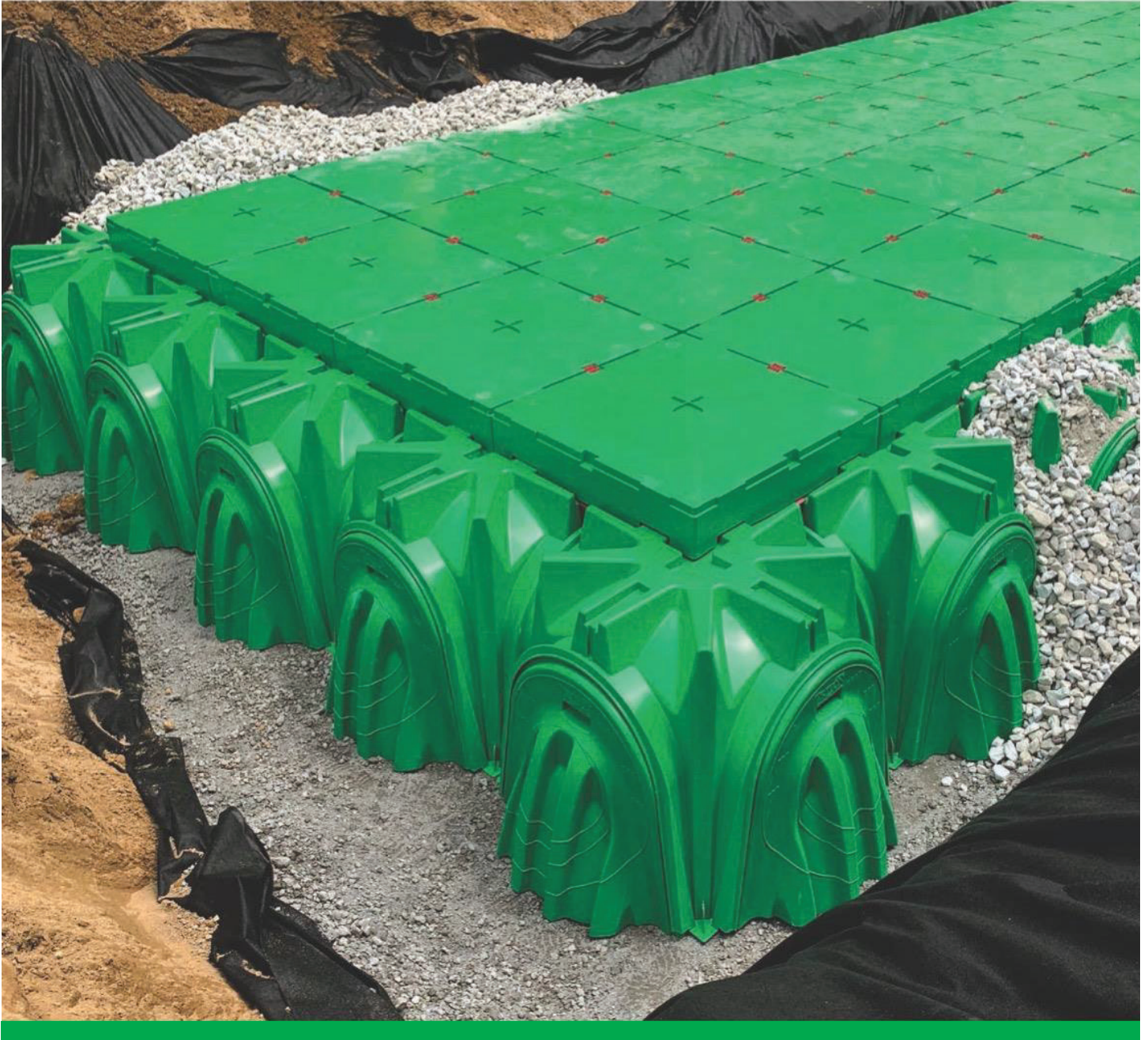


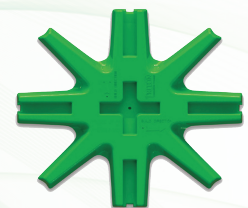


The Future of Stormwater
Management is Here



Introducing...

THE **VAULT** SYSTEM



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This installation guide provides the minimum requirements for proper installation of the Triton Vault System.

Non-adherence to this guide may result in damage to the vaults during installation. Installers are required to read and understand the following instructions. Contractor should inspect all products for distortion, damage and integrity as product is installed. If any cracks are detected, do not install that product – set aside and contact Triton immediately. If you have any questions regarding this installation manual, please call 810-222-7652 to schedule a pre-con meeting.

*REQUIRED MATERIALS LIST FOR VAULT INSTALLATION

- Approved Foundation Material (Table #3)
- Approved Fill Material above system (Table #3)
- Approved Embedment Stone surrounding system (Table #3)
- Approved Non-Woven Geotextiles, Bi-axial Geogrid and, if required per site design, Woven Geotextile and/or Liner material (Table #1)
- Triton Supplied Materials for System: Vaults, End Caps (large and small), Trays, PVC Tray Pipes, Close Offs, and Bowtie Locks. Additionally, if required per site design: Vault Foot Plate and/or internal End Cap Tape (Table #7)
- PPE, Sawsall with tapered bi-metal blade (for cutting internal end caps), Rubber Mallet
- OSHA Compliance
- Liner per specified engineered design (if required)
- Inlet and Outlet Pipes (PVC preferred)
- “Great Stuff Pond & Stone” self expanding waterproof foam

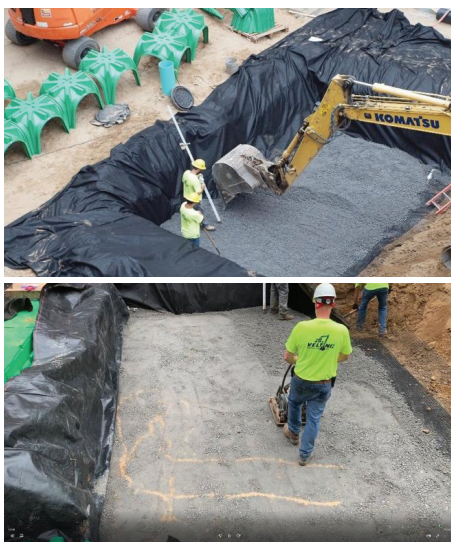
> A. Steps for Vault Site Preparation

Step A1: EXCAVATE, LEVEL AND PREPARE SOIL BED

- Prepare designated area per the approved system design. Note the extra foot of perimeter to accommodate the required 12” (300mm) of stone around the entire system. Minimum dimension of the system, including perimeter stone, should be shown on the system design.
- Soil bed must be free of all standing water and must meet minimum soil bearing capacities for system depth and base stone (Tables #5 and #6). If bearing capacity of soil, once tested, does not meet guidelines then additional foundation material may be required (Tables #5 and #6).
- Compaction and Leveling of soil bed is necessary to ensure a flat, level surface so that a consistent depth of foundation stone is used across the entire system.

Step A2: NON WOVEN GEOTEXTILE

- Line trench base and walls with approved non-woven geotextile (Table #1), making certain to overlap adjacent filter fabric at least 24” (600mm).



Step A3: BI-AXIAL GEO GRID

- Place approved bi-axial geogrid (Table #1) above non-woven geotextile on base of trench, again making certain to overlap adjacent pieces by at least 24” (600mm).

Step A4: FOUNDATION MATERIAL

- If an underdrain is required, place that prior to base stone
- Place a minimum 6” (150mm) layer of approved foundation material (Table #3) above bi-axial geogrid to depth designated on approved site design. Refer to the approved design drawings for correct foundation stone depth for your particular job.
- Compact foundation material to achieve a flat level surface. Elevation variance across the system must be no more than 1%.

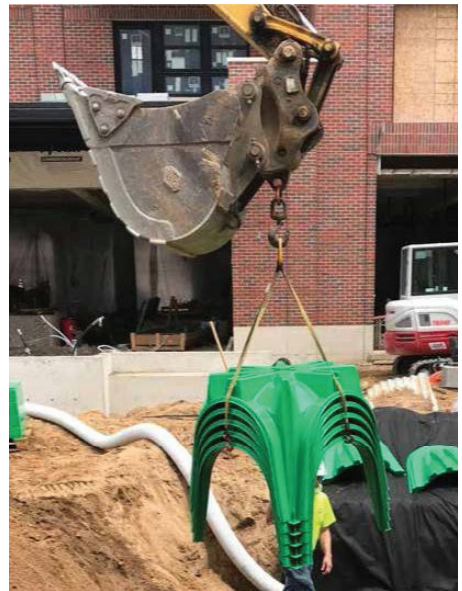
Step A5: VAULT FOOT PLATE – OPTIONAL

- If specified stone is an issue or system depth is constrained, Vault Foot Plates 12”x12” (300mm x 300mm) are an optional remedy for ensuring a flat, level foundation bed or using a minimum of 12” (305mm) wide reinforced concrete roll to provide a solid surface for the Vault feet to sit upon. Please consult with design engineer before utilizing any of these options.

> B. Moving the Triton Vault System:

How to handle the Vault/Trays

- The use of a four legged Nylon sling (like the one shown to the right) is recommended for lowering the vaults/trays into the trench, picking up no more than 5 at a time. Hook the lips of the vault ensuring that the hooks on the sling are secure.
- As site constrictions vary, it is up to the installing contractor to determine the best method for moving the Triton product without causing damage.



> C. Preparing for the Treatment Forebay (if required):

Step C1: LOCATION OF FOREBAY

- Determine the location of the forebay within the system, as is called out in the system design as the “hatched” area.
- Cut required forebay internal end caps, per system design. Internal forebay end caps will always be the smaller end cap
* see Section D

Step C2: SEDIMENT BARRIER

- Sediment Barrier must be laid down above the foundation material, prior to setting the forebay vaults.
- Sediment Barrier must be completely under the Vault feet, over the foundation material, and extend a minimum of 12” beyond treatment area.

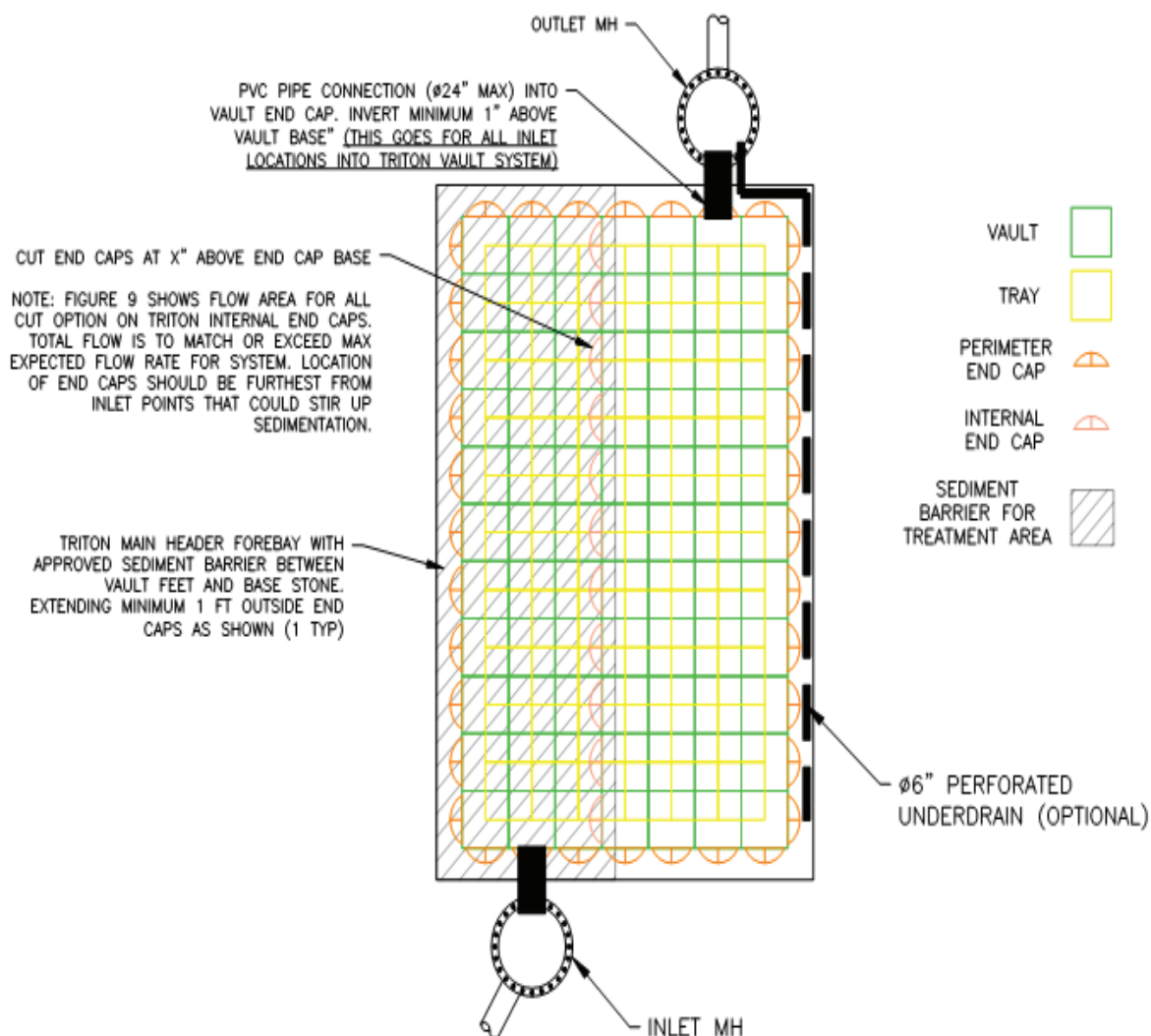
Step C3: FOREBAY VAULTS AND END CAPS

- Cut the forebay end caps at the elevation as shown per the approved design drawings.
- Set the Forebay Vaults and End Caps on top of the Sediment barrier.
- The internal forebay end caps must be oriented with the end cap facing inward, the bulge will be inside the forebay.
- Insert internal end caps into the appropriate Vault prior to its placement within the system.
- As internal end caps are placed, the provided Tar tape must be placed on the base of the end cap so there forms a seal between the base sediment barrier and the end cap foot.
- Cut end caps should be placed furthest from the inlet location(s) as possible.



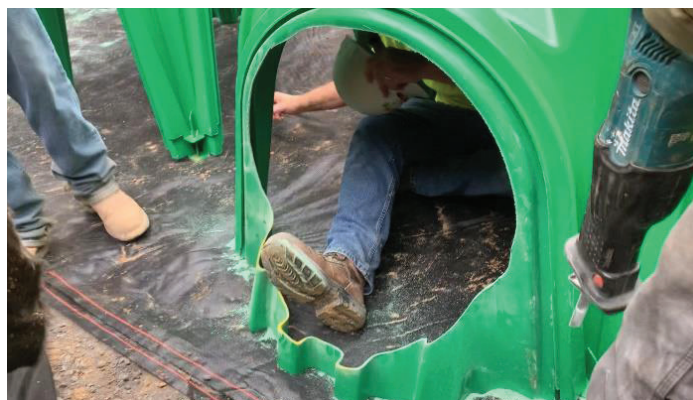


> D. Building the 5 Component Vault system



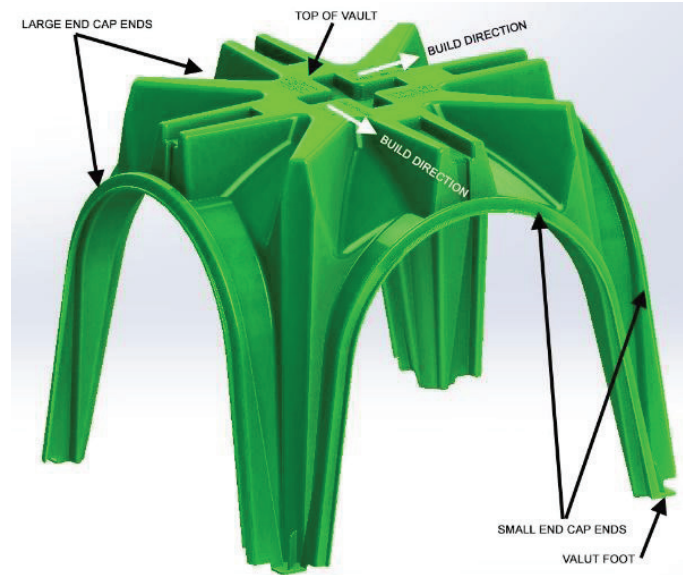
* Cutting Inlet/Outlet Pipe Holes

- Determine the location of the Inlet/Outlet Pipes. The end caps are easiest to cut once installed (as they are held down by the weight of the vault). However, holes can be cut prior to end caps installation, as well.



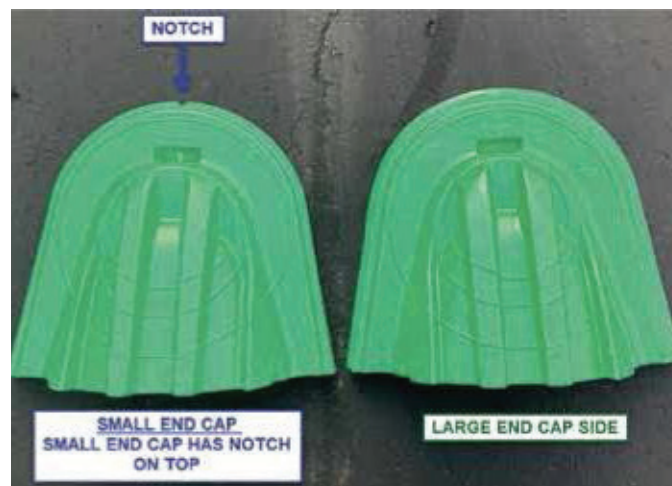
*Setting the first Vault

- The vault system is built starting from a single point. The top of each Vault has two build arrows showing which of two directions the next Vault can be placed to ensure proper overlap and connection.
- If chosen start location is part of the treatment area make sure to have sediment barrier down prior to placing the first vault (refer back to Section C).
- Locate the start point of the system by identifying one corner that is 22.64" from the trench edge and running string lines down the length and width of the system, ensuring the string line is straight and square. String lines are highly recommended to ensure the entire installation runs smoothly or snap a chalk line to ensure the system is installed straight and square.
- Set the first vault's corner foot in the designated corner, ensuring the build direction aligns with the arrow directions on the top of Vault.



*Setting the first end caps

- The first corner Vault will require 2 end caps to enclose the corner.
- Please note there are 2 sizes of end cap that coordinate with the size of the vault connecting rib.
- Small end cap = thinner rib, larger end cap = wider rib. The different sized end caps are not interchangeable.
- Small End caps have a noticeable notch at the top of the arch. (see photo to the right)
- To install the end cap, tilt the vault a few inches off the ground with the curved face of the end cap facing outward, the bulge should be facing outward.
- Place the small or large end cap up inside the vault's V-shaped corresponding thin or wide connecting rib. Ensure a snug, secure connection. Use the built in handles of the end cap to set the vault back down on all 4 feet and ensure vault lands in designated corner.
- End caps must be placed within the Vaults as the system is being built, not after all the vaults have been put in place.
- Once the first Vault and first 2 end caps have been placed the building of the system can begin.



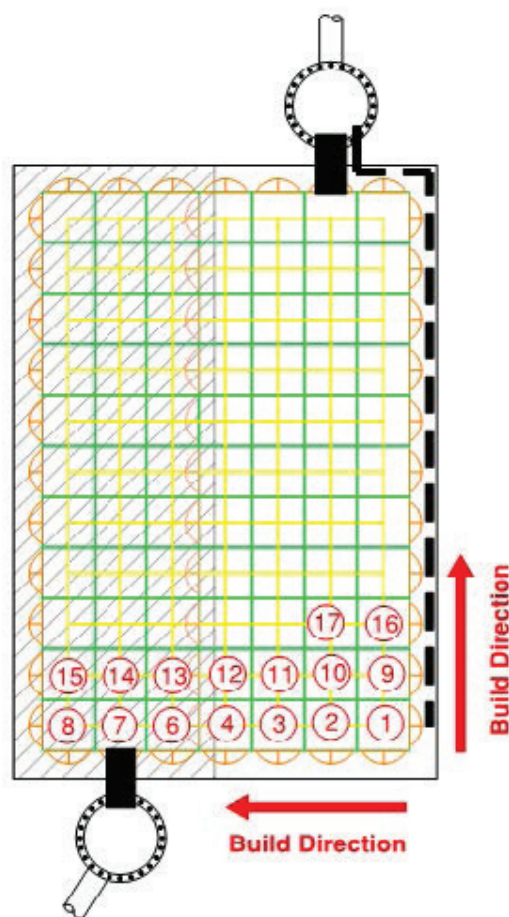


Step D1: VAULTS

- Once you have determined your build direction. Place Vault #1 as shown in the diagram to the right. Follow the instruction above for setting the first vault and end caps.



- Overlap the corrugations of Vault #1 with Vault #2, placing Vault #2 according to the diagram to the right. Ensure build direction arrows are facing in the same build direction. Overlap only one corrugation so that Vault joints are connected tightly together with no gaps.



- Measure to confirm system continues to be straight and level as you build.

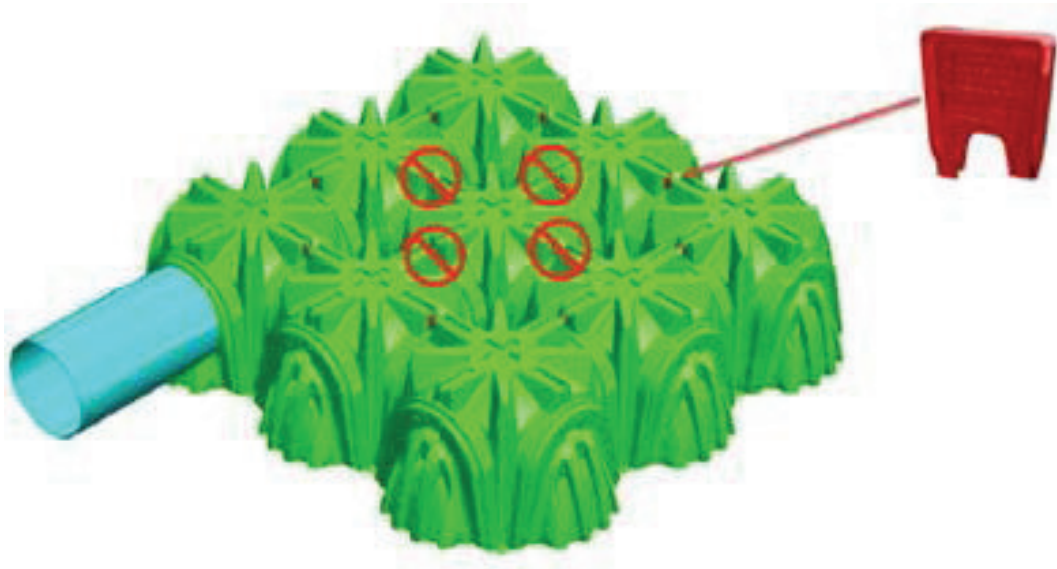


Step D2: PERIMETER END CAPS

- Continue setting straight lines of vaults and perimeter end caps. Remember to place each perimeter end caps as you build and prior to setting the next vault.
- After 2-3 rows of Vaults and End Caps have been placed – proceed to section D3.



Step D3: CLOSE OFFS



- Now you can place the vault red close off parts between the connected perimeter vaults. Close off parts are ONLY placed between outside perimeter vaults and are NOT needed inside the perimeter of the system.
- Notched bottom of close off should sit down in coordinating contour of the vault
- When installed properly, close off height should not exceed Vault pocket surface
- Close Off parts ensure that no stones or debris can infiltrate the overlapping vaults and MUST be installed prior to the placement of the trays.
- **VERY IMPORTANT! MAKE SURE THE PERIMETER CLOSE OFFS ARE INSTALLED PRIOR TO INSTALLING TRAYS.**

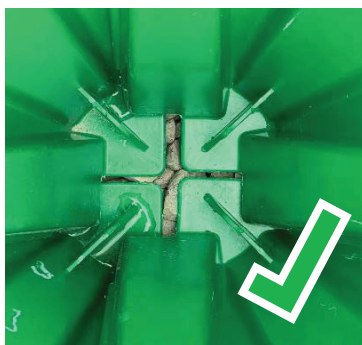




Step D4: TRAYS and TRAY PIPES

- When you have installed 2-3 rows of the vaults, trays, end caps and close offs, you can begin to assemble the pipes and trays.

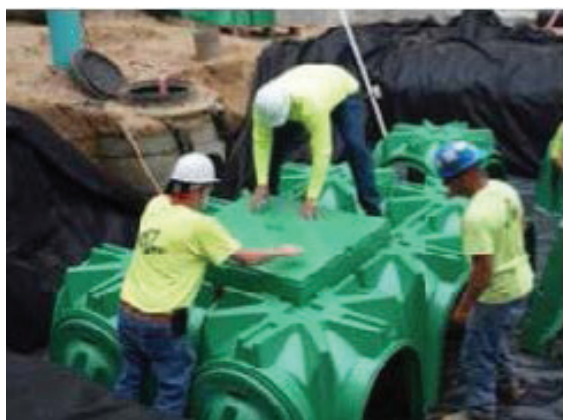
- Ensure that all debris is removed from void area in which 4 vault feet meet.



- The provided 2" (50mm) PVC pipe is installed into the round fitting on the underside center of the tray. Use A rubber mallet to tap the pipe into the fitting to ensure a tight firm fit and make sure the pipe is seated straight so that the centerline of the pipe is perpendicular to the Tray's flat surface.

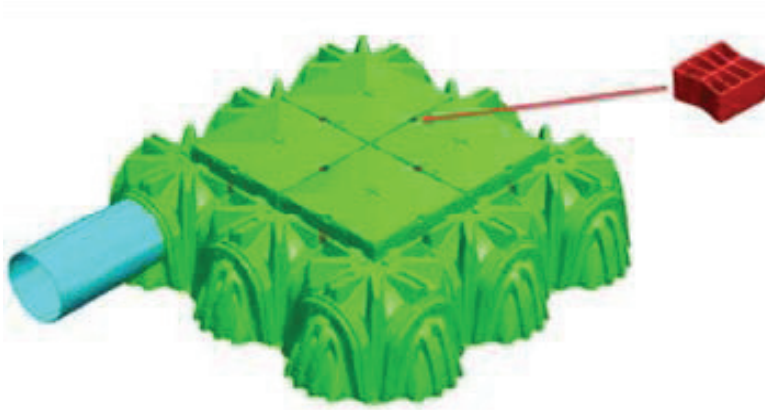


- Pipe and Tray are placed in the center of 4 connected vaults. Pipe is lowered in the cleared void space between the 4 vaults, resting evenly on the 4 vault feet at the base. The pipe should not rest on the foot rib or any other debris. Lower the Tray as evenly as possible to ensure that the pipe does not get caught up on the foot ribs on the Vault feet and that the pipe does not become dislodged from the Tray.

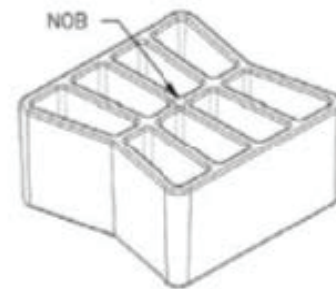


- Tray must be firmly seated on the top of the vaults. Measuring for level is recommended as you proceed.

Step D5: BOW TIE LOCKS



- After a series of trays have been installed, bow tie locks are inserted between the top of the trays to connect the trays together.



- The visible nob on the bow tie lock should be facing upward when installing.
- Bow tie locks should be placed as you build, to help ensure the proper spacing and alignment of the vaults and trays.
- At this point repeat steps C1-C5 until system is finished, making certain to pay attention to the location of the treatment area (if required).
- **NOTE: Placing the Trays and Bow Tie Locks as the system is installed will help to keep the system square and is highly recommended.**





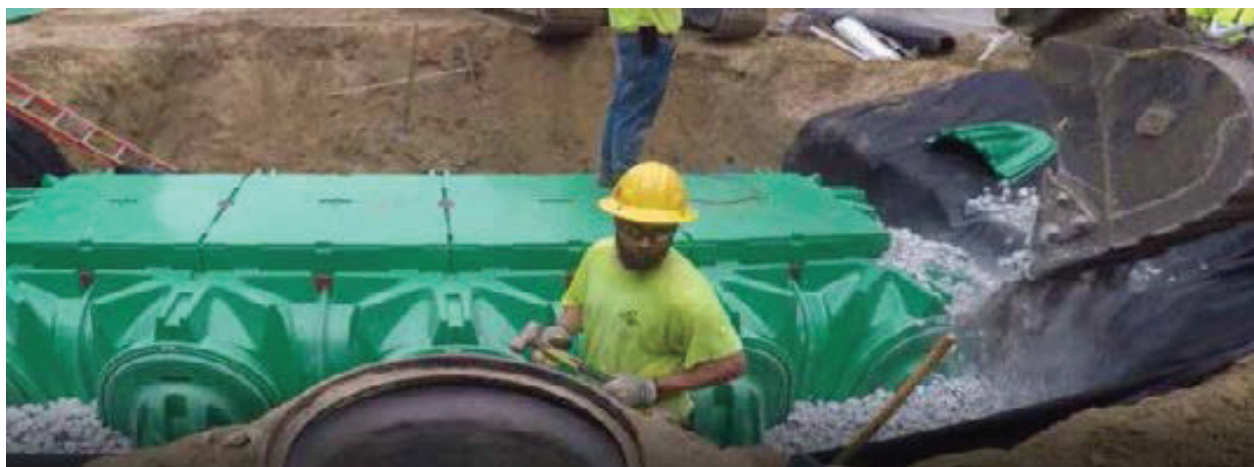
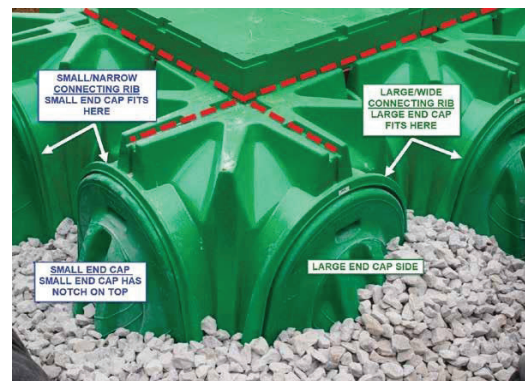
> E. Placing the Perimeter Stone

Step E1: PERIMETER STONE REQUIREMENTS

- Perimeter stone size (per Table 8) should meet specified engineering design.
- Perimeter Stone can be added once all 5 components of the Vault system have been installed for 1/3 of the overall system.
- Stone is laid between the perimeter end caps and the trench wall and must encompass a minimum 12" wide gap.

Step E2: PERIMETER EQUIPMENT SAFETY

- Stone can be dumped using an excavator ladle. All equipment must remain at least 24" from Triton system.
- Equipment closer than 24" to the system could compromise the pressures of the trench soil, cause damage to the system and cause long delays.



Step E3: PERIMETER STONE LEVEL

- Stone is placed around the perimeter of the system until it is aligned with the top edge of the tray, but not covering the tray. If there is no drainage stone above the trays proceed to Step F1.
- If the system detail calls for drainage stone above the trays then a layer of fabric should be placed on the trays prior to placing stone to the designed elevation above the trays.



> F. Covering the Vault System

Step F1: PLACING THE FABRIC

- Now that the perimeter stone is level to the top edge of the tray, the existing non-woven fabric that is under the system and up the sides of the perimeter wall can be folded over the entirety of the Vault system.
- At any place where there is a joining of non-woven fabric – it must overlap by no less than 24" (600mm).



Step F2: BACKFILLING TO GRADE

- After the non-woven fabric has been placed and overlapped above the system, refer to project specific section detail to determine appropriate backfill material.
- Backfill material should only be placed, leveled and compacted according to the allowable loads shown in Table #2





> G. Reference Tables

TABLE 1 – Some Suitable Geotextiles

MANUFACTURER	AASHTO M288 CLASS 2 NON-WOVEN ¹	AASHTO M288 CLASS 1 WOVEN ²
Amoco Fabrics and Fibers (Part of BP)	ProPex 4506, ProPex 4508, ProPex 4551, ProPex 4552, ProPex 4553	ProPex 2006, ProPex 2016, ProPex 2004
BTL Inc. (Bend Tarp Liners)	Style 801, 8 oz., GN200	PPL-20, PPL-24, PPL-36
Carthage Mills	FX-60HS, FX-80HS	FX-66
TerraFix Geosynthetics Inc.	360R, 400R, 420R	200W, 400W
GSE Lining Technology	NW6, NW8	—
Maccaferri	MacTex MX245, MacTex MX275	—
Mirafi Const. Products	Mirafi 160N, Mirafi 180N	Mirafi 600X, Filterweave 403, Filterweave 404, Geolon HP570, Geolon HP665m /geikib HP770
Pavco-Amanco	NT 3000, NT 4000	TR 4000
SI Geosolution	Geotex 601, Geotex 801	Geotex 315ST
TNS Advanced Tech.	R060, R070, R080, R100	M 403
US Fabrics	US 205NW-C	US 315
Hanes Geo	TeraTex N06, TeraTex N08	TeraTex HD

¹ AASHTO M288 Class 2 Non-Woven Geotextile Application: Separation layer between angular stone cover and fill to prevent fines intrusion.

² AASHTO M288 Class 1 Woven Geotextile Application: Stabilization layer for angular stone foundation to prevent scouring of the stone base during JetVac maintenance procedure, modest hydraulic flows maintained. Can also be used in place of the Triton SWS Sediment Floors at each inlet row and Main Header Row to prevent scouring of foundation stone.

TABLE 2 – Maximum Allowable Construction Vehicle Loads

Material Location	Fill Depth over Chambers in [mm]	Maximum Allowable Wheel Loads		Maximum Allowable Track Loads (see note 6)		Maximum Allowable Roller Loads
		Max Axle Load for Trucks lbs [kN]	Max Wheel Load for Loaders lbs [kN]	Track Width in. [mm]	Max Ground Pressure psf [kPa]	Max Drum Weight or Dynamic Force lbs [kN]
D Final Fill Material	36" [900] Compacted	40,000 [177]	16,000 [71]	12" [305]	3420 [164]	38,000 [169]
				18" [457]	2350 [113]	
				24" [610]	1850 [89]	
				30" [762]	1510 [72]	
				36" [914]	1310 [63]	
C Initial Fill Material	24" [600] Compacted	40,000 [177]	16,000 [71]	12" [305]	2480 [119]	20,000 [89]
				18" [457]	1770 [85]	
				24" [610]	1430 [68]	
				30" [762]	1210 [58]	
				36" [914]	1070 [51]	
	24" [600] Loose/Dumped	32,000 [142]	32,000 [142]	12" [305]	2245 [107]	16,000 [71]
				18" [457]	1625 [78]	
				24" [610]	1325 [63]	
				30" [762]	1135 [54]	
				36" [914]	1010 [48]	
	18" [450]	32,000 [142]	32,000 [142]	12" [305]	2010 [96]	5,000 [22] (Static loads only) ³
				18" [457]	1480 [71]	
				24" [610]	1220 [58]	
				30" [762]	1060 [51]	
B Embedment Stone	12" [300]	NOT ALLOWED	NOT ALLOWED	12" [305]	1100 [53]	NOT ALLOWED
				18" [457]	715 [34]	
				24" [610]	660 [32]	
				30" [762]	580 [28]	
	6" [150]	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED

TABLE 3 – Acceptable Fill Materials

MATERIAL LOCATION	DESCRIPTION	AASHTO M43 DESIGNATION	COMPACTION/DENSITY REQUIREMENT
D	Final fill material: fill material for layer “D” starts from top of layer “D” to the bottom of flexible pavement or unpaved finished grade above. Note that the pavement sub-base may be apart of “C”.	Good quality crushed aggregate (0.75” – 2.5”)	Prepare per engineer’s plans. Paved installations may have stringent material and preparation requirements. For compaction efforts, equipment must be kept at or below Triton’s allowable ground pressure per the installation manual.
C	Initial fill material: fill material for layer “C” starts from top of “B” layer to the bottom of layer “D”. To be sand/max particle (20mm) aggregate.	N/A	Compact with plate compactor of no more than 992 lbs (450 kg).
B	Embedment stone: backfill stone surrounding vault system from the foundation stone (A) to the “C” layer above.	AASHTO M43 3, 357, 4	Stone is self-compacting. No compaction required.
A	Foundation stone: free draining aggregates below chambers from the subgrade up to the foot (bottom) of the vault.	AASHTO M43 56, 57 21AA (See Note 4)	Compacted to form level base. Place and compact in 6” (150mm) max lifts using two full coverages with a vibratory compactor.

PLEASE NOTE:

- 1. The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for #4 stone would state “clean, crushed, angular No. 4 (AASHTO M43) Stone.”
- 2. Triton SWS compaction requirements are met for “A” location materials when placed and compacted in 9” (229mm) max lifts using two full passes with an appropriate compactor.
- 3. Where infiltration surfaces may be comprised by compaction, for standard installations and standard design load conditions, a flat surface may be achieved by raking or dragging without compaction equipment. For special load designs, contact Triton for compaction requirements.
- 4. Stone porosity assumed to be 40% with AASHTO M43 56 and 57 stone. If 21AA or similar is used allowable stone porosity will be less than 40% and must be approved by both Triton and engineer to ensure proper storage calculations are used.

*The design engineer is solely responsible for assessing the bearing resistance (allowable bearing capacity) of the subgrade soils and determining the depth of foundation stone. Subgrade bearing resistance should be assessed with consideration for the range of soil moisture conditions expected under a stormwater system.

TABLE 4– Vault Standard Infiltration Standard Detail

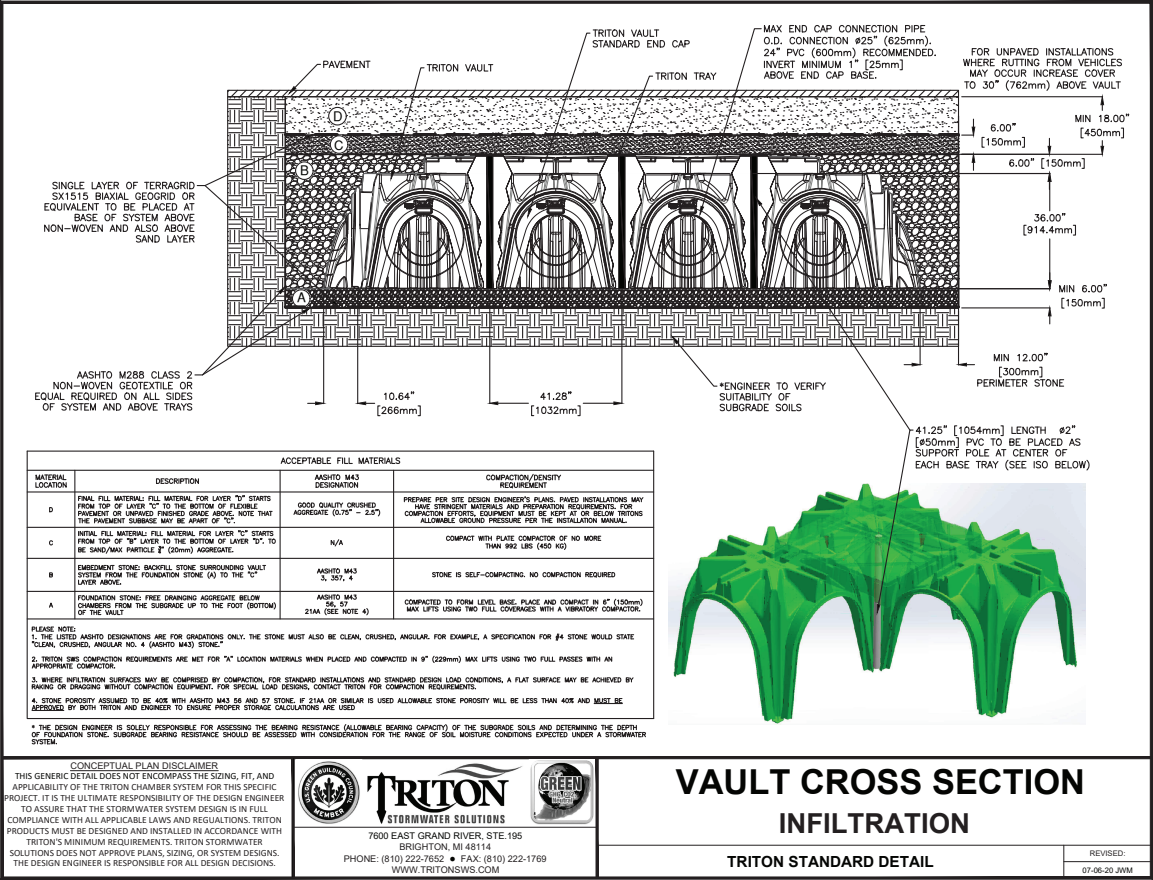


TABLE 7 – Components of the Vault System



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