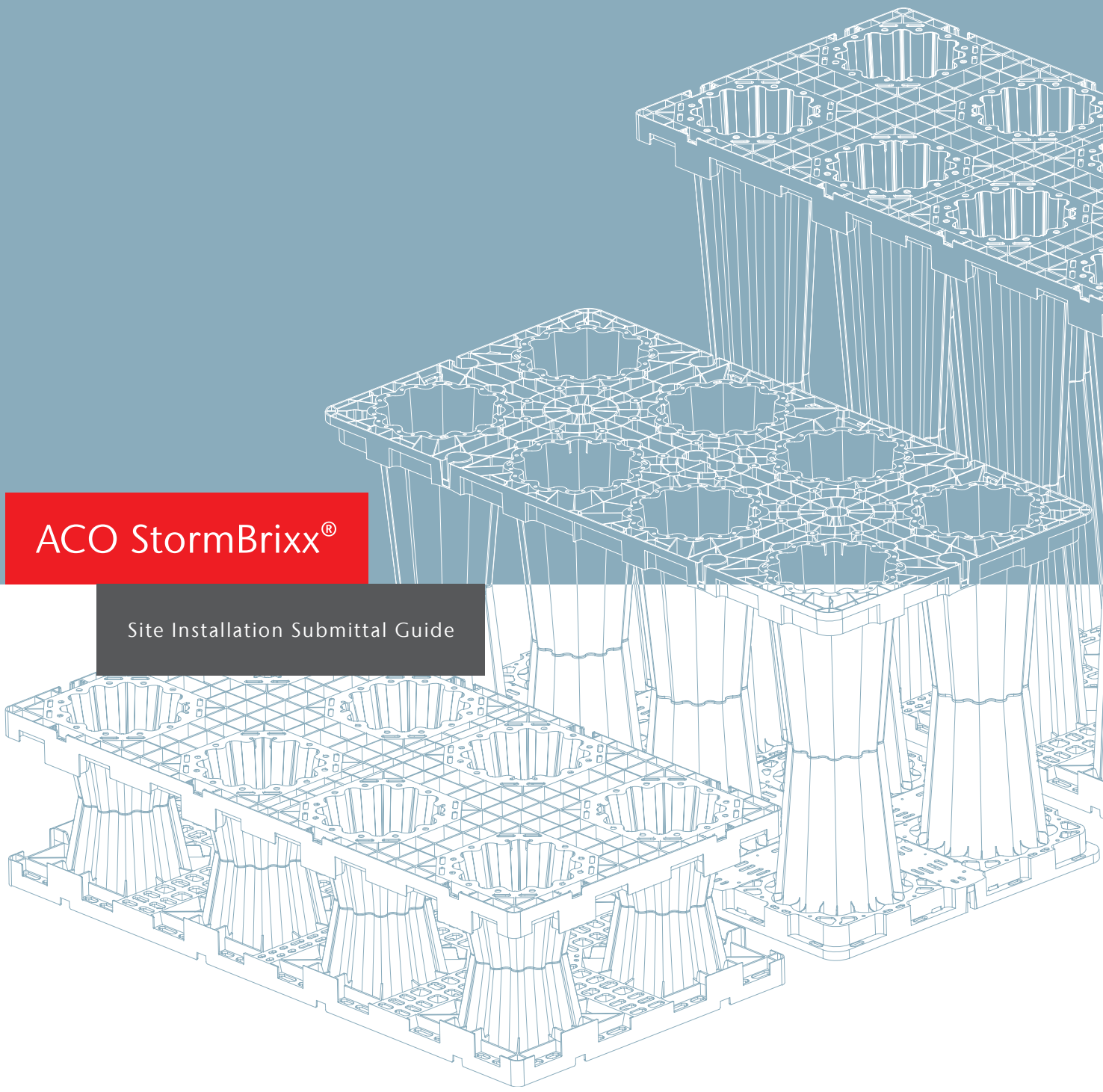
ACO StormBrixx®

Site Installation Submittal Guide



StormBrixx® 300

StormBrixx® 600

StormBrixx® 900

Outline

ACO. we care for water

Introduction

ACO StormBrixx Modules are easily assembled with each Half-module interlocking using our patented brick-bonding method to create the stormwater management tank. Side panels, top covers, and top plates are then used to enclose the tank. Accessories such as the Inspection Point, Remote Access Plate, and the remote access unit provide inspection and maintenance points.

Open design allows for easy access to clean. When properly designed, installed, and maintained, StormBrixx systems are engineered to achieve a 50+ year design life.

Getting Started

Tools Needed:

- Sand Bags or other stabilizing tools
- String Line
- Marking Paint
- Laser or transit
- Measuring Tools
- Razor knife (for cutting geosynthetics)
- Screw driver/nut driver set (for pipe boots)
- Reciprocating saw (to cut in pipe connections and Inspection Points)

Materials Needed:

- StormBrixx Modules and Accessories (See Bill of Materials)
- 6 oz/square yard Non-Woven Geotextile Fabric or otherwise specified
- 30 mil Impermeable Geomembrane or otherwise specified (if required by plans)
- Stainless Steel Bands (for pipe boots)
- Bedding & backfill material as required (see installation drawings)

Equipment Needed:

- Forklift and other equipment/tools to unload truck
- Pallet jack (to unload material from a box truck)
- Backfill placement and compaction equipment - see site traffic considerations

Fill Material Considerations

Fill Table

Material Location	Description	Material Classification	Compaction/Density Requirement[4]
Final Fill[1,2] Fill starting from top of the embedment fill layer	Suitable fill materials as noted in Project Geotechnical Report and Site Design Engineer Plans	See Project Geotechnical Report and Site Design Engineer Plans	Plate compact or static roll loose lifts to densify fill. Loose-lift thickness should be selected based on compaction equipment used. Use at least two full passes of eqipment to level layer. Continue until 24" of total fill thickness has been placed above the tank. For AASHTO M145 soils, a minimum of 95% of Standard Proctor Maximum Dry Density is recommended. After 24" of fill is placed, place fill in accordance with the engineer of record's relative compaction requiremnt or the 95% of Standard Proctor Maximum Dry Density is recommended.
Embedment Fill[3] Fill immediately surrounding sides and top of tank	Sand/gravel mixtures or open-graded crushed aggregate blends	AASHTO M145 A-1, A-2-4, A3 OR AASHTO M43 3, 357, 4, 467, 5, 56, 57	Plate compact or static roll loose lifts to densify fill. Loose-lift thickness should be selected based on the compaction equipment used. Use at least two full passes of eqipment to level layer. For AASHTO M145 soils, a minimum of 95% of Standard Proctor Maximum Dry Density is recommended.
Bedding Fill[3] Fill immediately below tank			

Notes:

1. *This layer can include pavement subbase*
2. *If open-graded aggregates are used for embedment fill, fines migration from the final to embedment fill layer may be reduced by installing a layer of 6 oz non-woven geotextile fabric at the final and embedment fill interface.*
3. *Import or native soils may be used if the soils meet the material classification listed. Fill material should be selected based on classification, groundwater conditions, and tank invert elevation.*
4. *See Construction Equipment Table (page 14) for more information for construction equipment limitations.*

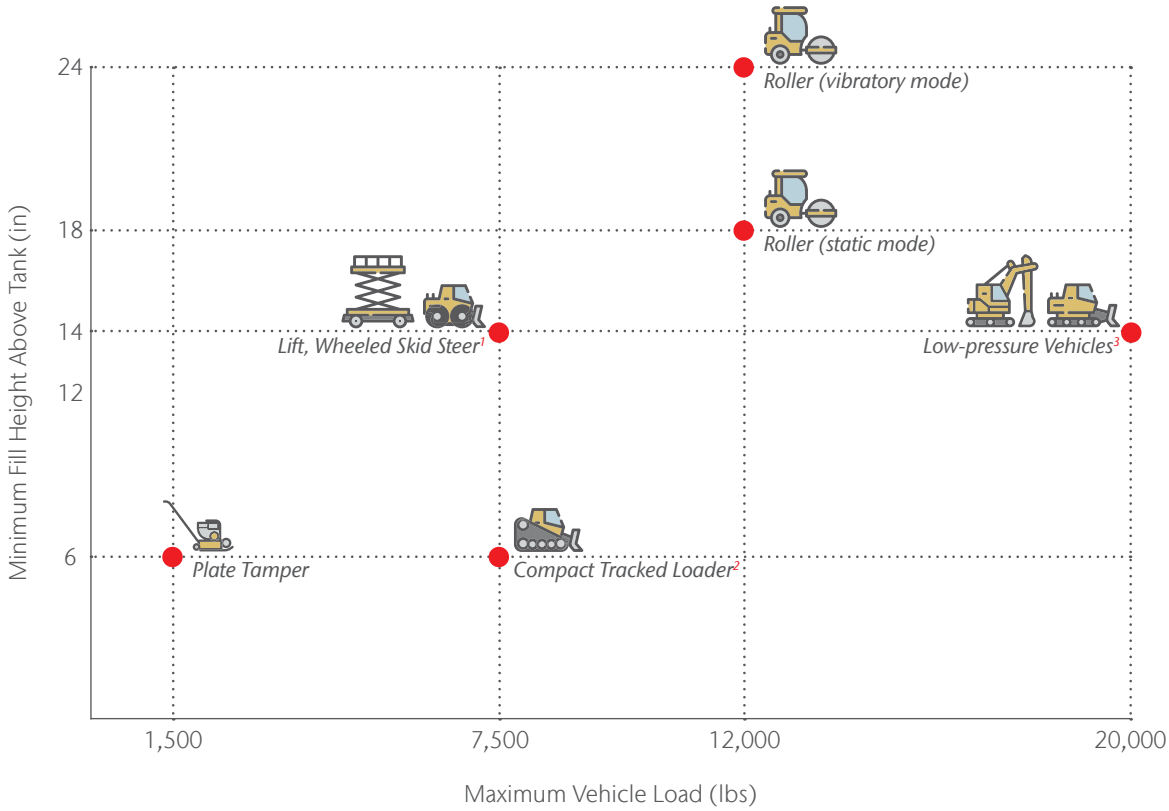
Site Traffic Considerations

Construction Loads

Construction loads are often the heaviest loads the system will experience. Care must be taken during backfilling and compaction, and post-installation construction traffic should be routed around the system if possible. If equipment must traffic the tank footprint, use the chart below to guide equipment selection to reduce risk of system damage.

ACO recommends dumptrucks, pans, and concrete trucks do not traverse system during construction. Contact ACO Technical Services for further guidance regarding these vehicles.

All vehicles should ONLY make straight runs across tank footprint.



Notes:

1. *Maximum axle load = 5,250 lbs for lift or wheeled skid steer*
2. *Maximum ground pressure = 5 psi for compact tracked loader*
3. *Maximum ground pressure = 7 psi for low-pressure tracked vehicles*

Proofrolls During Construction

Proofrolling is an important process to approve subgrade conditions prior to pavement or slab construction. To protect the StormBrixx system, we recommend the following proofroll parameters:

Fill Thickness ≤ 32" Above Tank at Time of Proofroll	Evaluate subgrade using hand tools such as t-handled probes or dynamic cone penetrometers taking care to not puncture geosynthetics.
Fill Thickness > 32" Above Tank at Time of Proofroll	Evaluate subgrade using a truck with a maximum axle weight of 32,000 lbs.

Site Preparation

Excavation and Subgrade Preparation

Excavation

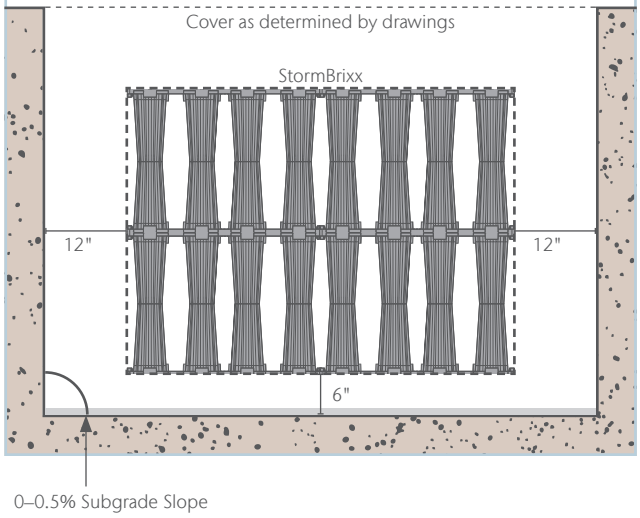
- Layout and excavate per approved plans. The excavation should follow all relevant local, state, federal and OSHA guidelines.
- Bottom of excavation elevation must be a minimum of 6" below designed StormBrixx invert.
- The excavation should extend a minimum of 12" laterally from the edge of the StormBrixx tank or large enough to accommodate selected compaction equipment, whichever is greater.

Subgrade Preparation

- Subgrade conditions below the StormBrixx shall be evaluated as indicated in the project Geotechnical Report.
- Subgrade evaluation and preparation shall follow the recommendations in the Geotechnical Report and Civil Engineering Plan Set.
- Support conditions should be verified in the field by a qualified Geotechnical testing firm.

NOTE: Subgrade preparation requirements will vary based on site conditions. Consult project Geotechnical Report and ACO for assistance.

Excavation and Subgrade Preparation Section View

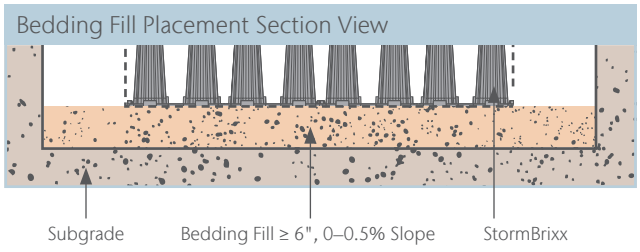


Bedding Fill Placement

- Bedding fill shall meet material and compaction requirements in the Fill Chart (see "StormBrixx Backfill" section). ACO recommends a minimum bedding layer thickness of 6".

NOTE: It is critical for system construction that the bedding fill surface be uniform and level (maximum of 0.5% slope). If bedding fill is loosened or disturbed during installation, the contractor should recompact and level the bedding fill.

Bedding Fill Placement Section View



Site Preparation (cont.)

Geosynthetics Installation (Geotextiles and Geomembranes)

1. Install specified geomembrane and/or geotextile in panels of proper length, and place over subgrade on the bottom of the excavation. The geosynthetics should extend beyond the edge of the excavation such that adequate overlap can be provided when tank is wrapped. Adjacent panels of material should be overlapped by a minimum of 12" or as specified by geosynthetic manufacturer.

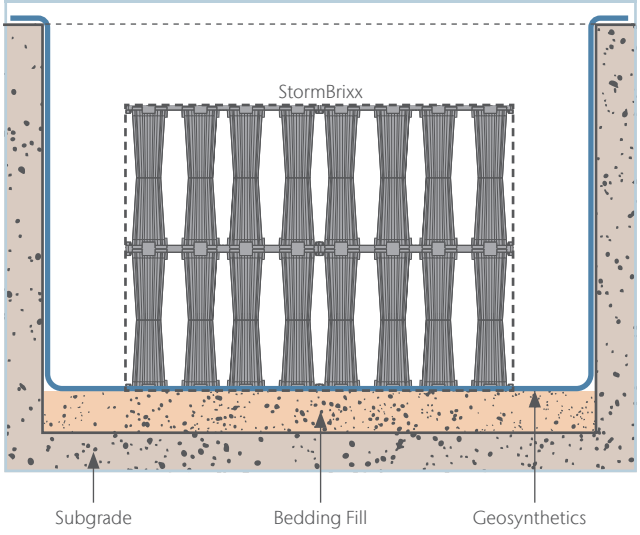
2. Use pins, staples, sandbags to hold geotextile in place, preventing it from blowing or sliding out of position.

3. Patch holes made in the geosynthetic by placing small patch of fabric over damaged area. The patch should be sized to provide adequate lap based on guidance from geosynthetic manufacturer.

4. If additional geosynthetics are required, install as shown on project plans.

NOTE: ACO does not provide geosynthetics with StormBrixx systems. These materials should be purchased separately. Please consult with geosynthetics manufacturer for product selection and installation.

Geosynthetics Installation Section View



Tank Assembly

1 Determine Starting Location

ACO recommends using an inlet pipe, outlet pipe or control structure as a guide. Using a string line, establish two adjacent edges of the ACO StormBrixx footprint and ensure the corner is square. Mark these two edges with marking paint and remove string line.

NOTE: Care should be taken to repair geosynthetics fabric that is punctured or torn during the layout process.

2 Third-Party Concrete Control Structures

(Skip this step if Third-Party Concrete Control Structures Units are not used.)

Rectangular concrete control or similar structures may be placed within the tank footprint along the perimeter to allow system access for larger inlet pipes.

2.1 Place control structure directly onto geosynthetic layer(s) prior to placing StormBrixx Half-modules such that the Half-modules are flush with the control structure.

Figure 1: Module Install Plan View

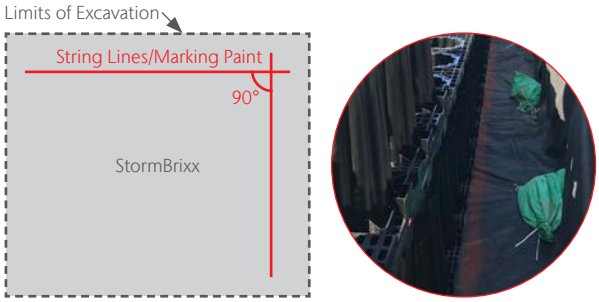
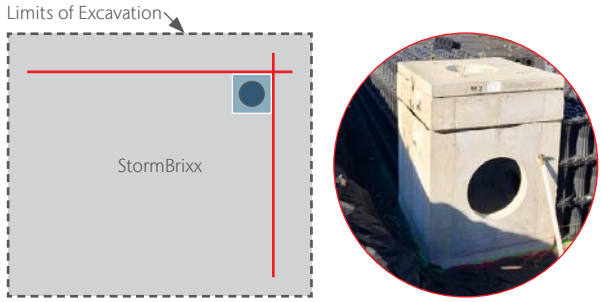


Figure 2: Module Install Plan View

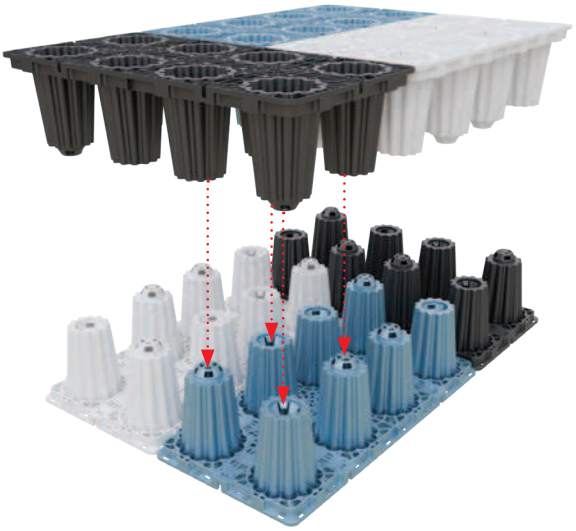


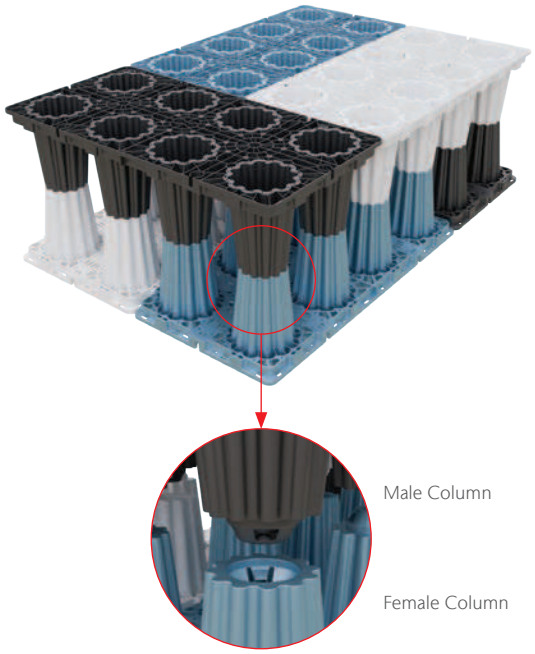
Tank Assembly (cont.)

3 Placing the Modules

Brick-bonding

ACO-provided layer orientation drawings are created with brick-bonding in mind. Brick-bonding is performed by connecting a bottom Half-module and a top Half-module perpendicular to one another by four end columns as seen below. Ensure that column connections align properly with all adjacent Half-modules to fit.



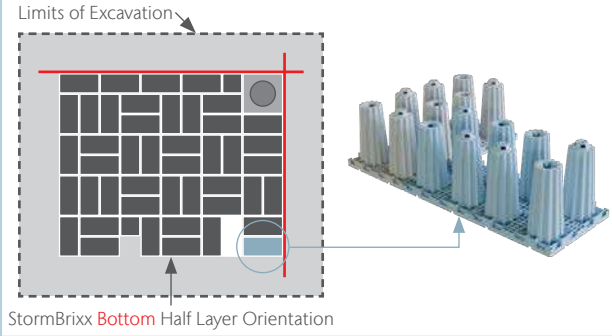


3.1 Place Half-modules in the corner of the marked area based on the ACO-provided layer orientation drawings.

NOTE: Do NOT place units on their sides. Check plans to ensure the correct orientation of the system. StormBrixx units should fit together evenly, variations in the height of the layers (< ½") are acceptable, but reasonable efforts should be made to minimize these. If gaps or height variations persist through 3 or more adjacent units, remove Half-modules and pull back the textile to repair and flatten base.

Because Half-modules come palletized, they can be staged near or within the excavation to increase installation efficiency.

Figure 3.1: Module Install Plan View



3 Placing the Modules (cont.)

3.2 As Half-modules are installed, take note of locations for Remote Access Unit(s) and Remote Access Plate(s), which may require Half-modules to be cut in half to create 2' by 2' voids for access. Vertical pipe penetrations for Inspection Points should be cut into each Half-module EXCEPT THE BOTTOM HALF LAYER prior to installation. Install Remote Access Plates and/or Remote Access Units as shown on the layer orientation drawings.

NOTE: See the steps # and # for more information on Remote Access Plate and Remote Access Unit installation, respectively. See step # for Inspection Point installation.

3.3 *(Skip to Step 6 if the tank has a 1-layer system height.)*

Continue to place Half-modules based on the layer orientation drawings to complete the first 1/2 layer. Install Remote Access Units as needed. The next 1/2 layer of Half-lodules may then be placed via brick-bonding method to achieve a 1-layer system height.

NOTE: It is important to follow the ACO-provided layer orientation drawings to ensure brickbonding between Modules. See Figures 3.2 and 3.3 for examples of a bottom and top half layer orientation drawings.

Figure 3.2: Module Install Plan View

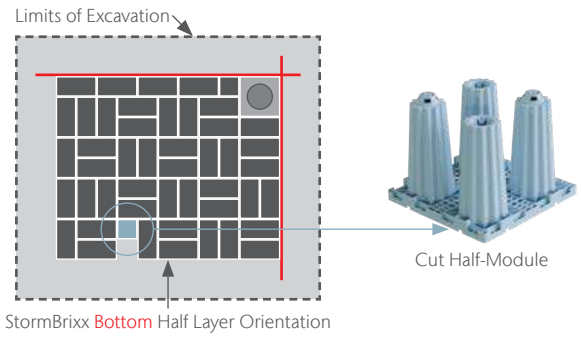
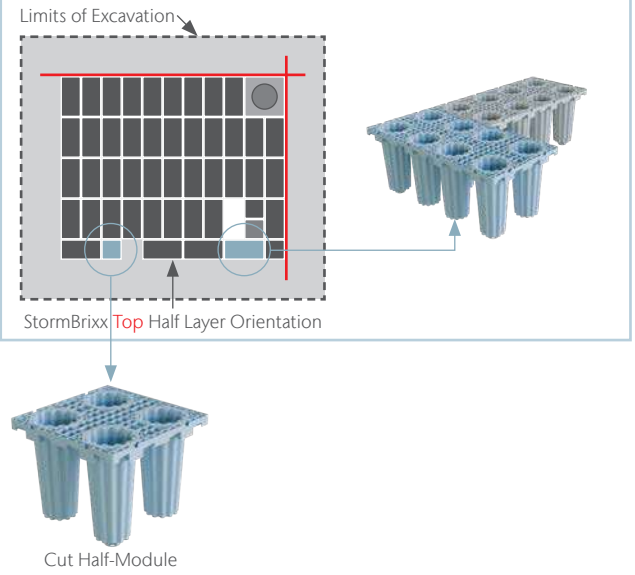
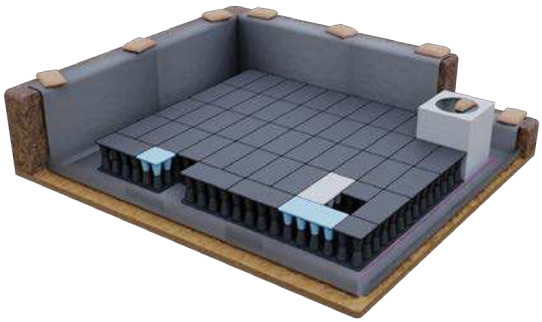


Figure 3.3: Module Install Plan View





Tank Assembly (cont.)

4 Layer Connectors

(System heights higher than 1 layer only.)

Before starting a 2nd, 3rd, or 4th layer, install Layer Connectors to help prevent lateral movement during installation. A minimum of 2 Layer Connectors per Module around the tank perimeter and 2 Layer Connectors per Remote Access Unit are recommended. See Figures 4 and 5 for examples.

5 Remote Access Units

(Skip this step if Remote Access Units are not used.)

Remote Access Units are installed at designated locations where Half-module bodies have been cut in half (i.e. approximate 2' by 2' void)

5.1 Prior to Remote Access Unit installation, cut pipe penetrations into Unit sidewalls and/or bottom as indicated on project drawings.

NOTE: Remote Access Units can accommodate up to 15" diameter pipe penetrations.

5.2 Place Remote Access Units at designated locations, starting from bottom layer of tank and stacking up to the top of tank.

NOTE: Use layer connectors at Remote Access Units (see step 4).

Figure 4: Module Install Plan View

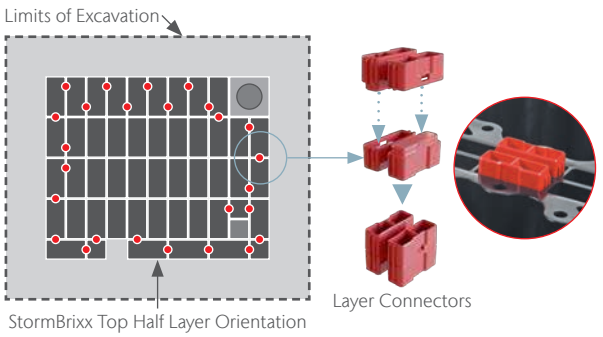
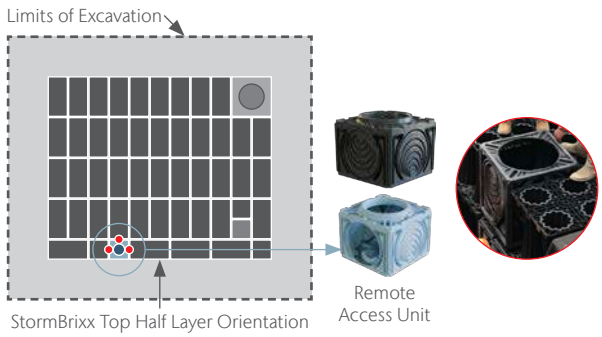
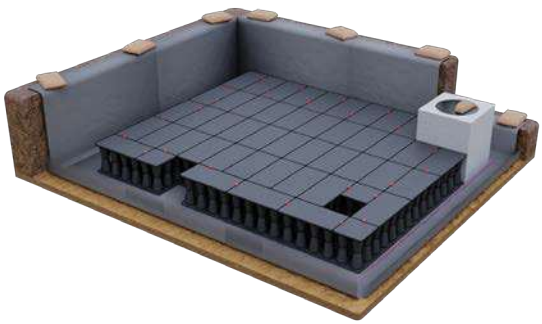
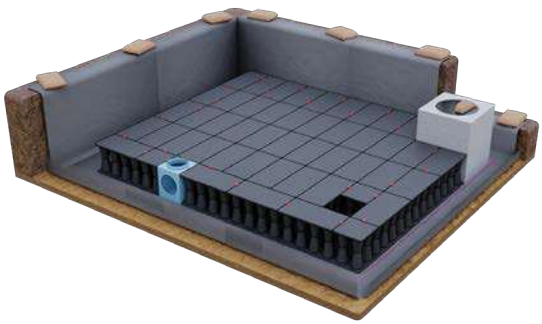


Figure 5: Module Install Plan View







Tank Assembly (cont.)

6 Side Panels

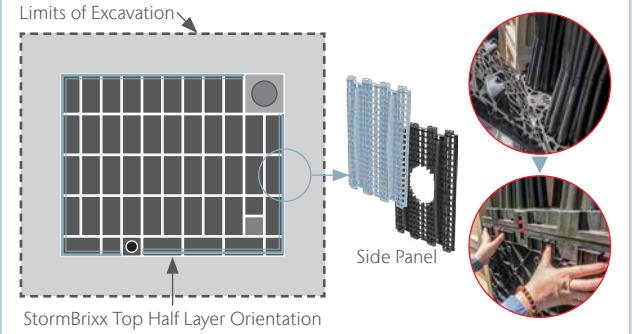
6.1 Side Panels are added to system perimeter by clicking them into place—bottom first then top—to enclose tank.

6.2 Cut pipe penetrations in side panels prior to installing Side Panel. See project drawings for pipe location and diameter.

NOTE: StormBrixx System can accommodate larger pipe sizes through use of multiple Side Panels or concrete control structures.

Side Panels are NOT required between the stacked modules and adjacent concrete control structures. See your project-specific plan set or contact ACO for more information.

Figure 6: Module Install Plan View



7 Top Covers or Half-Layer Top Plates

Top Covers or Half-Layer Top Plates cover the top system layer's pillars, ensuring vertical support for the cover fill material and avoids membrane being pushed into tank.

7.1 Top Covers are used for whole-number layer systems (e.g. 1-layer, 2-layer, etc). Half-Layer Top Plates are used for half-layer systems (e.g. 0.5-layer, 1.5-layer, etc.). Skip to step 7.3 if using Half-Layer Top Plates.

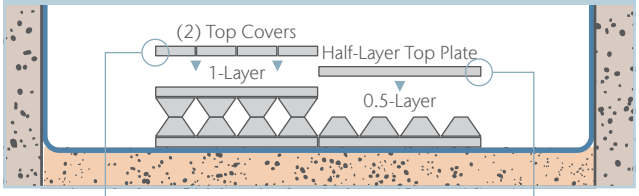
7.2 Each Half-module requires two Top Covers. Align the cover with four pillars on each half and push into place.

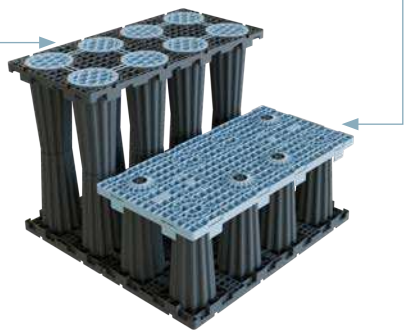
7.3 Each Half-module requires one Half-Layer Top Plate. Prior to installing, pre-cut plates to accommodate Remote Access Plate or remote access unit installation and any vertical pipe penetrations.

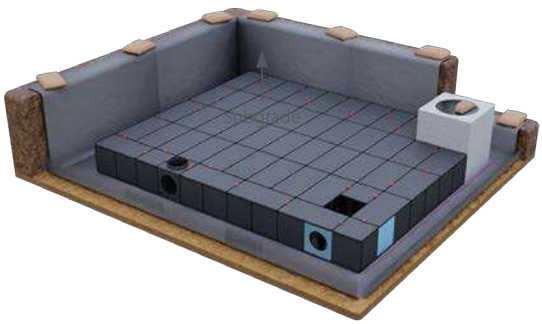
7.4 Align the plate with the pillar configuration on each Half-module and snap into place.

Note: See step # for more information on Top Cover and Half-Layer Top Plate penetration for Inspection Points.

Figure 7: Module Installation Section View







Tank Assembly (cont.)

8 Remote Access Plates

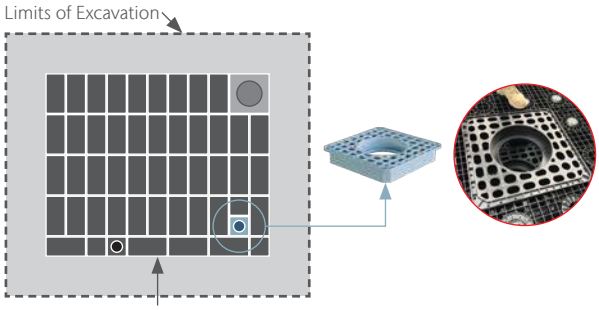
(Skip this step if Remote Access Plates are not used.)

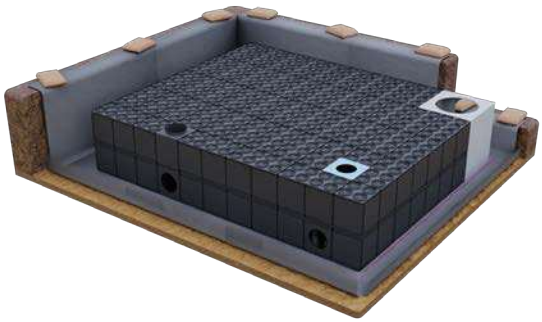
Remote access plates are installed at designated locations where Half-modules have been cut in half and an approximate 2' by 2' void is present at the top of the tank.

8.1 Place the access plate at the top of the tank at the designated location.

NOTE: Remote Access Plates require support on all four sides. Do NOT install access plates along the perimeter of the tank.

Figure 8: Module Install Plan View





Wrap & Fill

9 Geosynthetic Wrap

Upon completion of ACO StormBrixx Tank assembly, complete geosynthetic wrap of the system. Geotextile fabric is wrapped and secured per the manufacturer's recommendations. Geomembrane seams shall be joined per manufacturer's recommendations.

If damage occurs to the geotextile fabric or impermeable membrane liner, repair material in accordance with the geotextile/liner manufacturer's recommendations.

9.1 Cut panels of geosynthetics and install to provide full wrap of top and sides of tank. Fabric should be cut and installed to provide the minimum fabric lap per manufacturer.

9.2 If geomembrane is utilized, the seams shall be mechanically fastened or adhered per the manufacturer's installation instruction to provide sealed container. HEAT BONDING IS NOT AN ACCEPTABLE BONDING METHOD.

9.3 Fold geotextiles for outside corners and lay excess material flat against the StormBrixx tank. Leave corners loose to avoid creating weak spots in the material and temporarily secure excess fabric with duct tape. Use duct tape, sand bags or other ballast to temporarily secure overlaps.

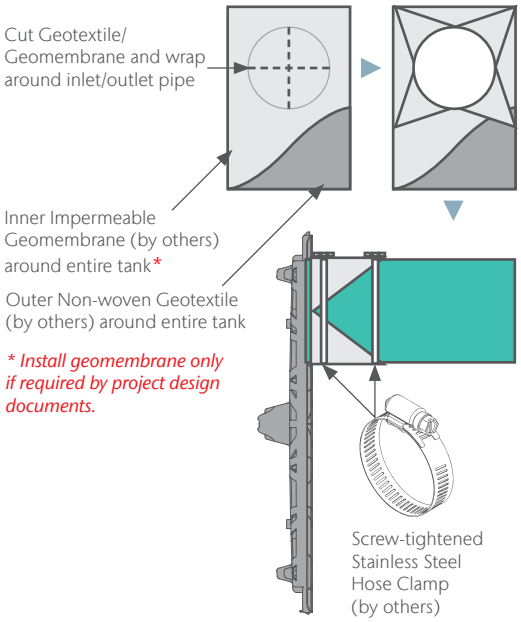
9.4 Walk bottom edge of geotextile along sides of StormBrixx tank to eliminate gaps between the fabric and the bottom corner of the system.

Wrap & Fill (cont.)

9 Geosynthetic Wrap (cont.)

9.5 To allow for pipe, Inspection Points, and Extension Shaft perforations in the geosynthetic layers, follow Figure 9.4 pipe wrap detail. See Step 11 for pipe installation details.

Figure 9.4: Pipe Wrap Detail



10 Inspection Points

(Skip this step if Inspection Points are not used.)

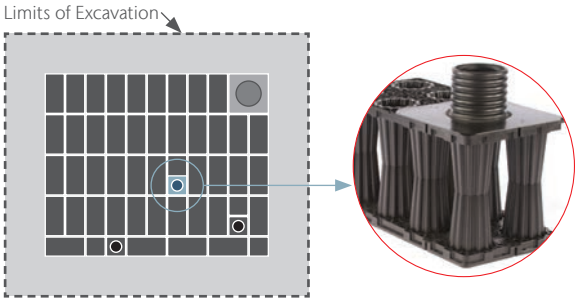
Inspection Points are installed at designated locations where holes have been cut in Half-Layer Top Plate or Half-module to provide inspection access into tank.

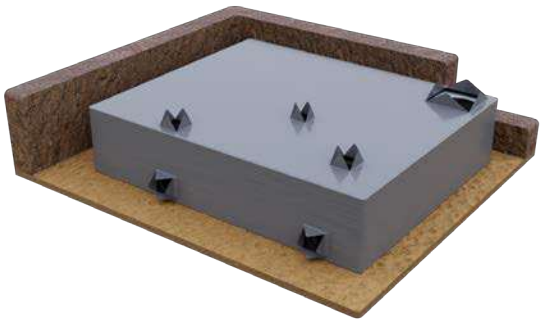
10.1 Place vertical Inspection Point connector over center of the hole, ensuring that its flange covers all four pillars.

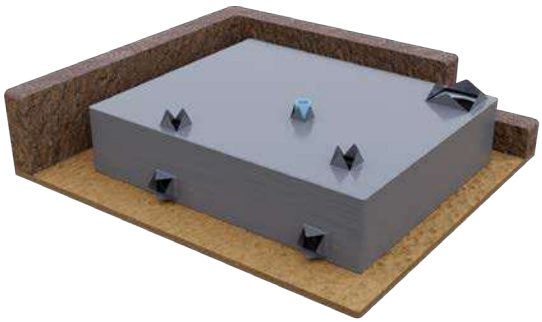
10.2 Using plastic rivets, fix flange to Half-Layer Top Plate or Half-module.

NOTE: Inspection Points should be aligned with one half of a Half-module (See Rendering below). It should NOT be placed in the center of the Half-module.

Figure 8: Module Install Plan View



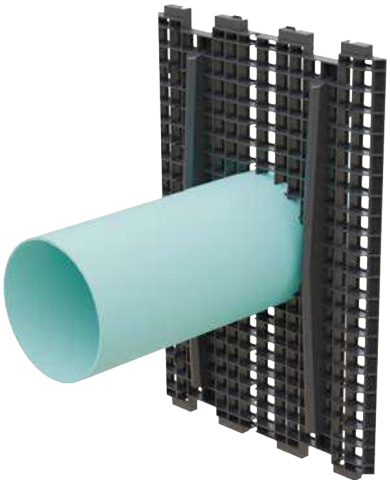




Wrap & Fill (cont.)

11 Pipe Install

For horizontal pipe connections, slip-fit pipe into previously cut holes within Side Panel or Remote Access Unit. Extend pipe a minimum of 2" into the system.

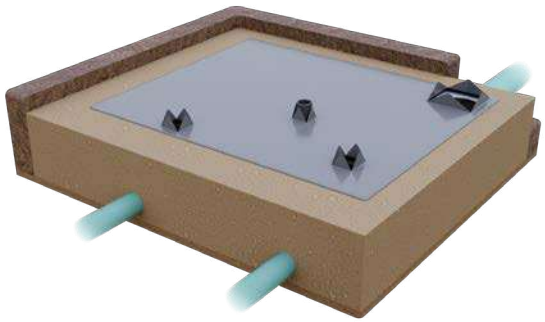


12 Backfill

Once geosynthetics are secured, begin to place backfill.

12.1 Place backfill material around perimeter of the ACO StormBrixx tank distributing material evenly to prevent movement of StormBrixx Modules. All backfill material must meet requirements listed in specifications.

12.2 Follow fill materials and compaction requirements as shown on page 13.



Access and Inspection

13 Extension Shafts (with or without Pipe Socket)

Both types of extension shafts are installed at Remote Access Plate or Remote Access Unit locations to allow access from ground surface.

13.1 Fit Shaft into the Plate or Unit hole. It should be a snug fit.

13.2 Place the next shaft into the top of the previous shaft. It should be a snug fit.

13.3 Repeat step 13.2 until the desired Shaft height is achieved.

NOTE: Prior to placing the final Shaft, cutting may be required to reach the desired total shaft height. If using the Extension Shaft with Pipe Socket, install pipes after installing the shaft. Extension Shafts are NOT used for Inspection Points.

Figure 13.1: Module Installation Section View

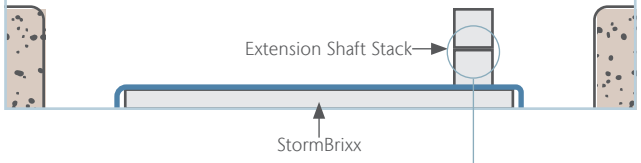
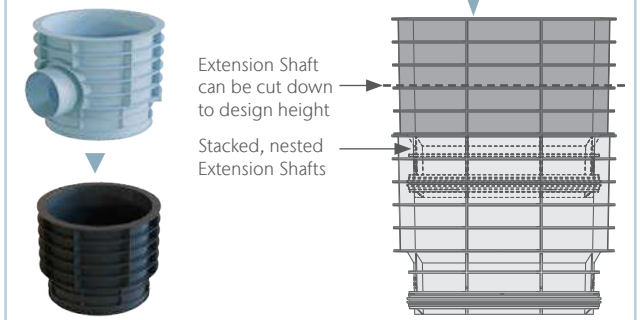
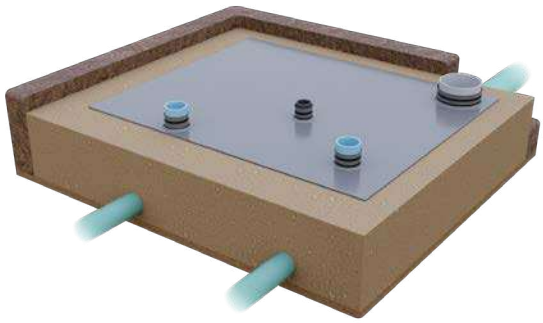


Figure 13.2: Extension Shaft Detail





14 Remote Access and Inspection Point Covers

14.1 Install third-party concrete load distribution ring as designed by civil engineer of record prior to installing covers.

14.2 Install cover at location indicated on project drawings.

NOTE: Vented or Non-Vented Remote Access Covers should be specified by the designer.

14.3 Follow other surface finishing details (e.g. surface concrete box-out) as specified by designer engineer of record.

Figure 14.1: Module Installation Section View

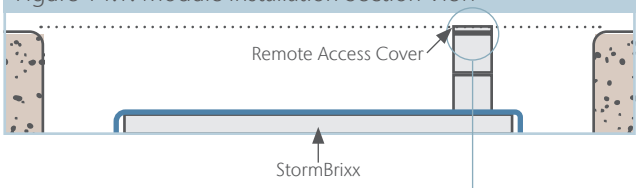
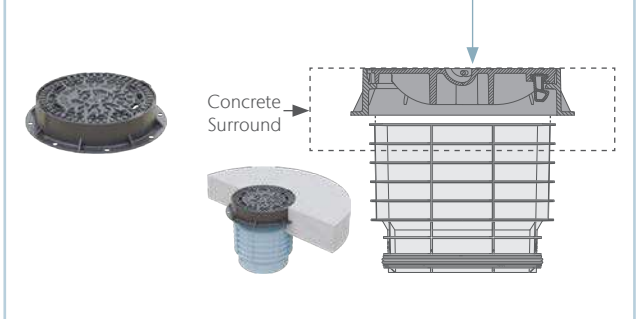
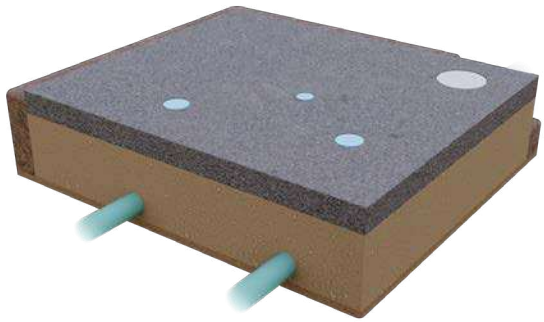


Figure 14.2: Remote Access Cover Detail





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