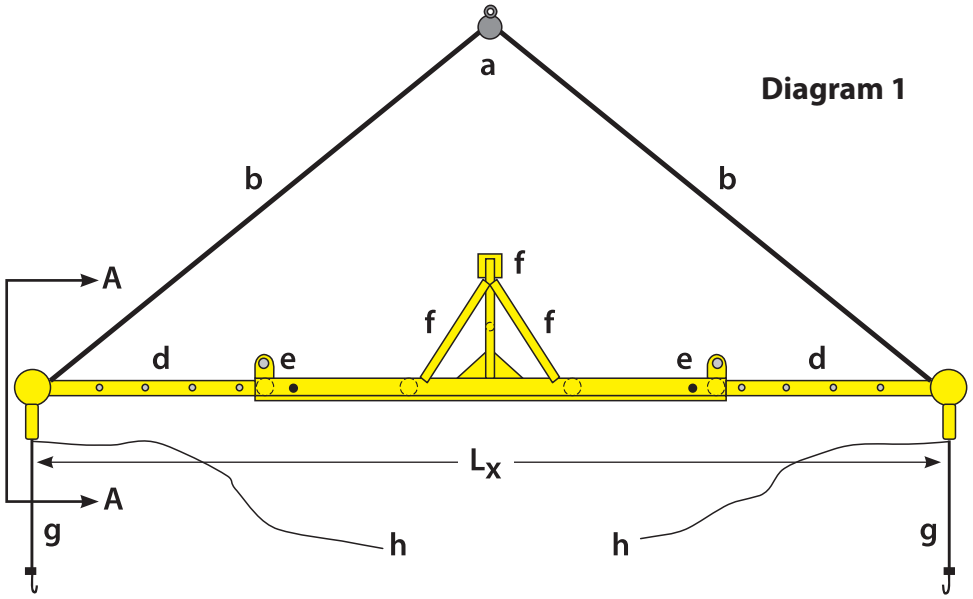



**Diagram 1**

a. Lifting Block
b. Bridle Quality (8 on each end)
c. Swivel and Release Mechanism
d. Extension Bars
e. Extension Pins
f. Structural Frame Supports
g. Lifting Hooks**
h. Guide Ropes

$L_X$ = Mat Length Capability of the Bar:

| Bar Capacity (ft) | Weight of Bar (lbs) |
|---|---|
| 24-40 | 4,200 |
| 9-24 | 3,000 |
| 12-20 | 2,400 |
| 10 | 800 |

*** A "jumper" may also be required when lifting shorter mats. This device simply attaches to the existing lift hook and extends the length for shorter mats.*

# Offloading

Mats can only be lifted one (1) at a time. The reasons for this are:

- Lifting more than one mat with the bar places stresses on the concrete and causes cracking and breaking of the block.
- The hardware used to assemble the mats become overstressed when trying to lift more than one mat.
- The spreader bar itself is designed for handling single mats.



Revetment mats should be lifted in a manor that will minimize the bowing of the mat. A properly adjusted spreader bar, and/or properly sized jumpers (if required) are necessary to maintain as flat a profile as possible when lifting the mats. Minimizing the bowing of the mats during lifting reduces the stress on the blocks that may cause cracking, breaking, and ultimate failure.

When lifting mats, all personnel should be well clear of the underside of the mat. Only those personnel holding the guide ropes at the four corners should be in the area.

When using a "friction band" type crane, the operator must take caution not to "snap" the load with the brake when lowering it into position. The high inertia forces generated by "snapping" the load can be detrimental to the wire ropes, concrete masonry units, spreader bar, and the crane itself.

**Diagram 2**
(View A-A)

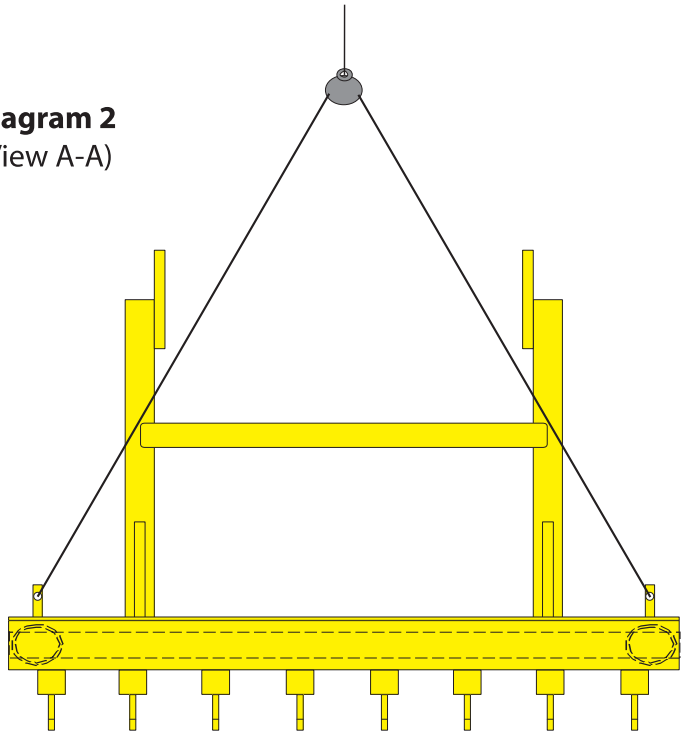
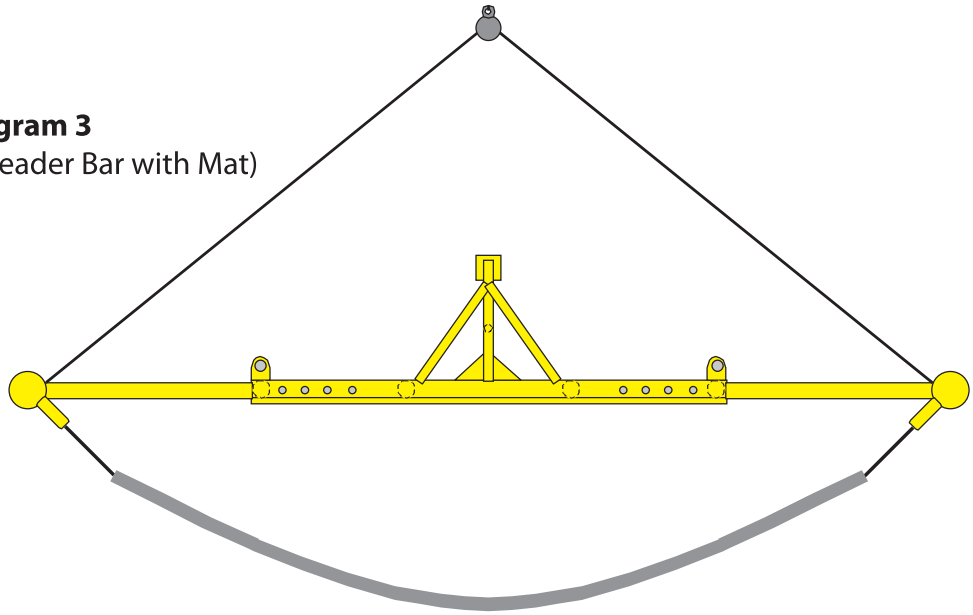


**Diagram 3**
(Spreader Bar with Mat)



## Subgrade Preparation

Compacted and stable subgrade soil should be prepared to all specifications, lines, grades, and

cross sections shown on the final drawings. Termination trenches, embankment crests, and toes should all be compacted and graded to ensure that water cannot migrate under the block and geotextile material at these points.

Final subgrade should be graded smooth to ensure complete contact wit the geotextile and ACB's. Unacceptable soils, soils to wet too achieve compaction, and soils with debris in them should be removed and replaced with approved material and compacted to specifications.

- Remove all surface vegetation and debris. This removed material should not be used as backfill or placed back on the surface. Prepare the surface for installation of the ACB system.

- When installing ACB systems the subgrade must be stable prior to installation. ACB systems maintain slope stability and prevent erosion, but are not slope stabilization systems. For this reason the subgrade must be as clean and level as possible.

- The block systems are designed to allow for block protrusions of one-half inch on random blocks. However, the goal is to minimize non-conformities in the subgrade. Geotextile products are strong and durable, but the area to be covered should be free of debris or any materials that may tear or puncture the geotextile.

- Compaction of the subgrade should be to 90% - 95% of standard proctor. This insures that the soils are stable and will not erode when water is flowing over and through the installation.

- After preparation of the subgrade installation of the geotextile can begin.



## Soil Testing

At the completion of rough grading, soil samples representative of subgrade conditions shall be obtained according to current best practices, and tested for the following:

1. Grain size distribution (ASTM D 422)
2. Atterberg Limits (ASTM D 4318)
3. Standard Proctor Density (ASTM D 698)

Results of laboratory tests shall be submitted to the engineer to ensure conformance with design parameters prior to placement of the geotextile and ACB revetment system. When a granular filter is used, it shall be tested for grain size distribution at the same frequency as the subgrade soil testing.

## Geotextile Installation

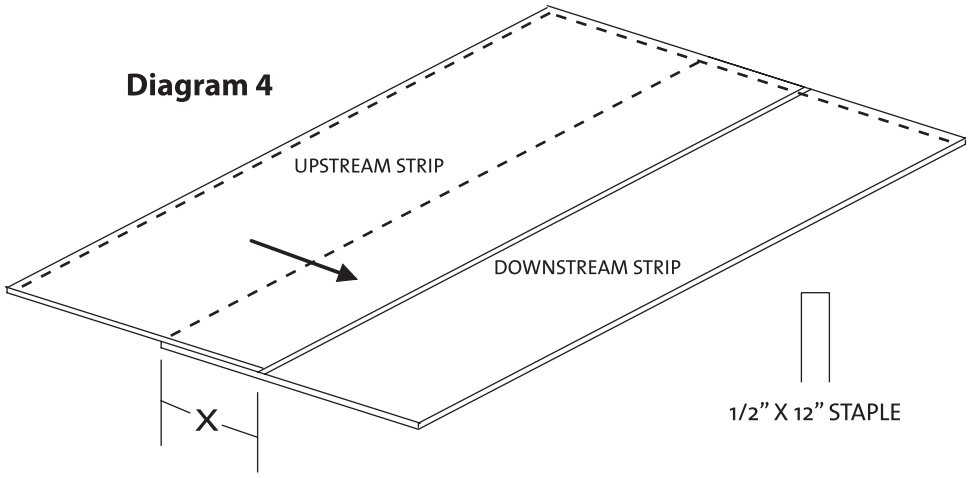
The geotextile should be placed on the prepared slope or other surface to be protected. All folds and wrinkles should be removed from the geotextile before the block is placed on top of it.

Place the geotextile so that there is sufficient overlap to seal the seams for intrusion of water and ensure minimal stretch of the geotextile material. Upstream strips of material must overlap the downstream strips and upslope strips overlap down-slope strips. The amount of overlap (X) is usually specified by the engineering firm and may be a

minimum of 3 feet for wet installations and a minimum of 1.5 feet for dry installations.

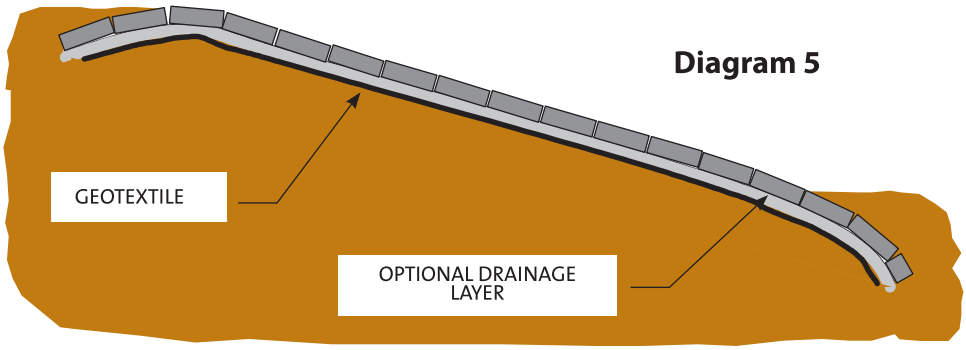
The upstream strips of material must overlap the downstream strips and upslope strips overlap down-slope strips. (See Diagram 4)

**Diagram 4**




There should be no voids or airspace between the subgrade and the geotextile so intimate contact can be maintained with the two surfaces. Once the geotextile is placed, the work area should not be disturbed. This is necessary to avoid any contact loss between the ACB's and the geotextile and the geotextile and the subgrade. (See Diagram 5)

**Diagram 5**



# Loading and Unloading Cabled Mattresses

When handling cabled mats you would need a piece of equipment that can lift the total weight of spreader bar and mattress. This requires a track excavator for smaller and lighter mats and a crane for the larger heavier mats. Refer to the chart in the Appendix of this manual for mat sizes and weights. The length of reach required to place the mat is a major determining factor when choosing the right equipment.



Each mat is loaded onto the truck by a spreader bar attached by six connections on each end.

A rope is attached to each end of the spreader so when it is lifted, personnel can guide the mat onto the truck. This insures an evenly distributed load for transportation to the job site.

Mats are kept to a maximum of eight feet wide for transportation purposes. Any width beyond eight feet requires the transporter to acquire costly permits for oversized loads. The eight-foot mats work very well on the flatbed trailers.

# Placement and Installation of ACB's



The articulating concrete blocks must be placed on the geotextile in such a manner as to produce a smooth plane surface in intimate contact with the geotextile. Joint spacing between adjacent blocks is to be maintained so that binding of blocks does not occur and block-to-block interlock is achieved. In curvature and grade change areas, alignment of the individual block and the orientation of the neighboring adjacent block must provide intimate block to fabric contact and block-to-block interlock. Care shall be taken to avoid damage to the geotextile or subgrade during the block installation process. When a geotextile is used, the ACB system placement should begin at the upstream end and proceed downstream. If an ACB system is to be installed from downstream up, a contractor option is to place a temporary toe on the front edge of the ACB system to protect against undermining when flows are anticipated. On sloped sections, where practical, placement shall begin at the toe of the slope and proceed up the slope. Block placement shall not bring block-to-block interconnections into tension. Individual blocks within the plane of the finished system shall not exceed the protrusion tolerance beyond that used in the stability design of the system. The maximum protrusion tolerance for any given block is 0.5 inches (13 mm) (See Diagram 6).

When terminating the installation at a structure such as a roadway, sheet-pile wall, concrete wall, or other structure, all openings must be sealed with grout or some other impermeable material.

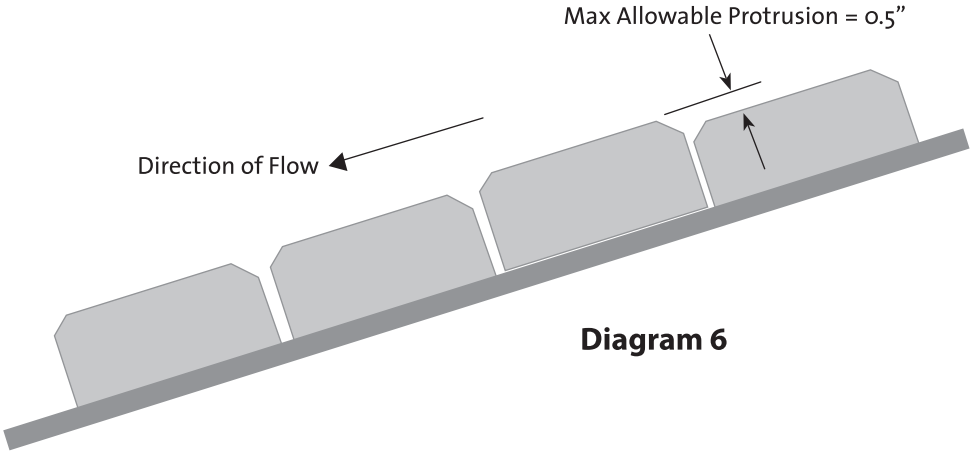



**Diagram 6**

The ACB revetment system can be used as a road for heavy rubber-tired construction traffic when designed as a flexible pavement that can handle the expected wheel loads. Mowing equipment, tractors, and utility vehicles are all able to use the ACB system as a roadway.

## Assembled Mattresses

If assembled and placed as large mattresses, the articulating mats can be attached to a spreader bar to aid in the lifting and placing of the mats in their proper position with a crane. Refer to the Spreader Bar Section of this manual for details on mat lifting. The mats should be placed side-by-side and/or end-to-end so the mats abut each other.



Mat seams or openings between mats greater than 2 inches (51 mm) separation distance between blocks in the matrix should be filled with grout. Whether placed by hand or in large mattresses, distinct grade changes should be accommodated with a well-rounded transition (i.e., minimum radius determined by individual system characteristics). Refer to the Appendix for typical installation details of ACB systems.

# Installing in a Wet Application

There will be projects, which require installation of the block under water. There are several methods for approaching this type installation. The depth of water and the type of water will dictate the best approach. The type of water refers to a tidal body of water or a fixed body of water, such as a fresh water lake or retention basin.



## Tidal Water Applications

These applications are normally along a coastal area, industrial channel, and inland water lakes, among others. Depending on the application there will be several things to consider:

1. Prop-Wash
2. Boat-Generated Waves
3. Under-Currents

In most tidal applications the soils beneath the water are soft and silty, allowing the block system to toe itself in over a short period of time. If the specification requires special protection beyond the natural toe, these are the methods.

**Method 1:** Use a much heavier block on the last four to five rows of the mat. This provides sufficient weight to keep the toe in place.

**Method 2:** Cover the base of the mats with riprap. If this is done then affects on a future dredging operations must be considered.

**Method 3:** Actually dig a trench under water, toe in the bottom and anchor.

**Method 4:** Anchor the bottom of the mats without a toe trench.

**Method 5:** Construct a dam along the slope between the slope and the water, and de-water the area to be covered.

If either Method 3 or Method 4 is used, divers and barge-mounted cranes will be required.

### Non-Tidal Water Applications

These bodies of water typically are not set very deep into the water. At most the depth will be a (-5). This system can be anchored with mechanical anchors without the aid of divers. Constructing a dam to allow dry installation is also a viable method of installing these systems.

## Installing in a Dry Applications

Cabling Mats in the Field



### Single-Directional Series Mats (SD Series)

These mats have to be laid out on a flat surface, strung, and placed with a crane or large excavator. Because of the offset between blocks they cannot be placed and then strung.

## Bi-Directional Series Mats (BD Series)

Bi-Directional mats be laid out on a flat surface, strung, and placed, or they can be placed a strung where they will lay. These blocks are not offset in either direction and allow for place-and-string. This also allows for easy repair of an isolated failure of the system.

## Anchoring and Crimping

### Anchoring

Standard applications have several points requiring the mats be secured to other structures and to one another. These are listed below.

1. Adjoining Mats
2. Angled Mats
3. Turning of Corners
4. Anchoring to Other Structures
5. Termination Trenches

Anchoring is always required at the crest of an installation such as a levee, channel slope, or shoreline slope. The anchoring method is normally determined by the steepness of the slope to be protected. The following rule of thumb is recommended:

1. If the slope is less than or equal to 3H:1V, no mechanical anchors are required in the crest termination trench, but can be used if specified or if the user simply wants the additional anchoring.

2. If the slope is greater than or equal to 2H:1V, mechanical anchors are required in the termination trench at the crest.

3. All of the leading edges must be terminated in a trench. The same rule of thumb applies to these areas as in items 1 and 2.

4. Two types of mechanical anchors are available; duckbill anchors and helical anchors.

When installing a duckbill anchor there is only one way to properly install these. This is addressed in the installation details of the appendix.

(Refer to the appendix in this document for typical installation details using all of these anchoring methods.)

## Crimping

Once all of the mats are laid the loose ends of the side cables must be crimped together to make one system of all the mats. This is accomplished with the crimps and crimpers furnished with the first shipment of mats. This is demonstrated in the typical installation details of the appendix section.

# Grouting

## Mat Joints (SD and BD Series)

Project specifications will normally dictate what has to be done as far as grout joints on an installation. When the specifications are not clear or do not specify what should be done, the general rule is as follows.



- When two mats are laid side-by-side and have a joint width equal to or greater than two inches, the joint must be grouted with a 4000 psi concrete grout.

- Joints created by laying mats in an internal or external radius must be grouted.

- The block systems are designed to allow for block protrusions of one-half inch on random blocks. However, the goal is to minimize non-conformities in the subgrade. Geotextile products are strong and durable, but the area to be covered should be free of debris or any materials that may tear or puncture the geotextile.

- Where mats are joined in the bottom of a channel up the slope must be grouted.

  *(See Appendix For Details On These Procedures)*

## Shoreloc® Hand-Placed Series

When placing the Shoreloc® product on a slope the block should start at the bottom of slope and work up the slope. Alignment of the block is critical to maintain a straight line up the slope and along the slope. Anchoring and termination of these systems requires a termination trench for the top of slope and the toe. All other leading edges should also be trenched in if they do not terminate with another structure.

The hand-placed block can be cabled after it is put in place. Because this is a positive interlocking block it is not necessary to use cables. However some engineers will specify cabling with this block.

# Appendix

# Single-Directional Cable
# SD Series Block Mat Sizes and Weights*

## OC = Open Cell

| Mat Width | Mat Length (Feet) | SD 400 OC | SD 475 OC | SD 600 OC | SD 800 OC |
|---|---|---|---|---|---|
| | | Mat Wt. | Mat Wt. | Mat Wt. | Mat Wt. |
| 8.00 | 8.00 | 2,048 | 2,432 | 3,200 | 4,288 |
| 8.00 | 9.33 | 2,389 | 2,837 | 3,733 | 5,003 |
| 8.00 | 10.67 | 2,731 | 3,243 | 4,267 | 5,717 |
| 8.00 | 12.00 | 3,072 | 3,648 | 4,800 | 6,432 |
| 8.00 | 13.33 | 3,413 | 4,053 | 5,333 | 7,147 |
| 8.00 | 14.67 | 3,755 | 4,459 | 5,867 | 7,861 |
| 8.00 | 16.00 | 4,096 | 4,864 | 6,400 | 8,576 |
| 8.00 | 17.33 | 4,437 | 5,269 | 6,933 | 9,291 |
| 8.00 | 18.67 | 4,779 | 5,675 | 7,467 | 10,005 |
| 8.00 | 20.00 | 5,120 | 6,080 | 8,000 | 10,720 |
| 8.00 | 21.33 | 5,461 | 6,485 | 8,533 | 11,435 |
| 8.00 | 22.67 | 5,803 | 6,891 | 9,067 | 12,149 |
| 8.00 | 24.00 | 6,144 | 7,296 | 9,600 | 12,864 |
| 8.00 | 25.33 | 6,485 | 7,701 | 10,133 | 13,579 |
| 8.00 | 26.67 | 6,827 | 8,107 | 10,667 | 14,293 |
| 8.00 | 28.00 | 7,168 | 8,512 | 11,200 | 15,008 |
| 8.00 | 29.33 | 7,509 | 8,917 | 11,733 | 15.723 |
| 8.00 | 30.67 | 7,851 | 9,323 | 12,267 | 16,437 |
| 8.00 | 32.00 | 8,192 | 9,728 | 12,800 | 17,152 |
| 8.00 | 33.33 | 8,533 | 10,133 | 13,333 | 17,867 |
| 8.00 | 34.67 | 8,875 | 10,539 | 13,867 | 18,581 |
| 8.00 | 36.00 | 9,216 | 10,944 | 14,400 | 19,296 |
| 8.00 | 37.33 | 9,557 | 11,349 | 14,933 | 20,011 |
| 8.00 | 38.67 | 9,899 | 11,755 | 15,467 | 20,725 |
| 8.00 | 40.00 | 10,240 | 12,160 | 16,000 | 21,440 |
| 8.00 | 41.33 | 10,581 | 12,565 | 16,533 | 22,155 |
| 8.00 | 42.67 | 10,923 | 12,971 | 17,067 | 22,869 |
| 8.00 | 44.00 | 11,264 | 13,376 | 17,600 | 23,584 |

*Unit weight may vary by geographic region due to varations in local materials. Contact you local producer for actual block/mat weights.

# Single-Directional Cable
# SD Series Block Mat Sizes and Weights*

## CC = Open Cell

| Mat Width | Mat Length (Feet) | SD 400 CC | SD 475 CC | SD 600 CC | SD 800 CC |
|---|---|---|---|---|---|
| | | Mat Wt. | Mat Wt. | Mat Wt. | Mat Wt. |
| 8.00 | 8.00 | 2,624 | 3,072 | 3,648 | 4,864 |
| 8.00 | 9.33 | 3,061 | 3,584 | 4,256 | 5,675 |
| 8.00 | 10.67 | 3,499 | 4,096 | 4,864 | 6,485 |
| 8.00 | 12.00 | 3,936 | 4,608 | 5,472 | 7,296 |
| 8.00 | 13.33 | 4,373 | 5,120 | 6,080 | 8,107 |
| 8.00 | 14.67 | 4,811 | 5,632 | 6,688 | 8,917 |
| 8.00 | 16.00 | 5,248 | 6,144 | 7,296 | 9,728 |
| 8.00 | 17.33 | 5,685 | 6,656 | 7,904 | 10,539 |
| 8.00 | 18.67 | 6,123 | 7,168 | 8,512 | 11,349 |
| 8.00 | 20.00 | 6,560 | 7,680 | 9,120 | 12,160 |
| 8.00 | 21.33 | 6,997 | 8,192 | 9,728 | 12,971 |
| 8.00 | 22.67 | 7,435 | 8,704 | 10,336 | 13,781 |
| 8.00 | 24.00 | 7,872 | 9,216 | 10,944 | 14,592 |
| 8.00 | 25.33 | 8,309 | 9,728 | 11,552 | 15,403 |
| 8.00 | 26.67 | 8,747 | 10,240 | 12,160 | 16,213 |
| 8.00 | 28.00 | 9,184 | 10,752 | 12,768 | 17,024 |
| 8.00 | 29.33 | 9,621 | 11,264 | 13,376 | 17,835 |
| 8.00 | 30.67 | 10,059 | 11,776 | 13,984 | 18,645 |
| 8.00 | 32.00 | 10,496 | 12,288 | 14,592 | 19,456 |
| 8.00 | 33.33 | 10,933 | 12,800 | 15,200 | 20,267 |
| 8.00 | 34.67 | 11,371 | 13,312 | 15,808 | 21,077 |
| 8.00 | 36.00 | 11,808 | 13,824 | 16,416 | 21,888 |
| 8.00 | 37.33 | 12,245 | 14,336 | 17,024 | 22,699 |
| 8.00 | 38.67 | 12,683 | 14,848 | 17,632 | 23,509 |
| 8.00 | 40.00 | 13,120 | 15,360 | 18,240 | 24,320 |
| 8.00 | 41.33 | 13,557 | 15,872 | 18,848 | 25,131 |
| 8.00 | 42.67 | 13,995 | 16,384 | 19,456 | 25,941 |
| 8.00 | 44.00 | 14,432 | 16,896 | 20,064 | 26,752 |

*Unit weight may vary by geographic region due to varations in local materials. Contact you local producer for actual block/mat weights.

# Bi-Directional Cable
# BD Series Block Mat Sizes and Weights*

## OC = Closed Cell

| Mat Width | Mat Length (Feet) | | Ft² Per Mat | BD 400 OC | BD 500 OC | BD 600 OC | BD 800 OC |
|---|---|---|---|---|---|---|---|
| | | | | Mat Wt. | Mat Wt. | Mat Wt. | Mat Wt. |
| 8.00 | 8.00 | 6 | 64 | 2,240 | 2,816 | 3,456 | 4,608 |
| 8.00 | 9.33 | 7 | 75 | 2,613 | 3,285 | 4,032 | 5,376 |
| 8.00 | 10.67 | 8 | 85 | 2,987 | 3,755 | 4,608 | 6,144 |
| 8.00 | 12.00 | 9 | 96 | 3,360 | 4,224 | 5,184 | 6,912 |
| 8.00 | 13.33 | 10 | 107 | 3,733 | 4,693 | 5,760 | 7,680 |
| 8.00 | 14.67 | 11 | 117 | 4,107 | 5,163 | 6,336 | 8,448 |
| 8.00 | 16.00 | 12 | 128 | 4,480 | 5,632 | 6,912 | 9,216 |
| 8.00 | 17.33 | 13 | 139 | 4,853 | 6,101 | 7,488 | 9,984 |
| 8.00 | 18.67 | 14 | 149 | 5,227 | 6,571 | 8,064 | 10,752 |
| 8.00 | 20.00 | 15 | 160 | 5,600 | 7,040 | 8,640 | 11,520 |
| 8.00 | 21.33 | 16 | 171 | 5,973 | 7,509 | 9,216 | 12,288 |
| 8.00 | 22.67 | 17 | 181 | 6,347 | 7,979 | 9,792 | 13,056 |
| 8.00 | 24.00 | 18 | 192 | 6,720 | 8,448 | 10,368 | 13,824 |
| 8.00 | 25.33 | 19 | 203 | 7,093 | 8,917 | 10,944 | 14,592 |
| 8.00 | 26.67 | 20 | 213 | 7,467 | 9,387 | 11,520 | 15,360 |
| 8.00 | 28.00 | 21 | 224 | 7,840 | 9,856 | 12,096 | 16,128 |
| 8.00 | 29.33 | 22 | 235 | 8,213 | 10,325 | 12,672 | 16,896 |
| 8.00 | 30.67 | 23 | 245 | 8,587 | 10,795 | 13,248 | 17,664 |
| 8.00 | 32.00 | 24 | 256 | 8,960 | 11,264 | 13,824 | 18,432 |
| 8.00 | 33.33 | 25 | 267 | 9,333 | 11,733 | 14,400 | 19,200 |
| 8.00 | 34.67 | 26 | 277 | 9,707 | 12,203 | 14,976 | 19,968 |
| 8.00 | 36.00 | 27 | 288 | 10,080 | 12,672 | 15,552 | 20,736 |
| 8.00 | 37.33 | 28 | 299 | 10,453 | 13,141 | 16,128 | 21,504 |
| 8.00 | 38.67 | 29 | 309 | 10,827 | 13,611 | 16,704 | 22,272 |
| 8.00 | 40.00 | 30 | 320 | 11,200 | 14,080 | 17,280 | 23,040 |
| 8.00 | 41.33 | 31 | 331 | 11,573 | 14,549 | 17,856 | 23,808 |
| 8.00 | 42.67 | 32 | 341 | 11,947 | 15,019 | 18,432 | 24,576 |
| 8.00 | 44.00 | 33 | 352 | 12,320 | 15,488 | 19,008 | 25,344 |

*Unit weight may vary by geographic region due to varations in local materials. Contact you local producer for actual block/mat weights.

# Bi-Directional Cable
# BD Series Block Mat Sizes and Weights*

## CC = Closed Cell



| Mat Width | Mat Length (Feet) | | Ft² Per Mat | BD 400 CC | BD 500 CC | BD 600 CC | BD 800 CC |
|---|---|---|---|---|---|---|---|
| | | | | Mat Wt. | Mat Wt. | Mat Wt. | Mat Wt. |
| 8.00 | 8.00 | 6 | 64 | 2,560 | 3,264 | 3,968 | 5,312 |
| 8.00 | 9.33 | 7 | 75 | 2,987 | 3,808 | 4,629 | 6,197 |
| 8.00 | 10.67 | 8 | 85 | 3,413 | 4,352 | 5,291 | 7,083 |
| 8.00 | 12.00 | 9 | 96 | 3,840 | 4,896 | 5,952 | 7,968 |
| 8.00 | 13.33 | 10 | 107 | 4,267 | 5,440 | 6,613 | 8,853 |
| 8.00 | 14.67 | 11 | 117 | 4,693 | 5,984 | 7,275 | 9,739 |
| 8.00 | 16.00 | 12 | 128 | 5,120 | 6,528 | 7,936 | 10,624 |
| 8.00 | 17.33 | 13 | 139 | 5,547 | 7,072 | 8,597 | 11,509 |
| 8.00 | 18.67 | 14 | 149 | 5,973 | 7,616 | 9,259 | 12,395 |
| 8.00 | 20.00 | 15 | 160 | 6,400 | 8,160 | 9,920 | 13,280 |
| 8.00 | 21.33 | 16 | 171 | 6,827 | 8,704 | 10,581 | 14,165 |
| 8.00 | 22.67 | 17 | 181 | 7,253 | 9,248 | 11,243 | 15,051 |
| 8.00 | 24.00 | 18 | 192 | 7,680 | 9,792 | 11,904 | 15,936 |
| 8.00 | 25.33 | 19 | 203 | 8,107 | 10,336 | 12,565 | 16,821 |
| 8.00 | 26.67 | 20 | 213 | 8,533 | 10,880 | 13,227 | 17,707 |
| 8.00 | 28.00 | 21 | 224 | 8,960 | 11,424 | 13,888 | 18,592 |
| 8.00 | 29.33 | 22 | 235 | 9,387 | 11,968 | 14,549 | 19,477 |
| 8.00 | 30.67 | 23 | 245 | 9,813 | 12,512 | 15,211 | 20,363 |
| 8.00 | 32.00 | 24 | 256 | 10,240 | 13,056 | 15,872 | 21,248 |
| 8.00 | 33.33 | 25 | 267 | 10,667 | 13,600 | 16,533 | 22,133 |
| 8.00 | 34.67 | 26 | 277 | 11,093 | 14,144 | 17,195 | 23,019 |
| 8.00 | 36.00 | 27 | 288 | 11,520 | 14,688 | 17,856 | 23,904 |
| 8.00 | 37.33 | 28 | 299 | 11,947 | 15,232 | 18,517 | 24,789 |
| 8.00 | 38.67 | 29 | 309 | 12,373 | 15,776 | 19,179 | 25,675 |
| 8.00 | 40.00 | 30 | 320 | 12,800 | 16,320 | 19,840 | 26,560 |
| 8.00 | 41.33 | 31 | 331 | 13,227 | 16,864 | 20,501 | 27,445 |
| 8.00 | 42.67 | 32 | 341 | 13,653 | 17,408 | 21,163 | 28,331 |
| 8.00 | 44.00 | 33 | 352 | 14,080 | 17,952 | 21,824 | 29,216 |

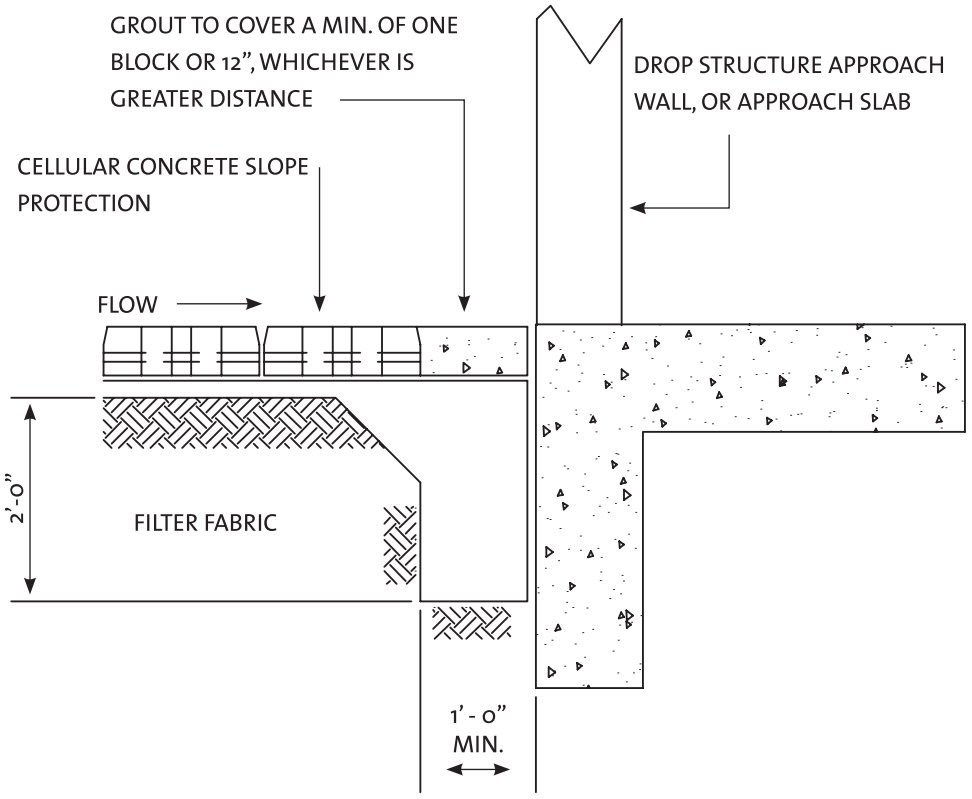
*Unit weight may vary by geographic region due to varations in local materials. Contact you local producer for actual block/mat weights.

# Typical Installation Details

## Slope Protection at Drop Structure

The grout cover is continuous along the approach invert, approach walls, and 1V:2H concrete slope paving.

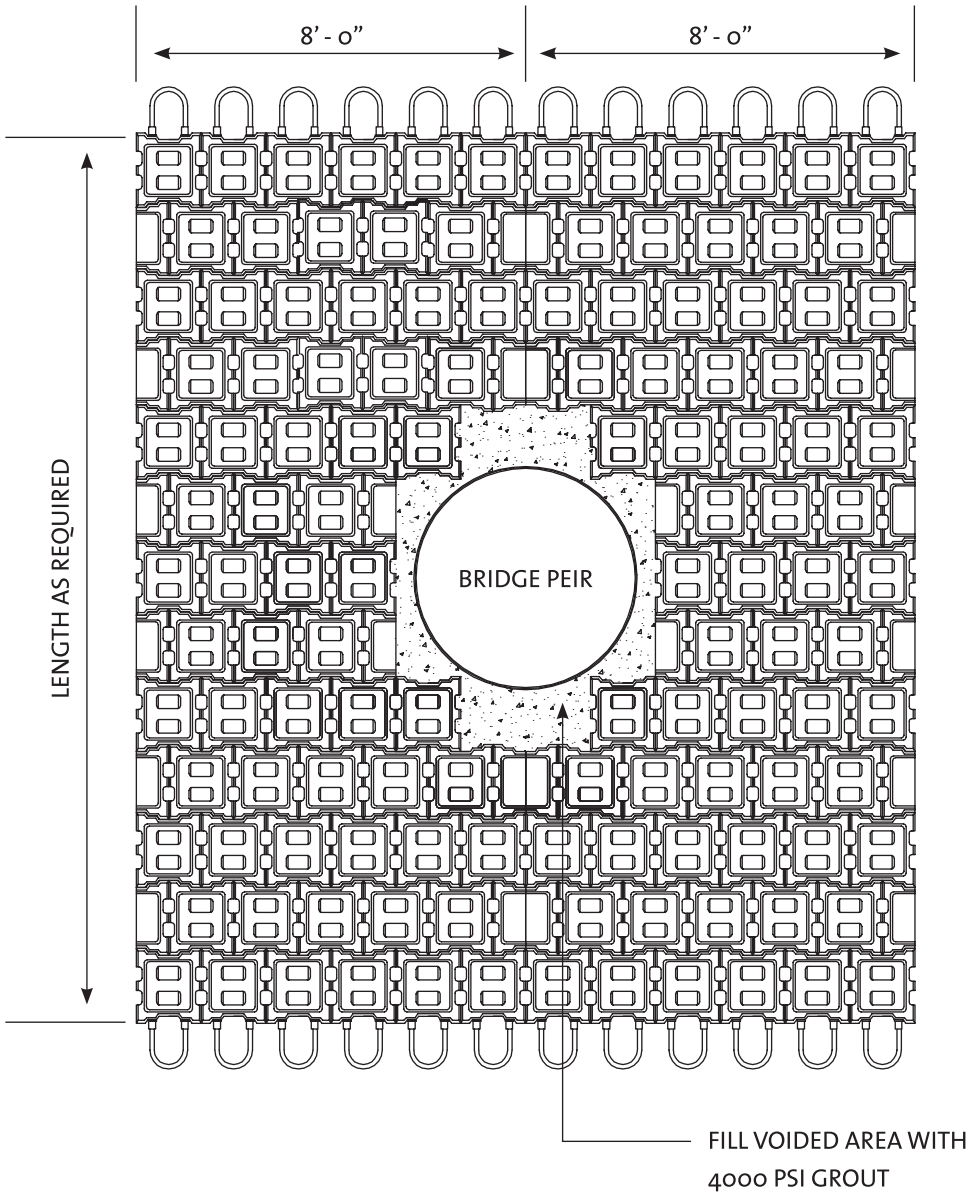




# Typical Installation Details

## Mat Layout Around Bridge Piers





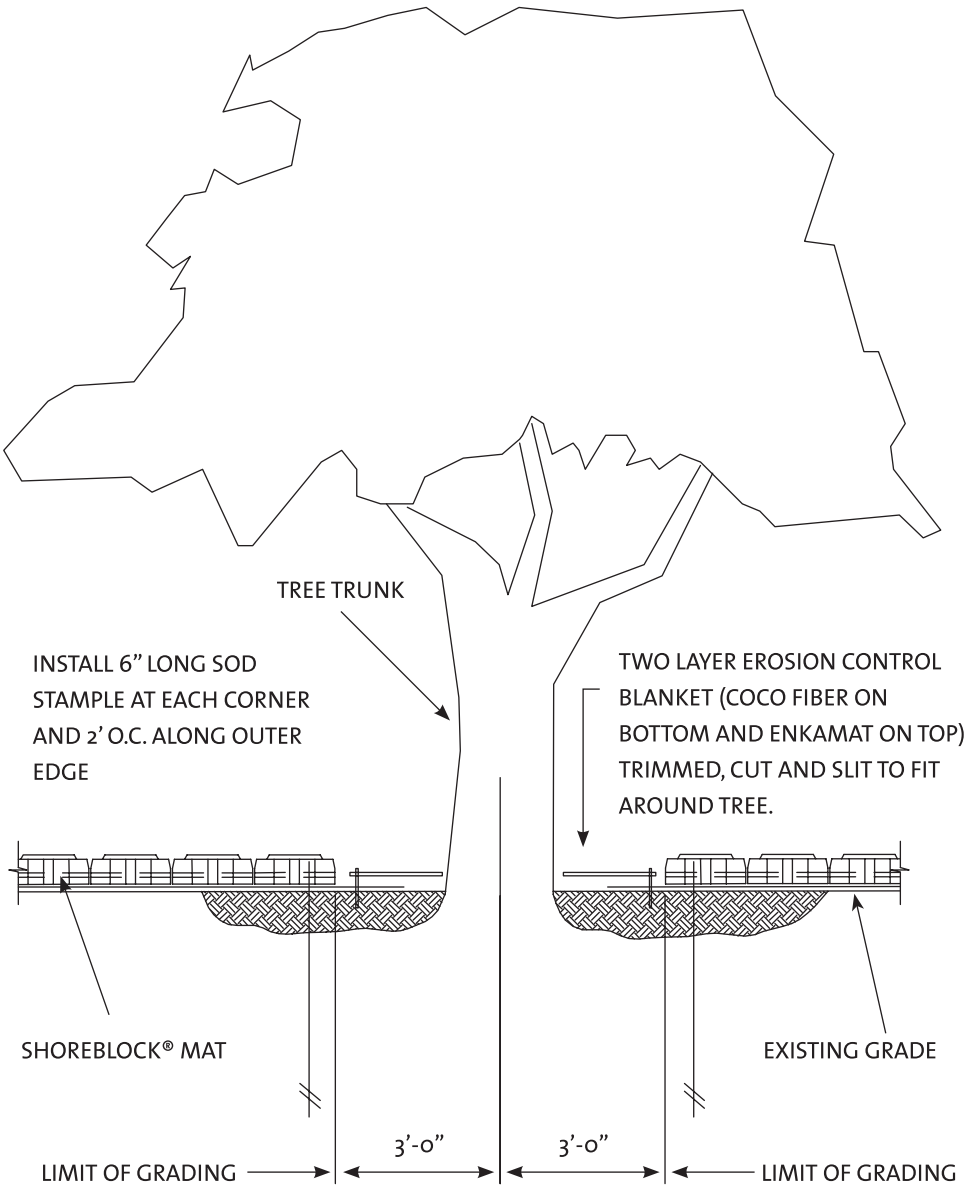
# Typical Installation Details

## Scour Protection at Trees

Clearing and grubbing within the tripline of trees to be preserved shall be limited to surface clearing and grubbing to a maximum depth of 2" using hand tools.

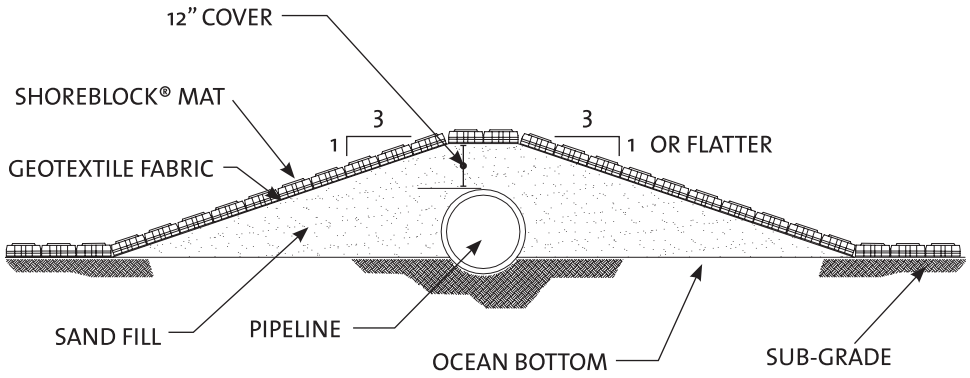


Erosion Control Blankets may be placed on undistrubed soil with maximum of 1 ½" mowed plant stubble.

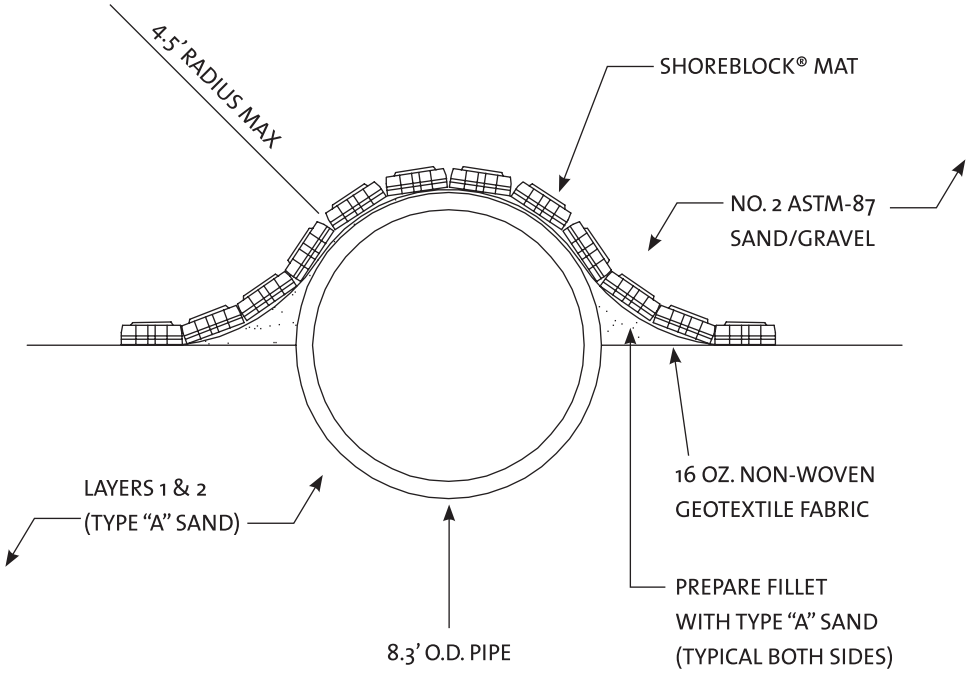


# Typical Installation Details

## Pipeline Cover

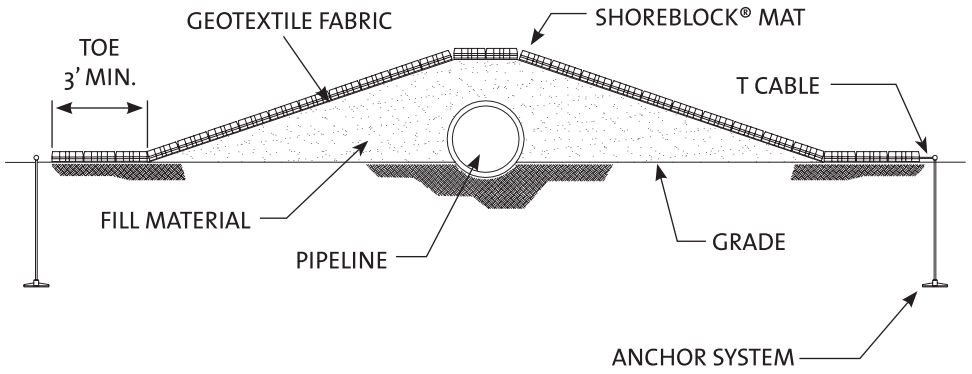



## Pipeline Cover Section

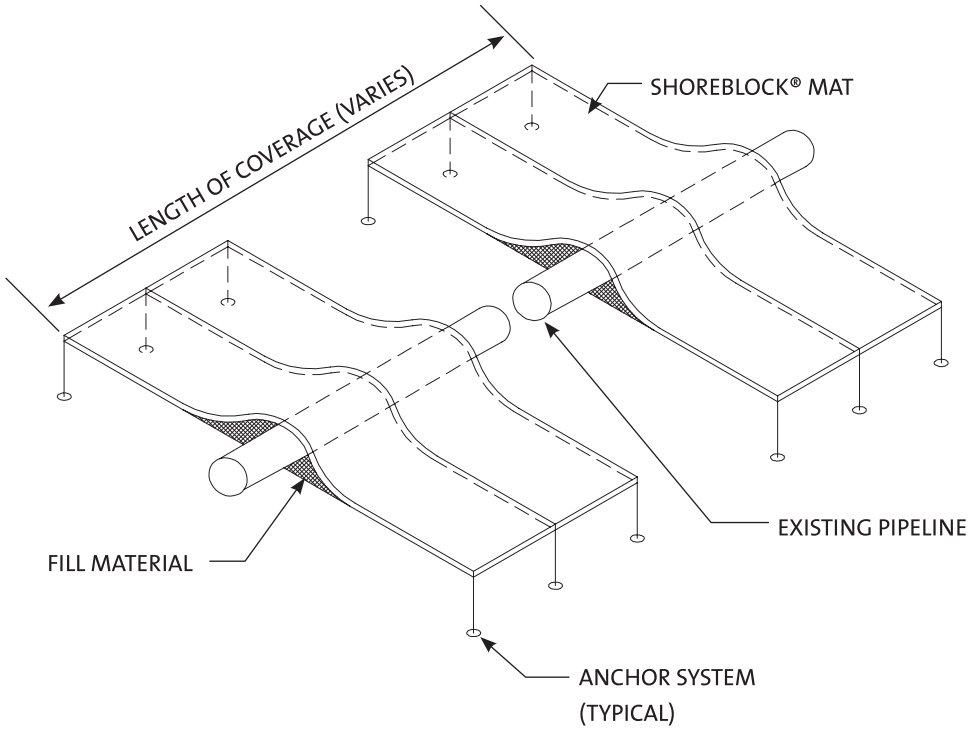


# Typical Installation Details

## Pipeline Cover

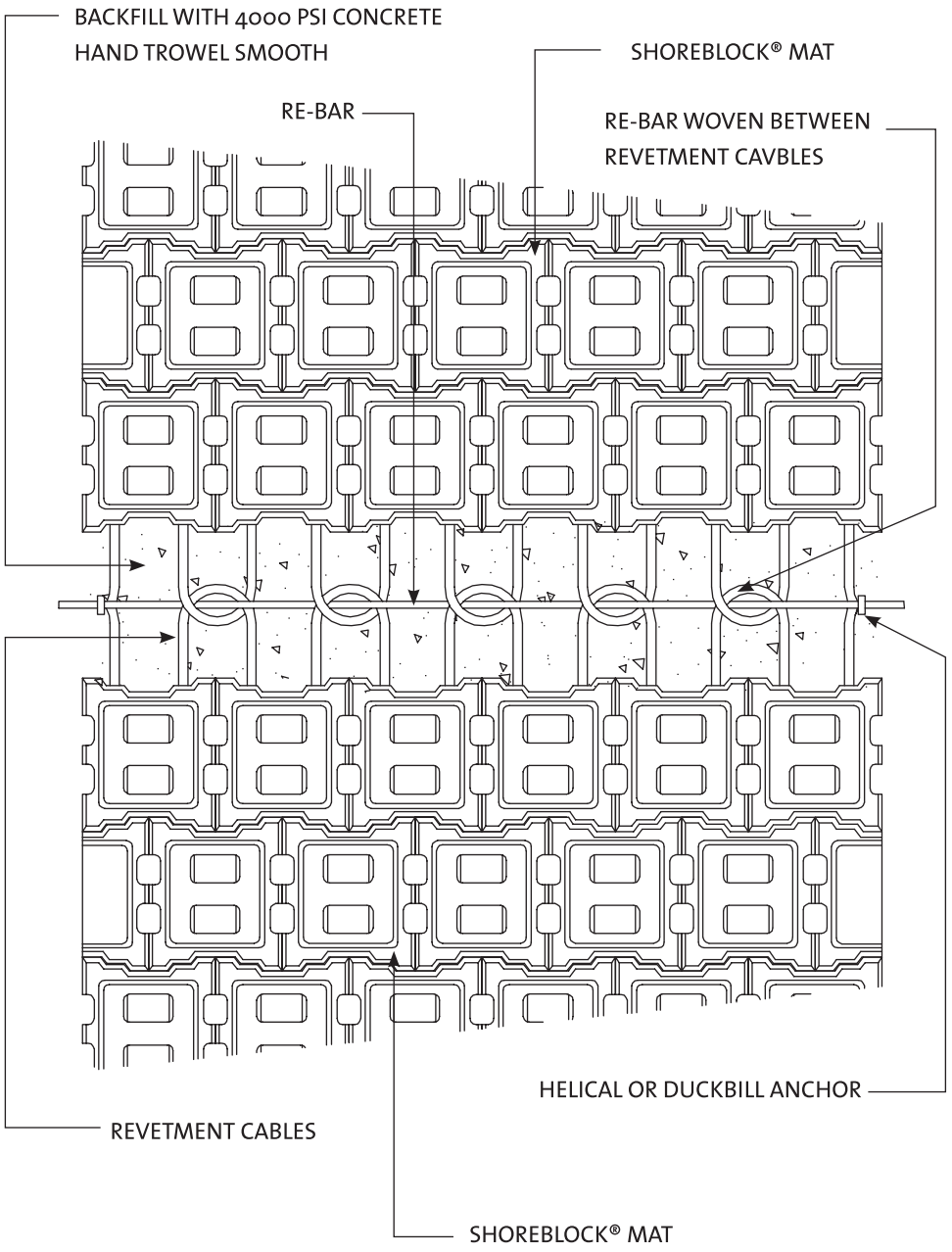



## Location Detail



# Typical Installation Details

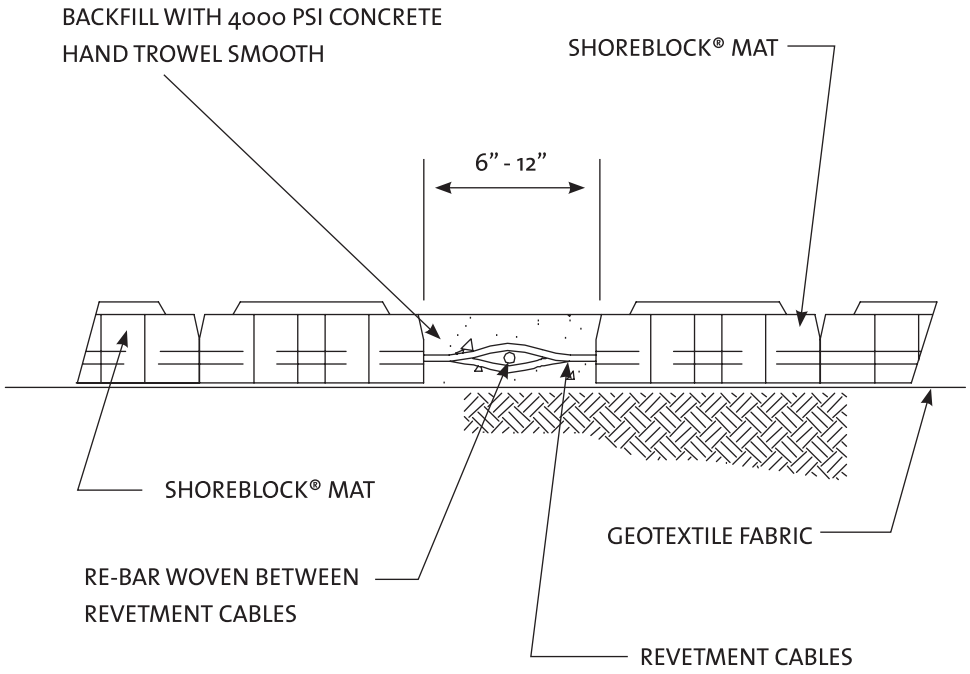
## Connection Between Mats (Grout Joint)



# Typical Installation Details

## Connection Between Mats (Grout Joint)



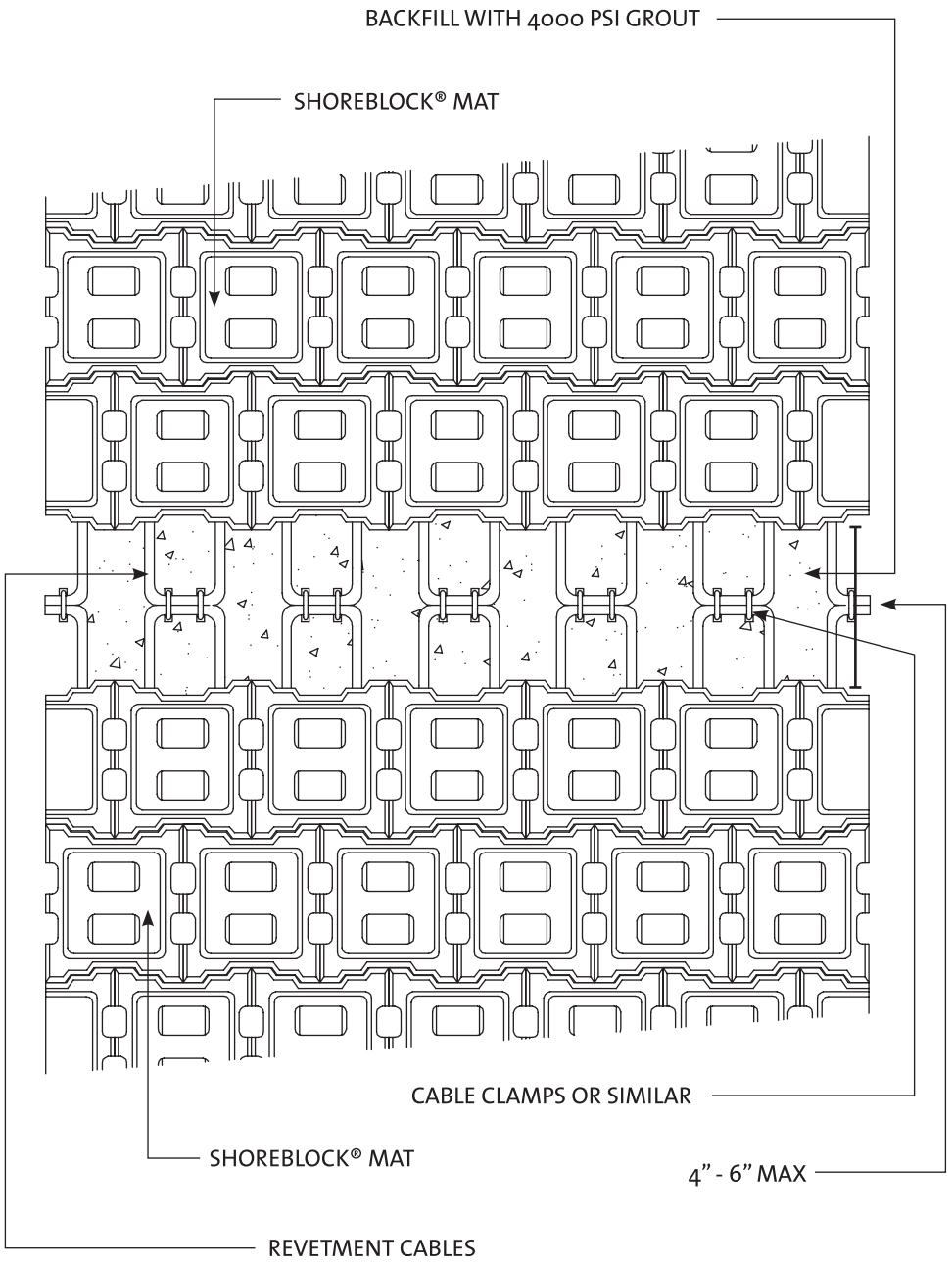


# Typical Installation Details

## Connection Between Mats Using Cable Clamps

Spacing between mats shown larger than actual for clairty. Mats should be placed between 4" and 6" maximum.



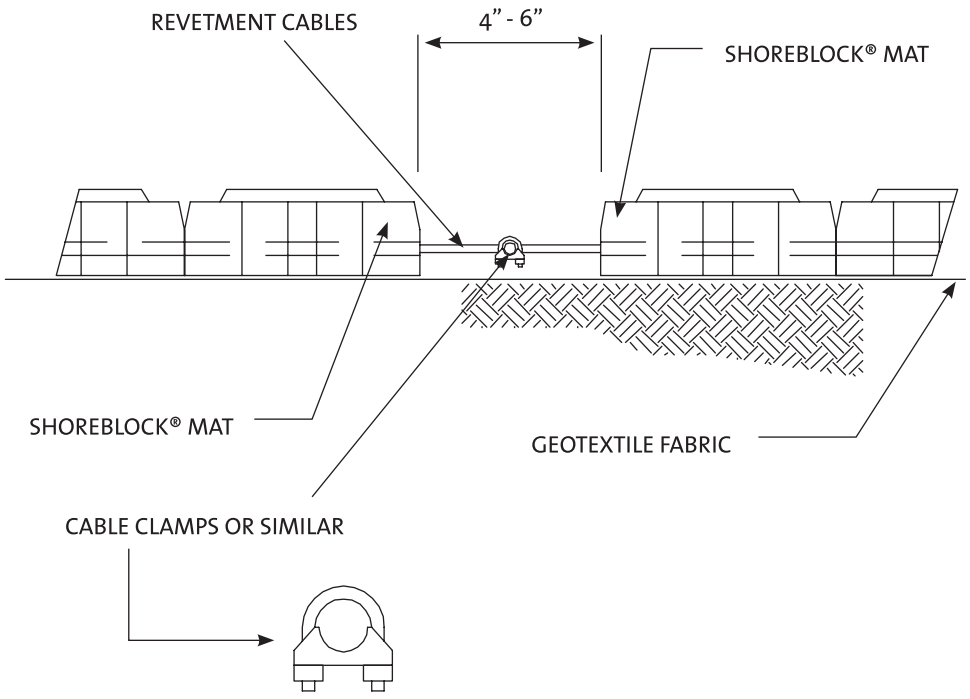


# Typical Installation Details

## Connection Between Mats Using Cable Clamps

Spacing between mats shown larger than actual for clarity. Mats should be placed as close as possible (4" - 6" MAX).

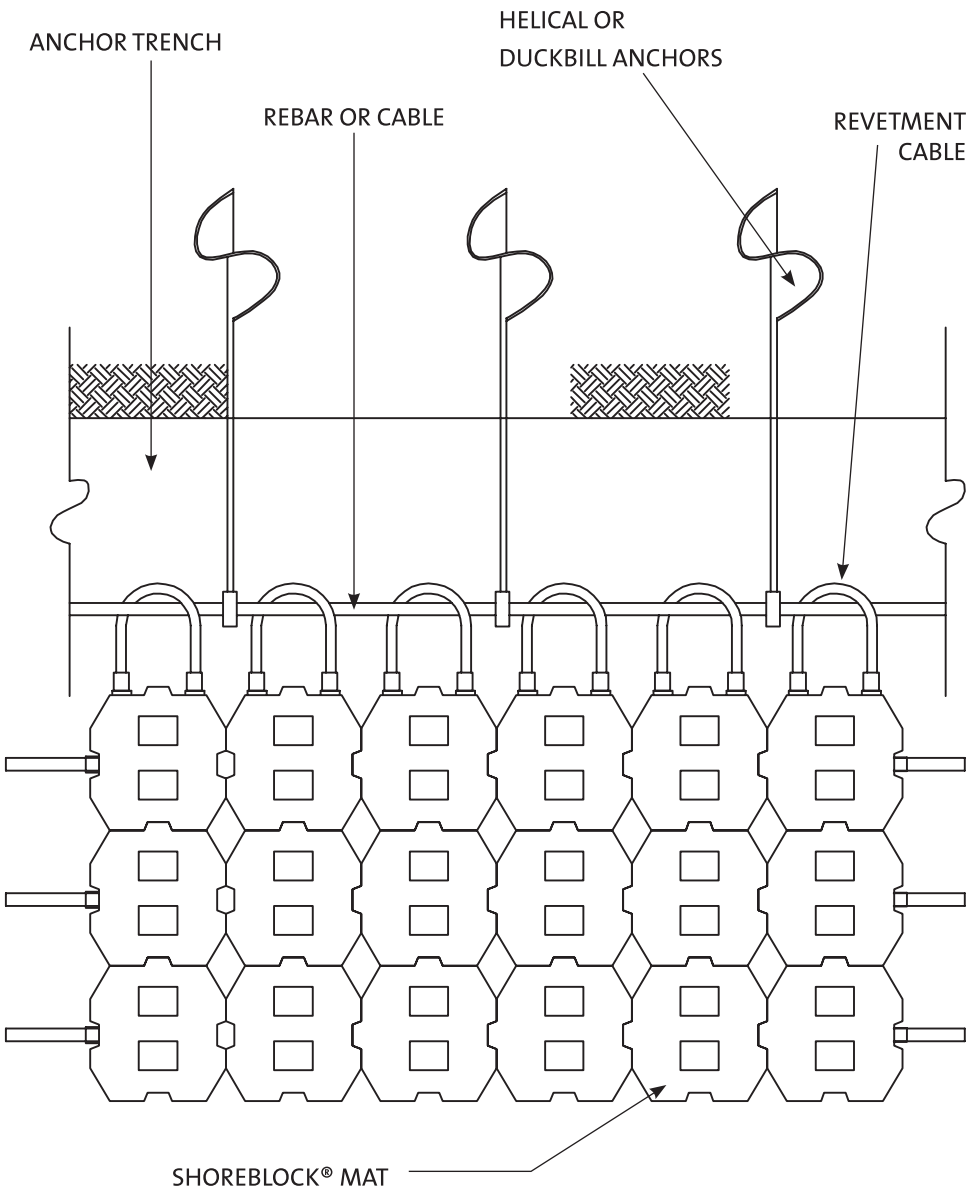




# Typical Installation Details

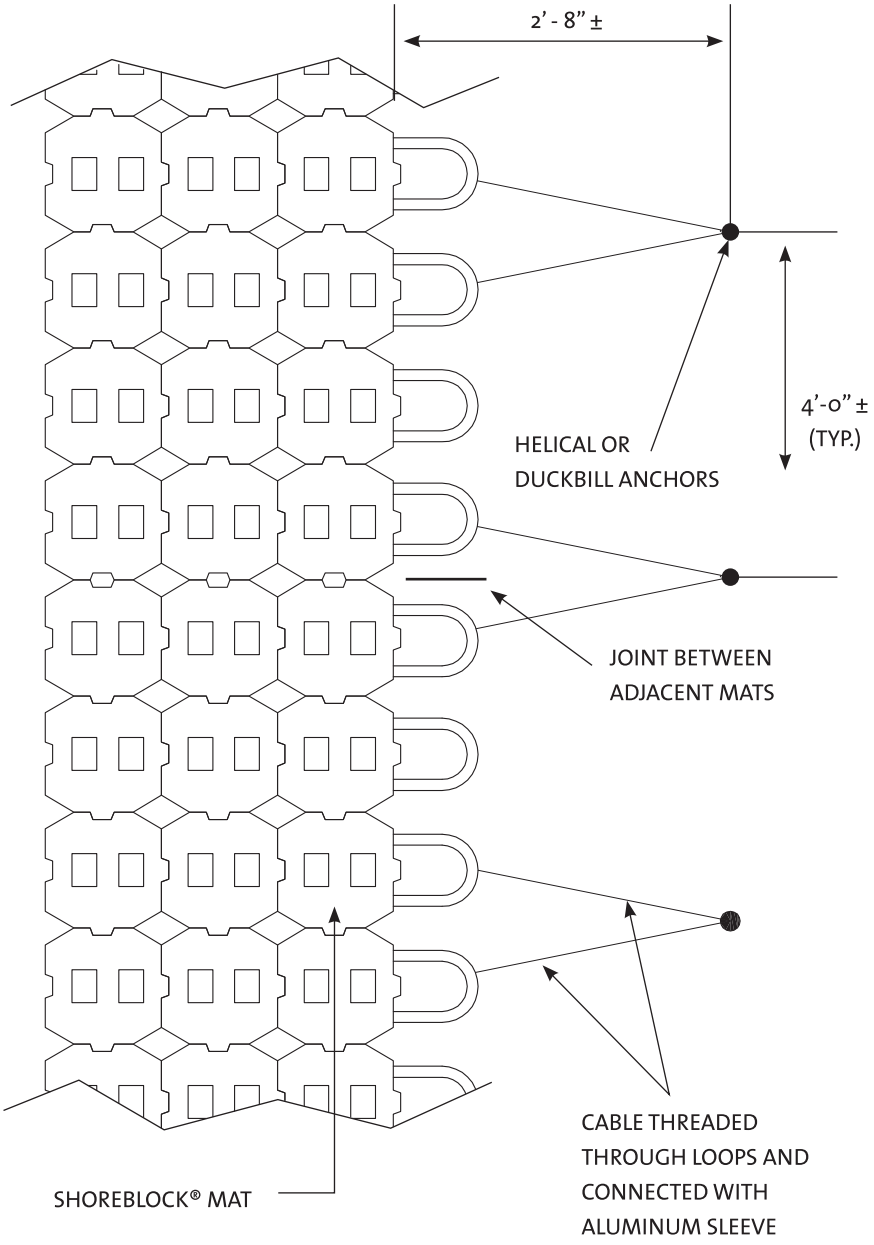
## Helical or Duckbill Anchoring in Termination Trench





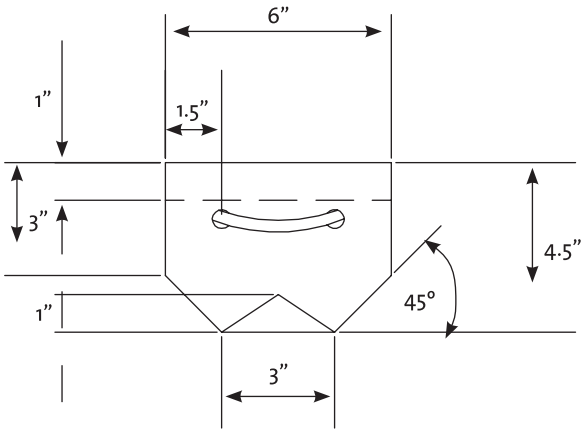
# Typical Installation Details

## Top of Slope Anchor Connection



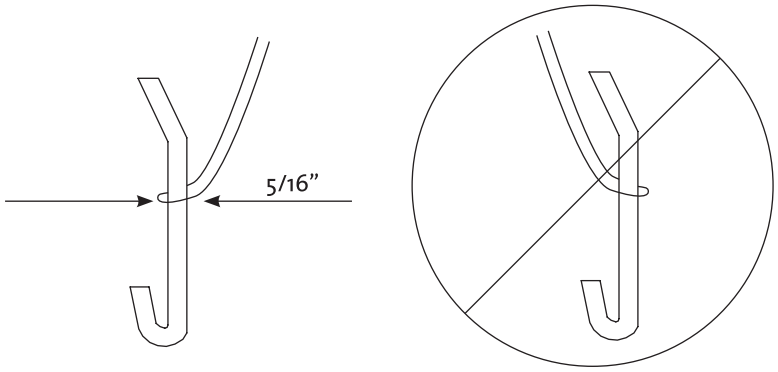
# Typical Installation Details

## Flex Anchor



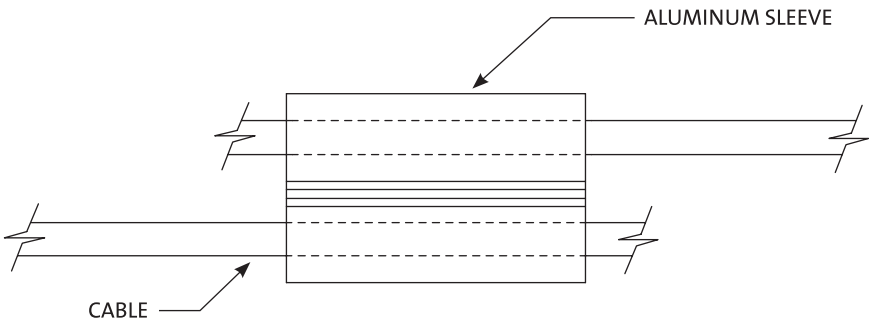



## Side View




**CORRECT** **INCORRECT**

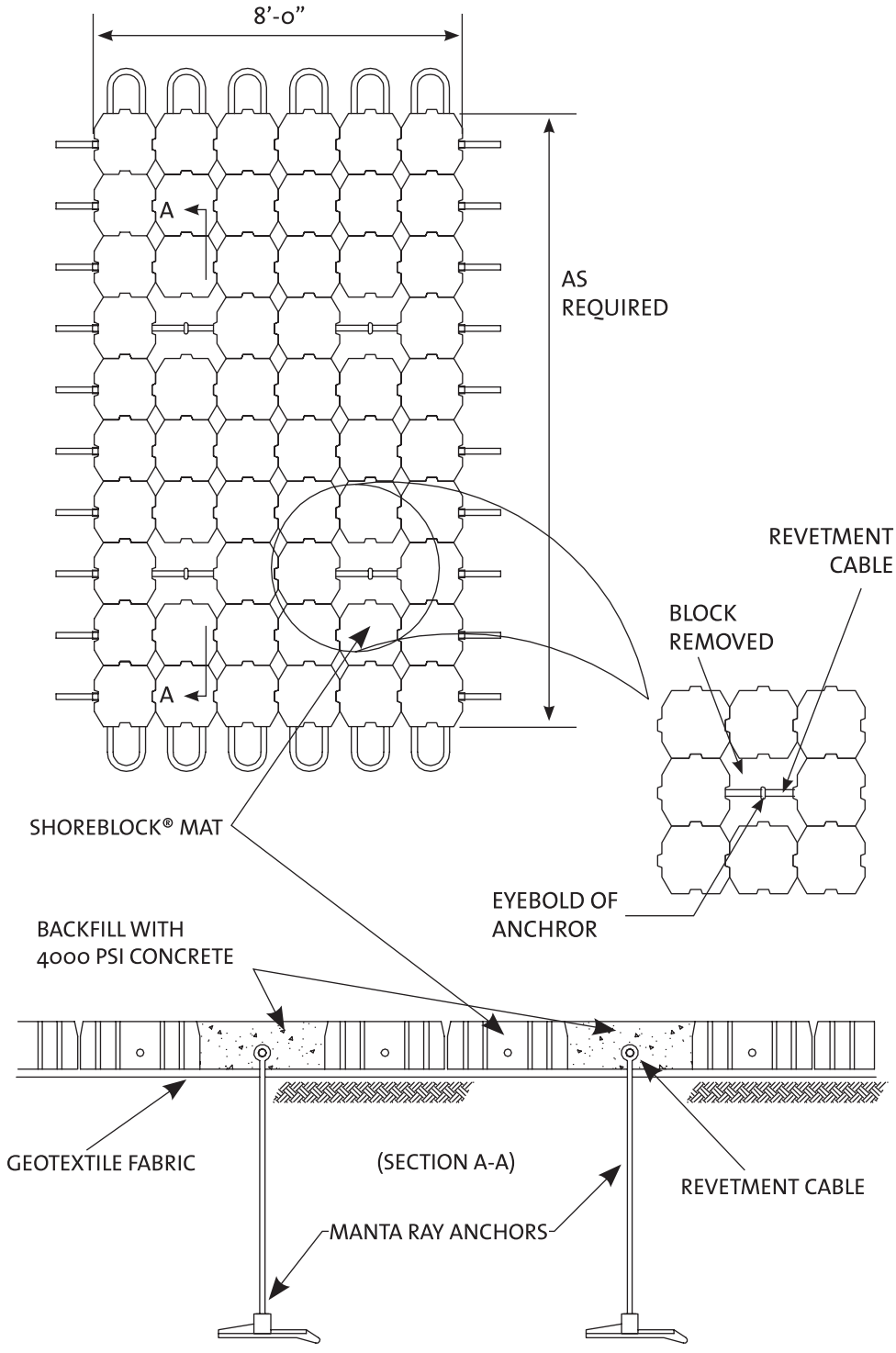
## Cable Connections



# Typical Installation Details



## Internal Mat Anchoring



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