

Underground Stormwater Management System.

STORMVAULT TANK

Installation Guide.



ASSEMBLING



INSTALLING



BACKFILLING



www.rainsmartsolutions.com

Pre-Construction Checklist.

A Tools You'll Need

- Laser or Transit
- Measuring Tape (long enough to mark Rainsmart Tank footprint)
- Razor Knife
- Screw Driver/Nut Driver Set
- String Line
- Marking Line
- Reciprocating Saw (to cut in Inspection & Maintenance Ports)

If you're assembling Rainsmart STORMVAULT Tanks:

- Dead-Blow Rubber Mallets
- Work Tables (3/4" Plywood Placed on Assembled Tanks works Well)



Figure 1 Most contractors find installing a Rainsmart STORMVAULT Tank system surprisingly easy.

B Materials You'll Need

- Rainsmart STORMVAULT Tank Module Units
- Geotextile 200 - 300 gsm minimum
- Geogrid (Only for Load Bearing Application)
- Impermeable Liner (Only for Retention / Recycling Tank Application)
- Clean Base & Backfill Material (95% Compactable angular stone or sand ½" - 2", free of debris - NO CLAY)
- Pipe Boot Kits (If not using kits, you'll need duct tape and a stainless steel band clamp for each inlet and outlet pipe, and for each inspection or maintenance port.)
- Pipe for Inspection & Maintenance Ports (Typically 12" (300mm) schedule 40 PVC, respectively)
- Ring, collar & cap (to fit all ports)
- Maintenance Port Kits (If not using kits, you will need non-corrosive rigid anti-scour pad [15" x 15"] [375mm x 375mm] to fit below Maintenance ports. Plexiglass works well. Fabric pipe boot, duct tape, stainless steel band clamp and H2O loaded ring and cover.)
- Metallic Tape

C Equipment You'll Need

- Forklift and other equipment/tools needed to unload box truck
- Pallet jack (to unload material from box truck)
- Walk-Behind Trench Roller (Plate compactor may work for smaller projects)
- Low Ground Pressure (LGP) tracked Skid Steer or Loader (<7.0 psi Gross Operating Pressure)
- For Larger Projects (>10,000cf / 250 Cbm):
 - LGP Dozer -10 ton Max gross weight and 4.52 psi (3.17 t/sqm) Max operating pressure.
 - Roller - 5 Ton Max Gross Vehicle Weight

Note: This list does not include equipment or tools needed to excavate or level the floor of the excavation

D General Notes:

Be sure to contact your local Representative at least two weeks prior to installation. We will provide you with on-site installation support AT NO CHARGE in order to facilitate your installation.

All pictures, illustrations and instructions have been included to guide you through a typical installation. The approved engineering drawings should ALWAYS take precedence over these instructions.

Coordinate the installation of Rainsmart-STORMVAULT Tank System at the end of the construction activities to minimize the construction traffic over the system. If the installation is completed during construction activities then the system MUST be roped off and construction traffic routed around the system (including excavators, loaders, dump trucks, forklifts, concrete trucks, material delivery trucks and cranes). The installation contractor is responsible for all loads placed or driven over the STORMVAULT Tank during the construction process: (including excavators, loaders, dump trucks, forklifts, concrete trucks, material delivery trucks and cranes). Rope off the area to prevent unauthorized traffic from driving over the STORMVAULT Tank. If sequencing of the project makes this impossible, a construction road or pad may be constructed over the STORMVAULT Tank System. Consult the project engineer and/or Rainsmart Solutions for assistance before allowing construction traffic on system. (**See Step #12: Secure the Installation** for additional information.)

After installation of the Rainsmart STORMVAULT Tank system, stormwater should not be allowed to enter the Tank until the site is completely stabilized and all pre-treatment systems (designed to remove debris and heavy sediment) are active. Otherwise, the STORMVAULT Tank may become prematurely contaminated with sediments from the project. For more information on Pre-Treatment systems, contact Rainsmart and request a copy of our Pre-Treatment Tech Note.

Throughout this document you will see three types of notes:



TIP: Ideas to improve your profitability on the installation.



IMPORTANT: Steps that require extra attention.



WARNING: Critical issues that MUST be handled correctly to ensure a good installation.

Any questions or issues not covered by these instructions can be directed to its closest Agent or Distributor or to:

Rainsmart Solutions Pty Ltd.

13, Butterfield Street

Blacktown, NSW-2148, Australia.

(T) +61 2 9678 9667 (F) +61 2 9678 9670

(e) info@rainsmartsolutions.com

1 Excavation

The excavation limits and the location of the STORMVAULT Tank System should be staked out. The design drawings should be used to determine these locations. If the excavation limits are not shown on the plans, then add 2' (600mm) on each side of the STORMVAULT Tank System to determine the limits.

Excavate the designated surveyed area according to plans following all relevant local, state and OHS guidelines. Typical excavations should include:

- Two-foot (600mm) perimeter around STORMVAULT Tank to allow for proper compaction of backfill.
- Enough depth to accommodate a minimum 6" (150mm) base below the STORMVAULT Tank.



Fig. 2 Excavate according to plans, following all Government & OHS Regulations



Fig. 3 Compacted and Levelled subbase to 95% proctor

Level the bottom of the excavation (Fig.2) as shown on plans. All excavations have a flat bottom NO falls or gradient.

Prepare the subgrade according to plans. Base of excavation shall be smooth, uniform level and free of debris and soft or yielding subgrade areas. Compact to at least 95% Standard Proctor Density (or as required by Engineer) (Fig. 3) unless infiltration of stormwater into sub grade is desired. A minimum bearing capacity of 2,000 psf (96Kpa) as per section 3.02D must be achieved or a CBR > 5 must be achieved prior to beginning installation of STORMVAULT Tanks.

If the subgrade is pumping or appears excessively soft, the design engineer should be consulted for advice. In many cases a stabilization Geotextile and 6" (150mm) of compactable material that drains well will be sufficient to amend the bearing capacity of the soil, or as recommended and approved by site engineer.

STORMVAULT Tank units arrive on your project as Preformed units, they simply need to be placed and clicked together, making installation very quick and easy on-site. Building the units should take less than 0.5 to 1.0 minutes per segment. This is a conservative estimate used to approximate the total man hours needed for assembly. The estimate includes the workers doing the assembly as well as material handling people to keep the assembly workers moving.

Units	Time
Single	0.5 Minutes
Double	1 Minutes
Triple	1.5 Minutes
Quad	2.0 Minutes

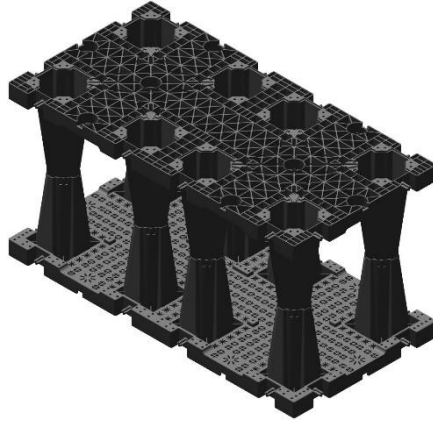


Fig. 1 Stormvault V Assembled Inner Units

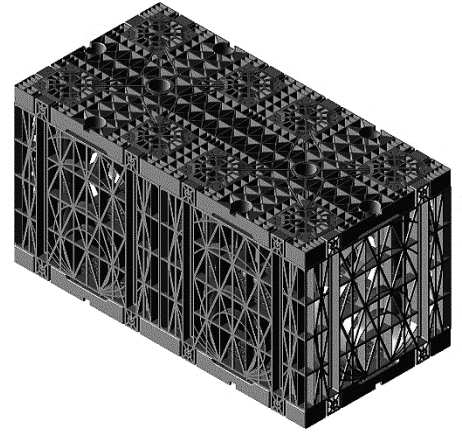


Fig. 2 Stormvault V Assembled Perimeter/ frame Units.

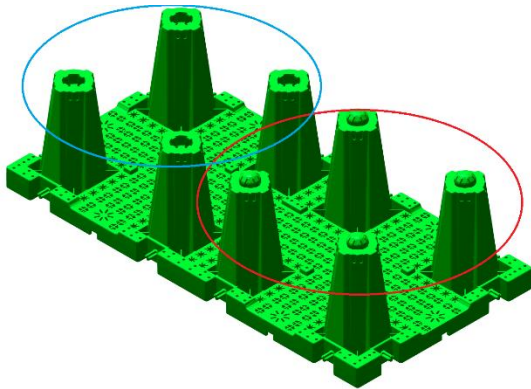


Fig. 3 Stormvault V Cone Body Unit

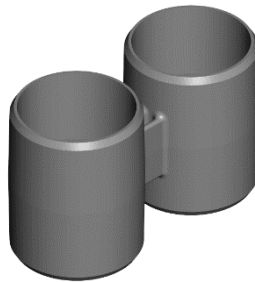


Fig. 4 Horizontal & Vertical Connectors

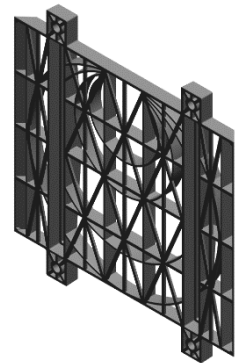


Fig. 5 STORMVAULT Perimeter End Plate. **To be installed only on the outside face of the perimeter tanks.**

STORMVAULT Tank Modules pallets should be staged as close to the installation area as possible.



Critical Warning: To increase the speed and quality of the installation, the base must be Smooth, Flat, so modules align perfectly. This will ensure the speed and quality of installation.

3 Prepare Base

Examine prepared excavation and conditions for smoothness, compaction and level. Do not start STORMVAULT Tank installation until unsatisfactory conditions are corrected. Check for presence of high-water table, which must be kept at levels below the bottom of the STORMVAULT Tank structure at all times. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Project Manager for resolution.

Standing water in the excavation will prevent proper base preparation and must be removed, if present.

In regions with sandy soils meeting the requirements noted and where the subgrade elevation is above the groundwater table, imported backfill materials may not be needed.

Grade and level base as shown on plans with more than 1/2" variance. Base must be free of debris and large rocks. Install base materials. Base materials must be as per spec section 2.03A:

Compaction	95% Compactable
Shape	Angular
Size	Not Larger than 1" in Diameter (10-20mm dia is ideal) DGB-20
Consistency	Free of Lumps, debris and sharp objects that could puncture the Geotextile
Applicability	Stone or sand is acceptable if it meets these requirements.
	In NO case shall clays be used



Fig. 7 & 7A Base must be smooth to ensure units fit together without gaps.

 **TIP:** Creating a smooth, level flat Compacted bases, will allow for faster installation of STORMVAULT Tank® modules, as they will fit together evenly, eliminating detailing work that can delay your progress. (Fig.7 & 7A.)

4 Place Geotextile

Geotextile will be required below the STORMVAULT Tanks on most projects, but not all. Check your plans to ensure that geotextile is to be placed between the base and the STORMVAULT Tank units.

Cut full-width strips of Geotextile to the proper length and place them over the base, covering the floor of the excavation and the side walls. The Geotextile should extend at least 2' (600mm) beyond the edge of the STORMVAULT Tank footprint. This will enable the whole unit to be able to be wrapped to the dimensions required. All overlaps are then to be suitably secured, weighted down, tapped or stapled in order to minimize the ingress of deleterious materials.

Geotextile are flammable. No smoking should be permitted on the Geotextile. Adjacent panels of material should be overlapped by 12" (300mm) or more, as shown on the plans (Fig.8 & 9).

Use pins, staples, sandbags or other ballast to hold the Geotextile in place, preventing it from blowing or sliding out of position.

Patch any holes made in the Geotextile by placing a small patch of fabric over the damaged area. The patch must be large enough to cover the damaged area with at least 12" (300mm) of overlap on undamaged material.

If a liner and/or additional Geotextile are required per plans, install these now as shown on the project plans.



Fig 8: Overlap Geotextile by minimal 12" (300mm) or more. Pull Wrinkles out of Geotextile



Fig 9: Reduced overlaps don't create significant savings and can create delays.

TIP: Some contractors choose to cut the Geotextile strips long enough to wrap up the sides and over the top of the STORMVAULT Tank in a single piece (Fig. 6). If space allows and the folded flaps of Geotextile will not slow our progress, you may want to consider doing this. If a liner is required on your project, this method should be used to protect the liner.

TIP: Many contractors find that it is both easier and less expensive to have specialty contractors install the liner (typically used when building a cistern). If you are installing a liner yourself, handle it VERY CAREFULLY to avoid damage.

5 Install STORMVAULT-Tanks

Determine the starting location. It is often helpful to use an inlet or outlet pipe to guide you. Using a string line, establish two adjacent edges of the STORMVAULT Tank footprint. Ensure that your corner is square. Mark these two edges with marking paint and remove the string line (Fig. 10 & 10A).



IMPORTANT: If using a liner, be careful not to puncture it with stakes or pins while placing your string line.

Begin placing STORMVAULT Tanks in the corner of the marked area. Do NOT place units on their sides, as this will void the warranty. Check your plans to ensure correct orientation of the STORMVAULT Tanks (Fig. 9/9A/9B).

Check the plans to ensure the STORMVAULT Tanks are running in the correct direction (North/South vs. East/West) to match the footprint shown. As the modules are 770mm x 385mm in footprint if any mistakes are made during laying, this can be squared off at the end, to get accurate dimensions as per plans. The unit can also be cut in half on 770mm side to adjust sides and ends.

- STORMVAULT Tank Width = 385mm (15.16")
- STORMVAULT Tank Length = 770mm (30.32")

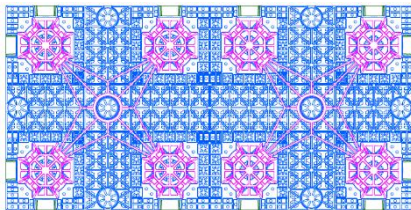


Fig 9: TOP VIEW (L x W)
770 MM X 385 MM

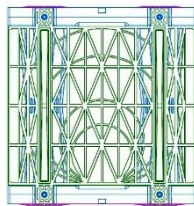


Fig 9A: SIDE VIEW (W x H)
385 MM X 400MM

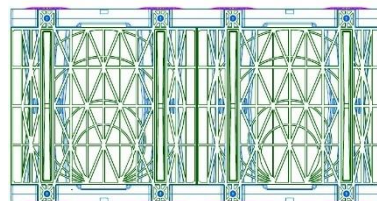


Fig 9B: SIDE VIEW (L x H)
770 MM X 400MM

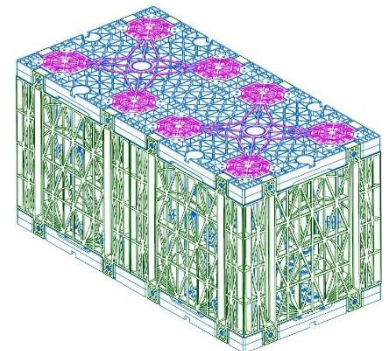


Fig 9C: ISOMETRIC VIEW (L X W x H)
770 MM X 385 MM X 400 MM



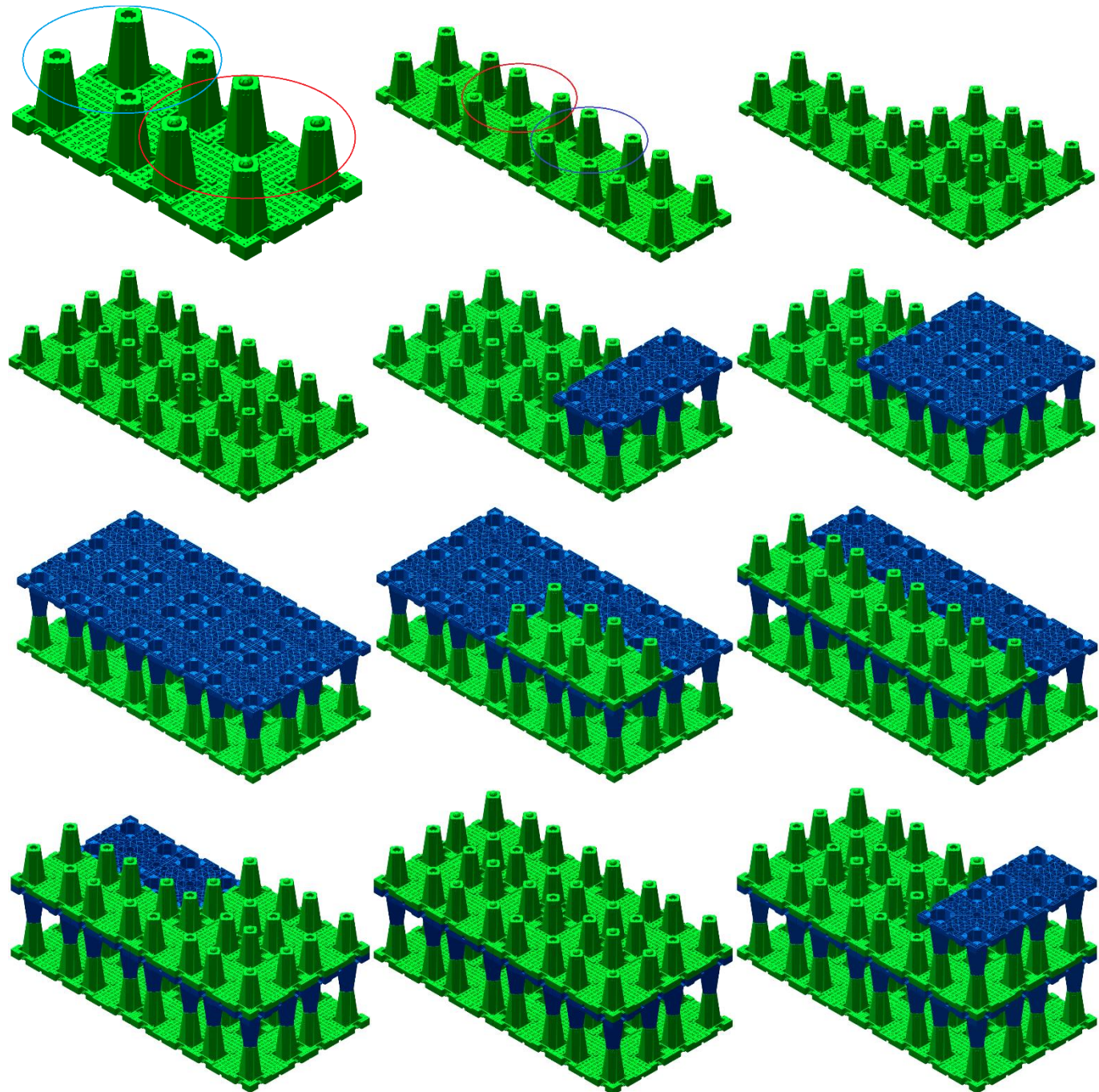
Fig 10: Use a String line & marking paint to square the system footprint.



Fig 10A : Place the frame STORMVAULT tank in Capital "L" format and start building the tank from the corner out to achieve perfect layout.

STORMVAULT Tank units should fit together evenly, without any minor gaps, or variations. This is very critical aspect of the installation, as all the Stormvault Units Need to be clipped vertically as well as horizontally, to form one Complete Structure. A flat compacted even base will ensure this goes smoothly and fast.

The Stormvault unit in each single layer will be installed in a Brick Bonding Pattern and interconnected with H/V Connectors to the neighbouring module. For multi-tier installation this same process should be followed all the way to the top in Brick Bonding Layout, to ensure each unit is horizontally and vertically connected to form a one big structure. Please refer to Fig: 11.



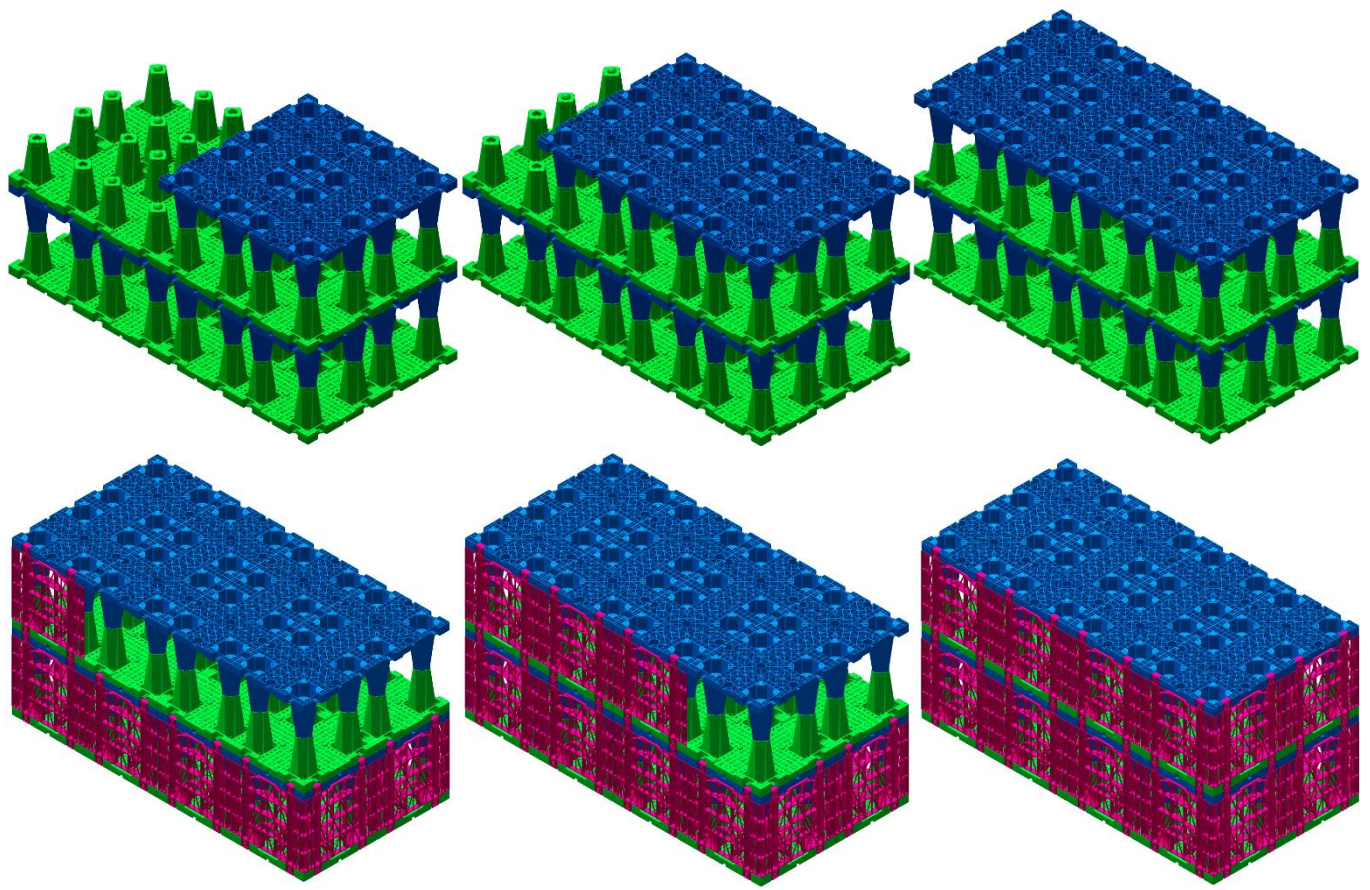


Fig 11: Plan view showing all units installed in a brick laying pattern.





The Side /End plates shall only be installed on the outside face of the periphery units.

Identify locations of inlet, outlet, Inspection Rows, and Inspection ports, and any other penetrations. Inspection rows will be wrapped in its own separate geotextile. All pipes should be positioned at 90 degree to the tank structure. Any inlets, outlets etc should be installed flush (butted up) to the tank and the geotextile fabric shall be cut to enable hydraulic continuity at the inlet and outlet and secured around the pipe using a suitable coupling or a stainless-steel clamp prior to backfilling.

After placement of Rainsmart® STORMVAULT tanks, wrap with geotextile which is brought up around the sides and lapped over the top of the full structure. Should any gaps be evident additional fabric can be cut and placed over any of these areas. Fold excess fabric at corners to lay flat against sides of structure, securing folds and seams with staples or similar methods.

Tanks require ventilation for proper hydraulic performance, number of pipes and vents will depend on the size of the tank. Vents are often installed using a 90 degree elbows etc with PVC pipe into soft landscape area with 'U' bend or venting bollard to inhabit the ingress of debris, alternatively a ground level concrete steel cover can be fixed to suit.



TIP: Moving STORMVAULT Tank units into the excavation quickly is essential to a profitable installation. Many contractors forklift the entire pallet of cone structures into the excavation hole.

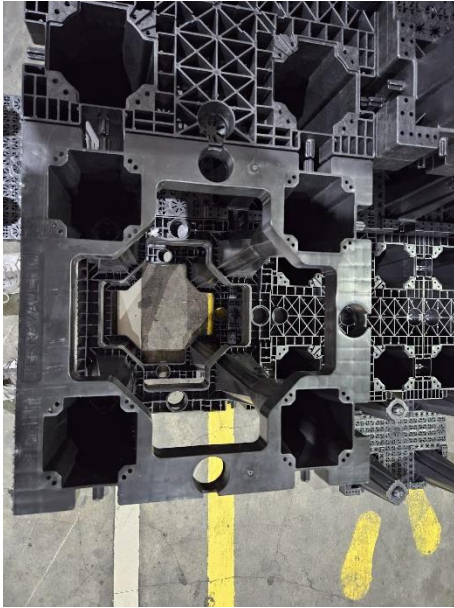


6

Install Inspection /Maintenance Ports

All ports should be made from pipe long enough to extend from the top of the STORMVAULT Tank to finished grade. They are typically Schedule 300mm U PVC pipe, but can be formed from other types of pipe, as well.

Identify the location of all ports and remove the top geotextile from STORMVAULT Tank from each location. STORMVAULT Inspect shaft module will be installed in these locations.



Maintenance / Inspection Ports:

Typically made from 12" (300mm) Schedule 40 PVC pipe, cut the pipe to length, leaving enough excess to trim the top when final grade is reached. Install the pipe into the STORMVAULT Tank unit, pour 150mm of concrete mix around the pipe to prevent it from moving during back fill (Fig: 11). Seal the opening on top of the pipe with a cap or temporary lid to prevent debris from entering the system.



TIP: If using Prefabricated Pipe Boot Kits, install them onto the Inlet and Outlet Pipes, leaving the band clamps loose so that final adjustment of the Stormvault units may be made.



TIP: If the location of Maintenance Ports is not shown on your plans, include a port within 10' (3mts) of all inlet and outlet pipes (a single maintenance Port can cover multiple pipe connections), and include additional Maintenance Ports, as needed, to prevent the distance between ports from exceeding 65 feet (20mts).

7 Seal Tanks with Geotextile

Clean off any debris that may be lying on top of the exposed Geotextile around the perimeter of the STORMVAULT Tank.

Cut strips of geotextile to fit over the top and down both sides of the STORMVAULT Tank with at least 2' (600mm) of excess material on each side of the system. This 2' (600mm) flap should overlay the geotextile placed below the STORMVAULT Tank units, creating a clean 24" overlap to seal the system.

Adjacent strips of geotextile should overlap at least 12" (300mm) or as shown on plans. Use duct tape, sand bags or other ballast to temporarily secure overlaps (Fig. 13).

Where the geotextile intersects an Inspection or Maintenance Port, cut an "X" into the geotextile and pull it over the pipe. The flaps of the "X" should point AWAY from the STORMVAULT Tank (Fig. 11). Use stainless steel band clamp to seal the flaps to the pipe.

Fold geotextile for outside corners similar to sheets on a bed, and lay excess material flat against STORMVAULT Tank. Leave corners loose to avoid creating weak spots in the material. Temporarily secure excess fabric with duct tape (Fig. 11).



Fig. 12 Encapsulate STORMVAULT Tanks with geotextile



Fig. 13 Maintain 12" (300mm) overlap



Fig. 14 Seal the pipe boot with band clamps and duct tape.

Connect Inlet & Outlet Pipe

Where the inlet and outlet pipes connect to the STORMVAULT Tank, cut an "X" into the geotextile so that the pipe makes DIRECT contact with the STORMVAULT Tank. Pull the flaps of the "X" over the pipe so that the flaps of the "X" point AWAY from the STORMVAULT Tank. Use a stainless-steel band clamp to seal the flaps to the pipe.

If used, adjust all pipe boots so that the fabric lays snug against the STORMVAULT Tank. Tighten the band clamps with a screw/nut driver. Use duct tape to secure the boot flap to the outside of the geotextile envelope (Fig. 21). Walk bottom edge of geotextile to eliminate gaps between the fabric and the bottom corner of the STORMVAULT Tank (Fig. 12).



TIP: If using Prefabricated Pipe Boot Kits, install them onto the Inlet and Outlet Pipes, leaving the band clamps loose so that final adjustments may be made.



WARNING: Inlet and Outlet pipes must make DIRECT contact with the STM Tank, allowing effluent to flow directly into or out of the STM Tank without filtering through the geotextile. Failing to correctly connect pipes to the STM Tank will void the warranty.

8 Backfill Sides

Place Backfill material (same as Base Materials in Step 3) around perimeter of the STORMVAULT Tank, distributing the material evenly to prevent shoving of the STORMVAULT Tank units. All backfill Material must meet the requirements listed in the specification,

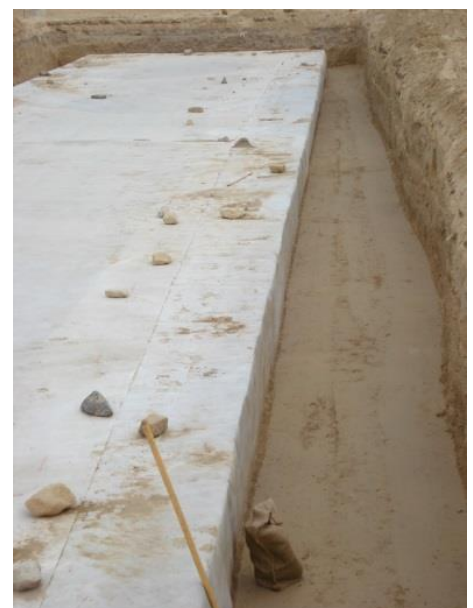
Use a trench roller or plate compactor to compact backfill in 12" (300mm) lifts. Continue placing and compacting backfill in 12" (300mm) lifts until the material reaches the top of the STORMVAULT Tank units. Ensure the Plate compactor doesn't hit the STORMVAULT tank. Or tear off the Geotextile wrap.



Fig. 15 "Walk" the geotextile into the corner to eliminate folds & air gaps.



Fig. 16 Vibratory compaction of side backfill is always required , regardless of what backfill material is used.



IMPORTANT: Vibratory compaction of the side backfill (Fig.15 & 16) is a critical step that both compacts the backfill and eliminates the minor gaps between individual STORMVAULT Tank units. While some backfill materials will yield a 95% proctor density without compaction, **vibratory compaction of the material must be completed to ensure the stability of the system.** Skipping this step will void the manufacturer's warranty.

Dump backfill material adjacent to the STORMVAULT Tank and, using your LGP Skid Steer or Dozer, push the material over the STORMVAULT Tank system (Fig. 17).

Largest Track Dozers that can be used with 12" (300mm) of cover over the STORMVAULT Tank.

MACHINE	Operating Weight (imp)	Operating Weight (metric)	Track Dimensions (imp)	Track Dimensions (metric)	Ground Pressure (imp)	Ground Pressure (metric)
Case 850K LGP	20,700 lbs	9.38 t	28" x 92.6"= 2593 si	0.7m x 2.35m = 1.67 sqm	4.0 psi	2.8 t/sqm
Caterpillar D5K LGP	21,347 lbs	9.68 t	26" x 91"= 2366 si	0.66m x 2.31m = 1.52 sqm	4.52 psi	3.17 t/sqm
John Deere 550J LGP	18,252 lbs	8.27 t	24" x 86"= 2064 si	0.61m x 2.18m = 1.33 sqm	4.2 psi	2.95 t/sqm
Komatsu D39PX-21	19,620 lbs	8.90 t	25" x 93"= 2325 si	0.635m x 2.36m = 1.49 sqm	4.27 psi	3.00 t/sqm
New Holland D95 LGP	20,700 lbs	9.38 t	28" x 93"= 2604 si	0.71m x 2.36m = 1.68 sqm	4.0 psi	2.81 t/sqm

** This list is not intended to be all inclusive, but representative.

If your machine is not listed, you'll need to find your vehicle's Operating Weight and measure the area where the tracks contact the ground. Take these dimensions and multiply them (Length x Width), then multiply by 2 (since the machine has two tracks), then divide the Operating Weight by the total square inches (sqm) of contact area to determine the contact pressure of the machine. If the contact pressure is less than 3.52 psi (3.17t/sqm) and the operating weight is less than 20,000 lbs(10.0t) the machine will work with 12" (300mm) of cover. Compact top backfill to 95% standard proctor density or as shown on plans using your walk-behind trench roller.

Lightly compact top backfill to 95% Standard Proctor density or as shown on the plans using a walk behind trench roller, Alternately, a roller (maximum gross vehicle weight of 5 tons) may be used. Roller must remain in Static mode until a minimum of 24" (600mm) of cover has been placed on the modules. Sheep Foot Rollers should not be used.



Fig. 17 Use an LGP dozer to push backfill over STORMVAULT Tank units.



TIP: When pushing backfill over STORMVAULT Tank units, work in the direction of the geotextile overlap to avoid shoving material between the fabric layers.



WARNING: A minimum of 12" (350mm) of material must be maintained between the Dozer tracks and the top of the STM Tank. For best results, push at least 20" (660mm) or more if needed of backfill over the units so that as the material compacts beneath the dozer, a 12"(300mm) minimum lift is maintained. It is recommended that the dozer drive straight on and then back straight off of the system during backfill placement. Turning or maneuvering movements are likely to shove the backfill material, reducing the thickness of the lift and potentially damaging the units. Hence not recommended.

 **WARNING:** Dump trucks should not drive over or dump material on top of the STM Tank.

 **WARNING:** Some materials will compact significantly while others may shove excessively as you work. Never allow your lift thickness to compact to less than 12" without adding more material.

10 Place Geogrid.

Geogrid is required for all load-bearing applications (Fig. 18), such as systems placed beneath parking lots and roads. It is not required above systems used in open space where traffic is prohibited, such as sport fields or natural Landscaped areas.

Geogrid must be placed 12" (300mm) above the STORMVAULT Tank. Overlap adjacent panels by 18" (450mm) minimum or as specified in plans. Roll out Geogrid over the top of the system, with the edges of the grid extending 5' (1.50m) from STORMVAULT Tank footprint or 3' (900mm) from edge of excavation or more as show on plans (refer to CAD detail H20 loads).



Fig. 18 Overlap Geogrid 18" (300mm) or as required by plans.

If metallic tape used to locate the system has been specified, now is a good time to install it.

11 Place Additional Cover Material as Needed

If additional cover or pavement base is required by the plans, begin placing and compacting material in the same manner as discussed in Step 9. Push cover material parallel to the geogrid for best results (Fig. 19). All cover materials must meet requirements of sequence of works specification section 2.03



Please contact Rainsmart or closest distributor for load calculations and design details for Maximum and minimum allowable top fill, based on project requirements.



TIP: To achieve proper compaction requirements, it may be beneficial to begin placing material in 6" (150mm) lifts.

Fig. 19 Pushing backfill parallel to the Geogrid.

prevents the grid from shoving.

12 Secure the Installation.

The STORMVAULT Tank System should be secured to prevent damage from construction equipment once it has been installed.

Construction loads are often the heaviest loads that ever drive over the STORMVAULT Tank System, and there are many construction vehicles that exceed the HS20 standard that most detention systems are designed to meet. To prevent damage from these vehicles, the installation should be secured to prevent unauthorized traffic from driving over the system once it has been installed.

Projects nearing completion (within three months) should use warning tape or temporary fencing to secure the installation (Figure 20).

For larger projects with ongoing construction activities, consider a more durable method for preventing unauthorized traffic from accessing the system (Figure 21).

Regardless of what method is selected to secure the installation, it must remain in place until construction activity has concluded and no further access of vehicles exceeding the HS20 standard is necessary.



Fig. 20 Secure the installation with temporary fencing.



Fig. 21 Secured STORMVAULT Tank installation using Jersey Barriers.

13 Install a Pre-treatment Devices.

Install pre-treatment devices prior to activating R- STORMVAULT Tank System to keep any debris from entering the system.



Fig. 22 Trash Guard Plus prevents contamination.

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