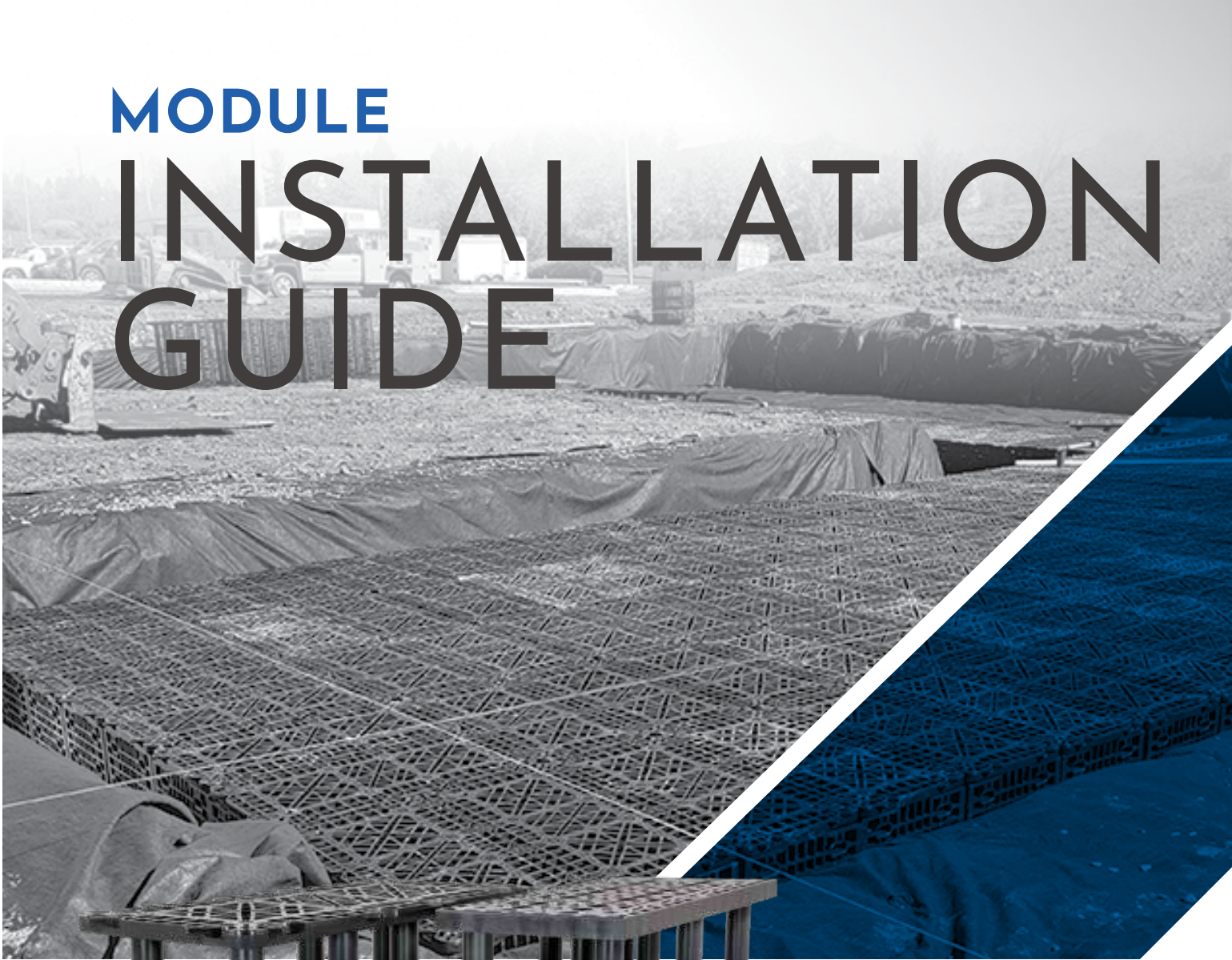


MODULE

INSTALLATION GUIDE



A BRAND OF  BRENTWOOD

 **STORMTANK**[®]
Expect Results[™]

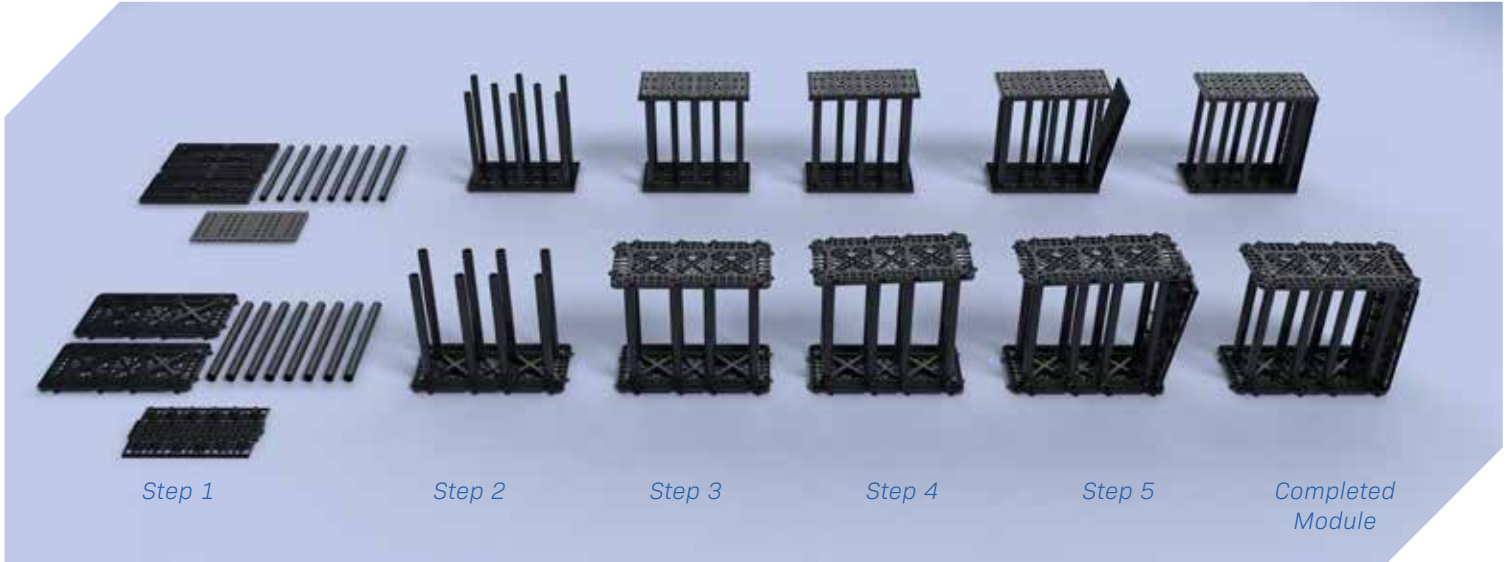
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GENERAL NOTES

1. Review installation procedures and coordinate the installation with other construction activities, such as grading, excavation, utilities, construction access, erosion control, etc.
2. Engineered drawings supersede all provided documentation, as the information furnished in this document is based on a typical installation.
3. Coordinate the installation with manufacturer's representative/distributor to be on-site to review installation instructions.
4. Components shall be unloaded, handled and stored in an area protected from traffic in a manner to prevent damage and UV degradation.
5. Assembled modules may be walked on, but vehicular traffic is prohibited until backfilled per Manufacturer's requirements.
6. Ensure all construction occurs in accordance with Federal, State and Local Laws, Ordinances, Regulations and Safety Requirements.
7. Extra care and caution should be taken when temperatures are at or below 40° F (4.4° C).
8. Check for any damaged material, report damage to a StormTank® Representative. All plastic wrap should be removed to prevent damage from heat or UV.
9. The StormTank® Module carries a Limited Warranty, which can be accessed at www.stormtank.com.

1.0 MODULE ASSEMBLY



Step 1:

Prepare the material to be assembled. Required materials include (2) Platens, (8) Columns, (1) Side Panel. (1) 1lb. Rubber Mallet. Note: Side panels only required on perimeter modules, refer to your project's layout drawings for perimeter module locations.

Step 2:

Place a platen on a firm level surface and insert the (8) columns into the platen receiver cups. Firmly tap each column with a rubber mallet to ensure the column is seated.

Step 3:

Install the top platen by aligning the receiver cups with the columns, or flip the previously assembled components upside down onto the second platen, aligning the columns into the platen receiver cups.

Step 4:

Once aligned, seat the top assembly by alternating taps, with a rubber mallet at each structural column until all columns are firmly seated.

Step 5:

If side panels are required, Prior to seating the edge column into the receiving cups, insert the side panel into the bottom platen.

Step 6:

Align the top of the side panel with the top platen and firmly seat the top platen utilizing a rubber mallet.

Completed Module

A completed module can support vehicular loading when installed per manufacturer recommendations.

2.0 EXCAVATION

1. Stake out and excavate, in accordance with OSHA regulations, to elevations per approved plans. Excavation Requirements:
 - a. Recommended Sub-grade excavation is a minimum of 6" (152 mm) below designed Module invert.
 - i. A 4" (102 mm) leveling bed may be acceptable, contact your StormTank Representative for further details.
 - b. The excavation should extend a minimum of 12" (305 mm) beyond the module unit's dimensions in each length and width to allow for adequate placement of side backfill material.
 - c. Remove objectionable material encountered within the excavation, including protruding material from the walls.



3.0 SUB-GRADE PREPARATION

1. Unstable, unsuitable and/or compromised areas should be brought to the Engineer's attention and mitigating efforts determined. Sub-grade shall be unfrozen, free of lumps or debris and contain no standing water or mud.
2. Sub-grade must be prepared, per the Engineer of Record, to provide a minimum bearing capacity and prevent settlement.
 - a. Maximum applicable settlements cannot exceed long-term 1/2" (12.7 mm) differential settlement between any two adjacent units within the system.
 - b. Sub-grade must be designed to ensure soil bearing capacity is maintained throughout all soil saturation levels.

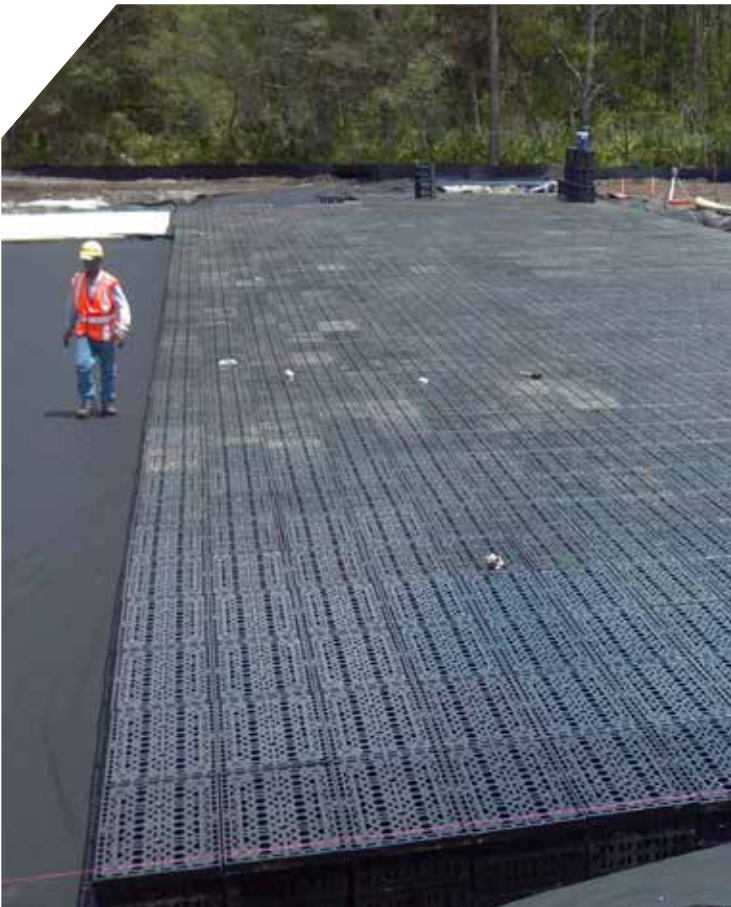
4.0 LEVELING BED INSTALLATION

1. **OPTIONAL:** A layer of geotextile fabric is recommended around the excavation to prevent material migration
 - a. Geotextile fabric shall be placed per geotextile fabric manufacturer's recommendations.
 - b. An impermeable liner may be incorporated to prevent infiltration. If specified, the liner must be installed per liner manufacturer recommendations.
2. Place a Leveling Bed per engineer plans.
 - a. Material should meet Appendix C – Acceptable Fill Material.
 - b. Material should be free of voids, lumps, debris, sharp objects and compacted.



5.0 STORMTANK[®] MODULE PLACEMENT

1. Install geotextile fabric and liner material (if required), as specified.
 - a. Geotextile fabric shall be placed per geotextile fabric manufacturer's recommendations.
 - b. An impermeable liner may be incorporated to prevent infiltration. If specified, the liner must be installed per liner manufacturer recommendations.
2. Mark the footprint of the modules for placement.
 - a. Ensure module starting point is square prior to Module placement, this will ensure proper layout of units.
 - b. Care should be taken to note any connections, ports, debris rows or other irregular units to be placed.
3. Install the individual modules by hand, as detailed below.
 - a. The modules should be installed as shown in the StormTank submittal drawings with the short side of perimeter modules facing outward, except as otherwise required.
 - b. Make sure the top/bottom platens are in alignment in all directions.
 - c. For double stack configurations (25 Series ONLY):
 - I. Install the bottom module first. **DO NOT INTERMIX VARIOUS MODULE HEIGHTS ACROSS LAYERS.**
 - II. Insert stacking pins (2 per module) into the top platen of the bottom module.
 - III. Place the upper module directly on top of the bottom module in the same direction, making sure to engage the pins.
4. Install the modules to completion, taking care to avoid damage to the geotextile and/or liner material.



5.0 STORMTANK[®] MODULE PLACEMENT

5. Locate any ports or other penetration of the Modules.

5.1. For Observation Ports:

- a. Layout and cut opening into the top platen per standard Observation Port Detail.
- b. Place port into opening, (Module 25 Series Only: use stacking pins to locate flange plate).
- c. If port is along the perimeter, cut the flange plate flush with the edge of the end Module.

5.2. For Connections:

- a. Locate and mark the connection opening in the side panels.
- b. Remove side panels and cut opening.
- c. Reinstall side panels.
- d. Install pipe (slip fit)

Note: When performing lateral connections to the Module system, the platens and columns are not to be modified/cut as to not compromise the integrity of the system.

6. Upon completion of module installation, wrap the modules in geotextile fabric and/or liner.



6.0 SIDE BACKFILL

1. Inspect all geotextile, ensuring that no damage exists; which will allow sediment into the module system.
2. Once the geotextile is secured, begin to place the Side Backfill.
 - a. Material should meet Appendix C - Acceptable Fill Material.
 - b. Backfill sides "evenly" around the perimeter without exceeding single 12" (305 mm) lifts.
 - c. Place material utilizing an excavator, dozer, or conveyor boom from the native soil surrounding the excavation, do not directly access the system during side backfilling.
 - d. Compact the backfill material to settle the stone and provide a uniform distribution.



Correctly Backfilled



Incorrectly Backfilled



7.0 TOP BACKFILL

1. Begin to place the top backfill.
 - a. Material should meet Appendix C – Acceptable Fill Material.
 - b. Place material utilizing a low ground pressure (LGP) equipment, dozer (Maximum D5 LGP or similar) or preferably a conveyor boom. **DO NOT DRIVE OR DUMP FROM DUMP TRUCKS DIRECTLY ONTO THE MODULES. DO NOT DRIVE ON THE MODULES WITHOUT A MINIMUM 12" (305 mm) COVER.**
 - c. Compact as required by engineer of record.
 - I. Utilize a static roller producing less than 10 psi per roller, unless otherwise approved, while ensuring a minimum 12" (305 mm) of cover. To do so, a minimum 15" (381 mm) layer of material may be required to account for compaction.
 - II. Sheep foot rollers are not permitted.
2. Upon completion of top backfilling, if specified, wrap the system in geotextile fabric and/or liner per the material manufacturer's recommendations.
3. **OPTIONAL:** Install metallic tape around the perimeter of the system to mark the area for future utility detection.



8.0 SUITABLE COMPACTABLE FILL

Non-Vehicular Areas

1. The minimum total cover allowable is 12" (305 mm).
 - a. This may decrease the depth of top backfill to allow for soil placement.
 - b. By installing less cover, the system is not designed to support vehicular traffic.
 - c. The maximum installation depth shall be based on lateral load calculations using the Rankine Theory and compared to StormTank Module testing results.
2. Finish to the surface and complete with vegetative cover.

Vehicular Traffic Area

1. Place fill onto the geotextile.
 - a. Maximum 12" (305 mm) lifts compacted to meet the Engineer of Record's specification.
 - b. Sub-base materials should be referenced by the approved Engineering Drawings.
 - c. The minimum top cover to finished grade should not be less than 24" (610 mm) for the following load ratings.
 - I. For fully factored HS-20 Loads (Module 20 Series)
 - II. For fully factored HS-25 Loads (Module 25 Series)

Note: Lower cover depths are acceptable depending on loading criteria. Contact your local StormTank representative for more information.
 - d. The maximum installation depth shall be based on lateral load calculations using the Rankine Theory and compared to StormTank Module testing results.
2. Finish to the surface and complete with asphalt, concrete, etc.

Fill and Surface Material Placement

Material Location	Placement Methods	Tired Equipment Limitations	Tracked Equipment Limitations	Roller Limitations
Finished Surface	Material dumping onto system should be limited to paving materials in paver equipment.	Equipment size is limited to ground pressure generated, most standard paving equipment is acceptable. Calculations must be performed to determine maximum allowable equipment.		
Suitable Compactable Fill	Utilize LGP equipment or a conveyor, to place material.	No tired equipment unless approved by the engineer of record.	Low ground pressure equipment, larger equipment must be verified before use.	Static rollers with a maximum pressure of 15 psi, unless verified before use.

Notes:

1. Storage of materials such as construction materials, equipment, soils, etc. over the module system is strictly prohibited.
2. Please contact a Brentwood representative prior to utilization of any equipment not listed above.

APPENDIX A - BEARING CAPACITY CALCULATION

Applicable bearing capacity calculations are per the AASHTO LRFD for Bridge Design. The calculation considers a dead load, based on cover, with a dead load factor of 1.95. In addition, it applies a live load, with a multiple presence factor of 1.2 and a live load factor of 1.75, which is distributed at a 1.15 factor (for aggregate) through the cover depth. If the cover material is soil, this factor is reduced to 1.00.

The following are two examples of that calculation:

1. HS-25 with 24" aggregate and asphalt cover

$$DL = \text{Density} * \text{depth} * DL \text{ Factor} = 140.00 \text{ pcf} * 2.00' * 1.95 = 546.00 \text{ psf}$$

$$LL = P * DLA * MP * LL \text{ Factor} = 20,000 \text{ lbs} * 1 * 1.2 * 1.75 / ((20" + 24" * 1.15) * (10" + 24" * 1.15) / 144)$$
$$LL = 3,379.22 \text{ psf}$$

$$TL = \text{Required Bearing Capacity} = 546.00 + 3,379.22 = 3,925.22 \text{ psf}$$

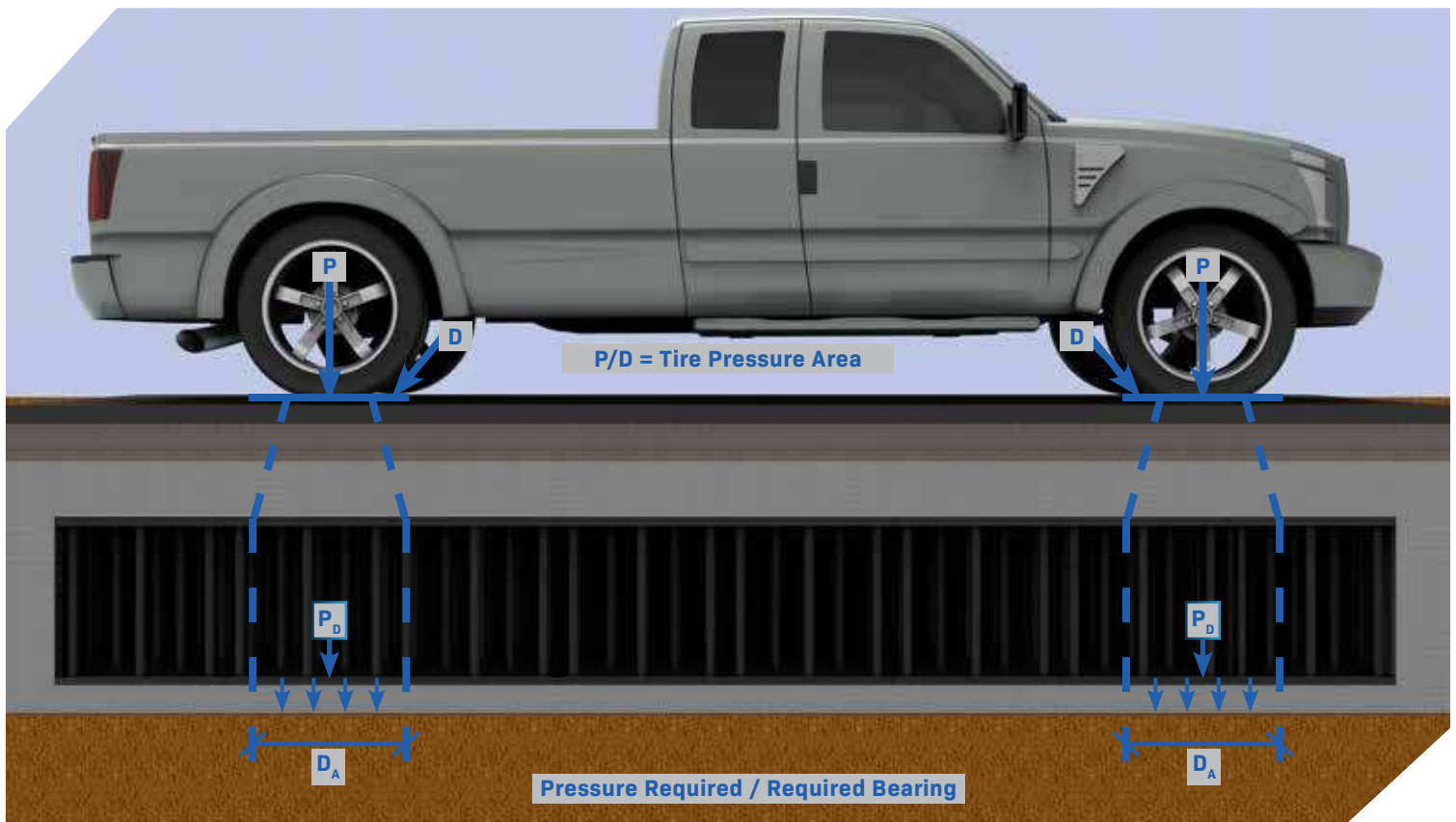
2. HS-20 with 48" aggregate and asphalt cover

$$DL = \text{Density} * \text{depth} * DL \text{ Factor} = 140.00 \text{ pcf} * 4.00' * 1.95 = 1,092.00 \text{ psf}$$

$$LL = P * DLA * MP * LL \text{ Factor} = 16,000 \text{ lbs} * 1 * 1.2 * 1.75 / ((20" + 48" * 1.15) * (10" + 48" * 1.15) / 144)$$
$$LL = 986.82 \text{ psf}$$

$$TL = \text{Required Bearing Capacity} = 1,092.00 + 986.82 = 2,078.82 \text{ psf}$$

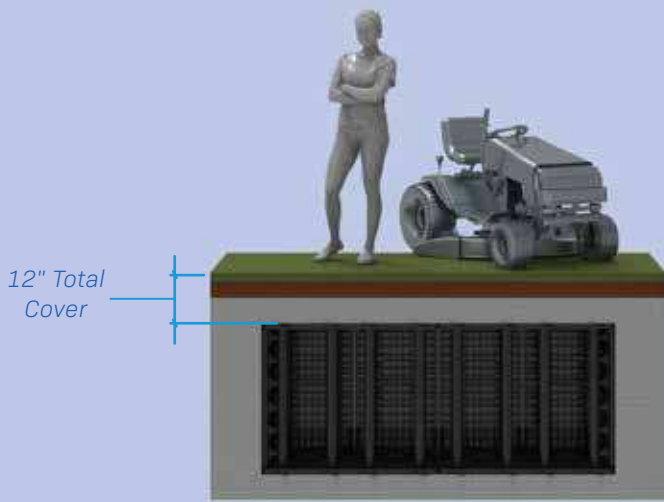
Note: All depths of cover greater than 32" require a minimum bearing capacity of 3.0 ksf.



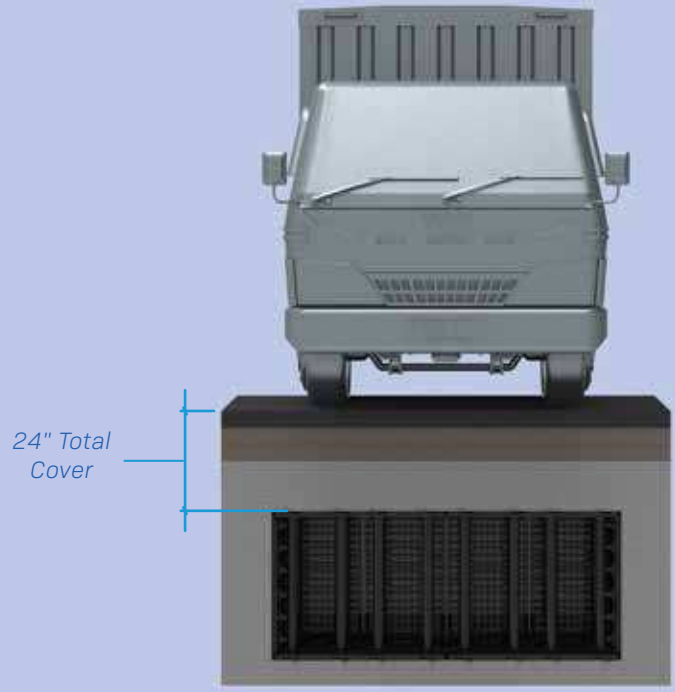
APPENDIX B - MODULE 20 SERIES LOAD RATING

The Module 20 Series has been designed to resist loads calculated in accordance with the American Association of State Highway and Transportation Official's (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design manual. Below are examples of various load ratings the Module 20 Series can achieve with the appropriate cover.

Pedestrian Loads



HS-20 Loads



Model 2036

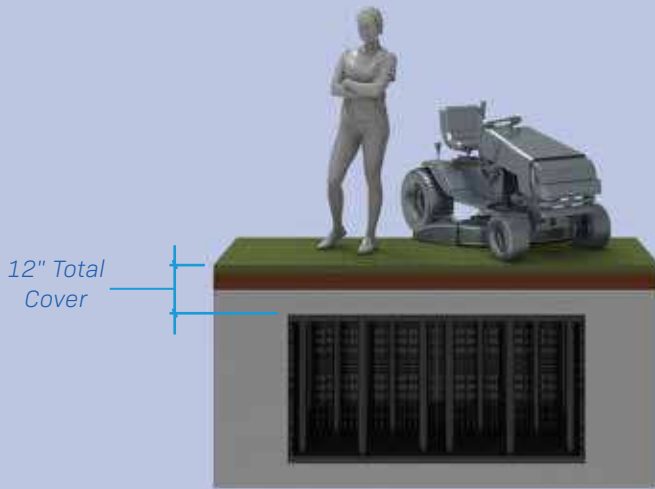
Model 2024

Model 2018

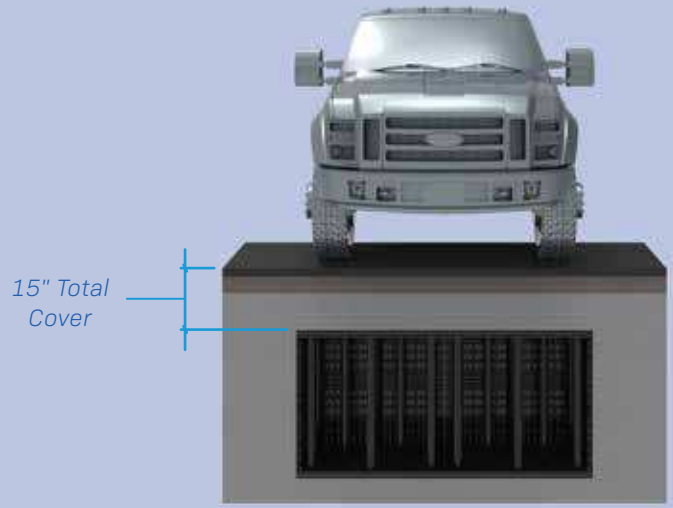
APPENDIX B - MODULE 25 SERIES LOAD RATING

The Module 25 Series has been designed to resist loads calculated in accordance with the American Association of State Highway and Transportation Official's (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design manual. Below are examples of various load ratings the Module 25 Series can achieve with the appropriate cover.

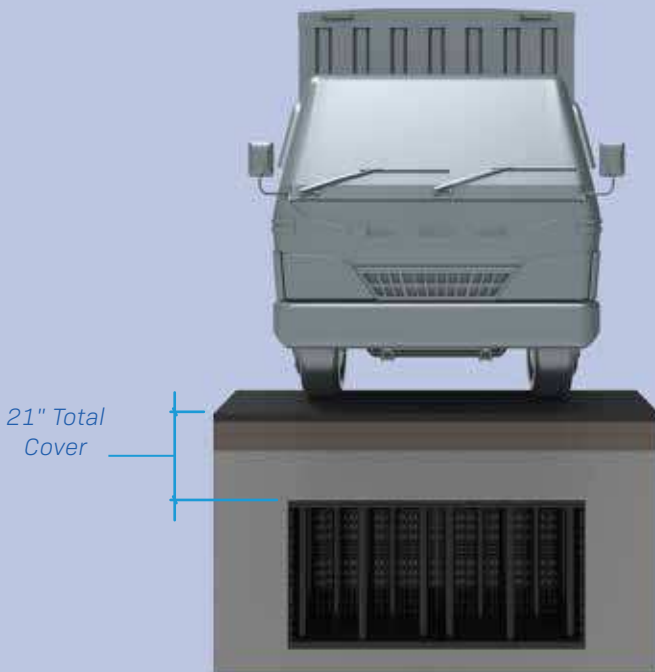
Pedestrian Loads



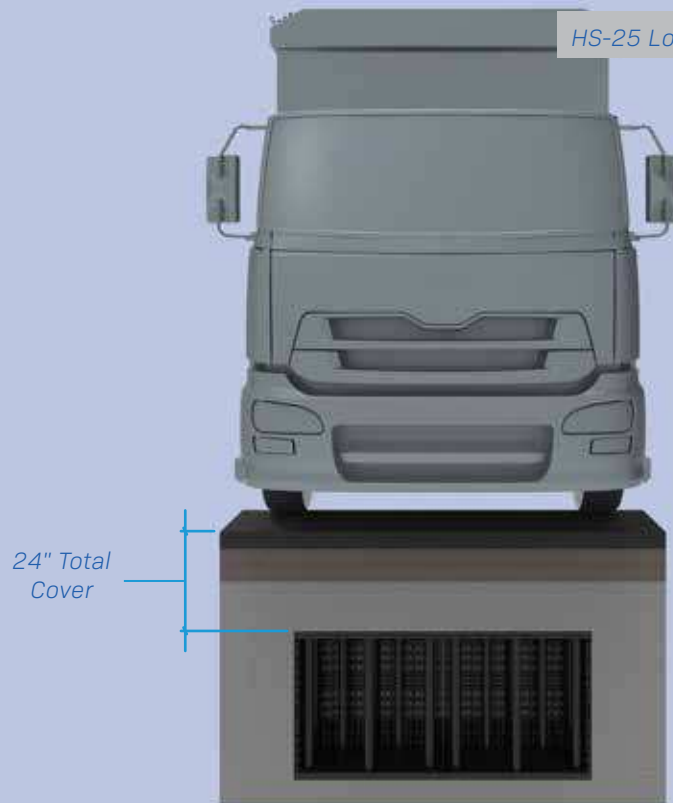
H-10 Loads



HS-20 Loads

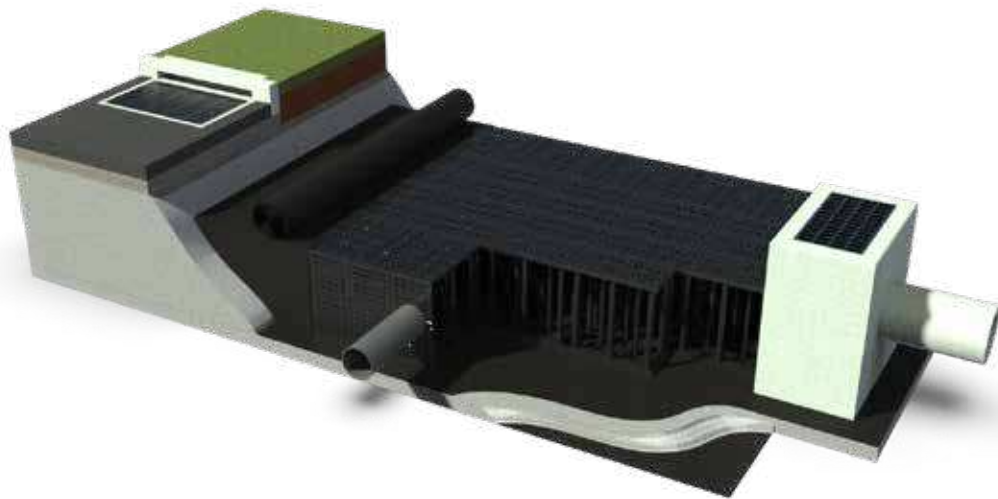


HS-25 Loads



APPENDIX C - ACCEPTABLE FILL MATERIALS

Material Location	Description	AASHTO M43 Designation	ASTM D2321 Class	Compaction/Density
Finished Surface	Topsoil, hardscape, stone, concrete, or asphalt per Engineer of Record	N/A	N/A	Prepare per engineered plans
Suitable Compactable Fill	Well-graded granular soil/aggregate, typically road base or earthen fill (maximum 4" particle size)	56, 57, 6, 67, 68	I & II III (Earth Only)	Place in maximum 12" lifts to a minimum 90% standard proctor density
Top Backfill	Crushed angular stone placed between Modules and road base or earthen fill	56, 57, 6, 67, 68	I & II	Plate vibrate to provide evenly distributed layers
Side Backfill	Crushed angular stone placed between earthen wall and Modules	56, 57, 6, 67, 68	I & II	Place and plate vibrate in uniform 12" lifts around the system
Leveling Bed	Crushed angular stone placed to provide level surface for installation of Modules	56, 57, 6, 67, 68	I & II	Plate vibrate to achieve level surface



Notes:

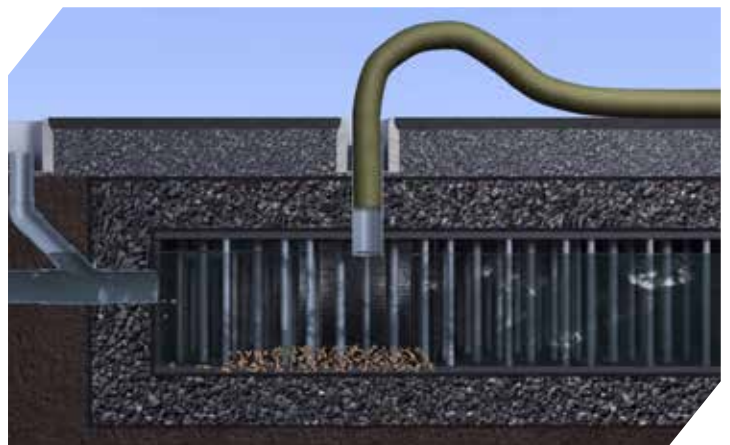
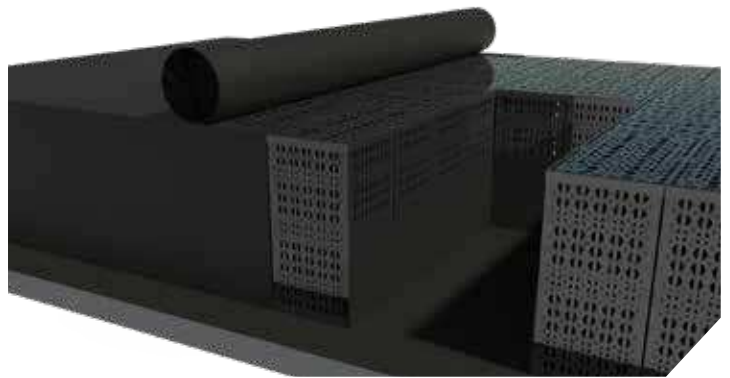
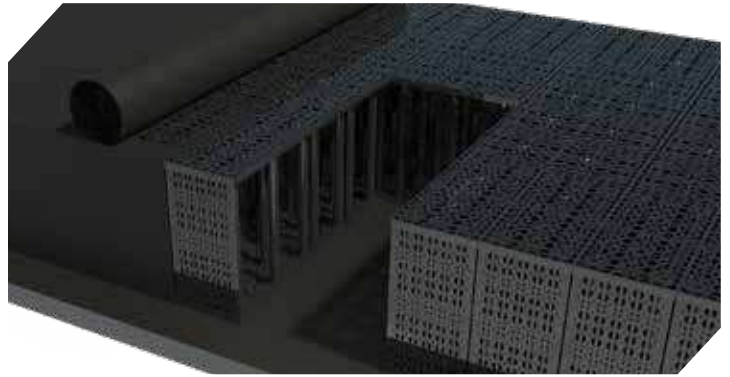
1. All stone must be angular stone meeting ASTM D2321. Recycled concrete may be utilized when meeting acceptable gradation and ASTM standards.
2. Storage of materials such as construction materials, equipment, soils, etc. over the module system is strictly prohibited.
3. Please contact a Geotechnical Engineer and the Brentwood representative prior to utilization of any material not listed above.

APPENDIX D - MODULE 25 SERIES DEBRIS ROW

The optional StormTank Module Debris Row provides a solution to trapping sediment. Observation/cleanout ports are to be installed with a minimum of one port at the inflow pipe location. Based upon Debris Row size and shape, additional ports may be required. See the approved submittals for debris row size and location.

1. Install Debris Row side panels in the modules adjacent to the Debris row, per the approved plans.
2. Install a layer of geotextile across the bottom of the Debris Row, extending up the side panels of the adjacent modules. Geotextile Fabric is to be installed to the height specified by the hydrograph elevation of the selected storm (per the engineer of record's plans), or a minimum of 12" (304.8mm), whichever is greater. Secure the geotextile fabric to the side panels with zip ties.
3. Place and install the Debris Row Modules in the appropriate location per the approved StormTank submittal drawings
4. Finally, make any necessary connections and complete the system installation per the StormTank installation instructions.

Note: For Module 20 Series contact a StormTank Representative





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