

# RAINVAULT

UNDERGROUND DETENTION SYSTEM

## INSTALLATION GUIDE

1. Plan the Installation
  - a. Consider construction schedule and site access to determine if any heavy loads must travel over the area directly above the system.
  - b. Delay installation until all heavy construction loads no longer need access to the area. Examples of heavy loads include cranes, lulls, scrapers, excavators, loaders, and any other heavy construction equipment.
2. Survey
  - a. Mark the corners of the excavation (not the RainVault itself) with 5' offsets.
  - b. If only the RainVault footprint is shown on the plans and the excavation is not shown, default to a 24" perimeter all the way around the system.
3. Excavate
  - a. Excavate the length, width, and depth of the system, providing enough area outside of the RainVault footprint to work (24" is recommended) following all local and OSHA requirements to work safely.
  - b. Level bottom and prepare per plans and confirm proper elevation.
  - c. Check subgrade stability to ensure a minimum bearing capacity of 2,000 lbs/sf has been achieved. For subgrades that do not meet this minimum, or if there are areas that are pumping or excessively soft, consult the engineer of record and remediate these areas before continuing with the installation.
4. Install Outer Envelope (if specified): Geotextile / Liner
  - a. Install the outer envelope using the material shown on project plans. This material is typically an 8 oz/sy nonwoven geotextile, but other geosynthetics may be specified.
  - b. Overlap edges a minimum of 12" (or as required by manufacturer) or seam as required by plans.
  - c. Secure material in place to prevent disturbance from wind.
5. Prepare Base
  - a. If required by plans, install base materials to appropriate depth and elevation as shown on plans (typically 3-6").
  - b. All materials immediately surrounding RainVault modules must be angular, less than 1.5" in diameter, and free of debris or other dissimilar materials.
  - c. Acceptable materials include the circled materials from the Unified Soil Classification System:

Major divisions		Group symbol	Group name
Coarse grained soils more than 50% retained on or above No.200 (0.075 mm) sieve	gravel > 50% of coarse fraction retained on No.4 (4.75 mm) sieve	GW	well-graded gravel, fine to coarse gravel
		GP	poorly graded gravel
		GM	silty gravel
	sand ≥ 50% of coarse fraction passes No.4 (4.75 mm) sieve	GC	clayey gravel
		SW	well-graded sand, fine to coarse sand
		SP	poorly graded sand
Fine grained soils 50% or more passing the No.200 (0.075 mm) sieve	silt and clay liquid limit < 50	SM	silty sand
		SC	clayey sand
		ML	silt
		CL	lean clay
	silt and clay liquid limit ≥ 50	OL	organic silt, organic clay
		MH	elastic silt
		CH	fat clay
		OH	organic clay, organic silt
Highly organic soils		PT	peat

- d. Sandy in-situ materials meeting these requirements may be used in lieu of import materials.

- e. Base should be smooth, firm, and level, with variations less than +/- 1/4".
  - f. Drain excessive groundwater, and remediate any soft or pumping areas.
6. Install Inner Envelope: Geotextile / Liner
- a. Install the inner envelope using the material shown on project plans. This material is typically an 8 oz/sy nonwoven geotextile, but other geosynthetics may be specified.
  - b. Overlap edges a minimum of 12" (or as required by manufacturer) or seam as required by plans.
  - c. Secure material in place to prevent disturbance from wind.
7. Install RainVault Modules
- a. RainVault modules may be pre-assembled or, for best results, assembled in the excavation. If equipment is used to transport pallets into the excavation, do not drive on geosynthetic materials and use caution to avoid disturbing or contaminating the base materials.
  - b. Modules are assembled by connecting the large panels together, matching the male fittings with the female fittings. For best results, cross-link bottom panels with top panels to form an interconnected vault.
  - c. If a First Flush Filter (F3) has been specified, begin the installation in this area. If multiple F3s are included, determine which one provides the most advantageous starting point and begin with this area.
    - i. The F3 traps pollutants, preventing them from spreading throughout the system, and is wrapped independently from the rest of the system. Install two layers of 300lb woven geotextile on the base directly beneath the F3 and extending out 12-18" beyond the edge of the F3.
    - ii. Install the RainVault modules included inside the F3. Modules within the F3 may be cross-linked, but cannot be cross-linked with modules outside of the F3.
    - iii. Add lugs and additional module layers to form taller modules if required (see step 7d and 7e for more details).
    - iv. Install top caps on all F3 modules
    - v. Install side panels on all F3 exterior modules (see Step 8 for more details)
    - vi. Place 8 oz/sy nonwoven geotextile (or as specified on plans) over the F3 modules, draping the material over the top of the modules, down the sides, and covering the woven geotextile on the base of the excavation.
    - vii. Install adjacent modules outside the F3 to hold the geotextile cap in place. Be sure to install side plates on module sides directly adjacent the F3 to sandwich and support the geotextile casing surrounding the F3.
  - d. Continue installing RainVault modules as shown on plans, cross-linking panels whenever possible.
  - e. Add lugs (supplied with the system) between top panels to securely interlock adjacent modules together.
  - f. For taller modules, repeat steps 7d-7e to add multiple layers (up to five layers high), stacking modules to the height shown on plans. Use the lugs installed in 7d secure the base of the new layer over the lower layer to prevent sliding/shifting between layers.
  - g. Once module has reached full height as specified, install module cap plates.
8. Install Side Panels on all exterior sides of the system
- a. Align side panels with module side pegs around perimeter of the system and tap side plates into place with the bump-outs facing into the module, resting against the interior cones.
  - b. In areas where pipes connect to the system, some adjustment to the side panels will be required.
    - i. For smaller pipes (< 12")
      1. Trim the side plate using the cutout rings molded into the plate to allow the pipe to penetrate into the system.
      2. Pipe should enter the modules by 2-3 inches, or as far as possible without modifying interior cones. **NEVER CUT OR MODIFY THE INTERIOR CONES OF THE RAINVAULT.**
    - ii. For larger pipes (>12")
      1. Remove side plates that are completely contained within pipe connection area.
      2. Side plates partially covered by pipe connections must be cut so that water can flow freely into the system.
        - a) Line up pipe and mark all side plates that need to be cut.
        - b) Remove side plates and cut close to your marks with a reciprocating saw.

- c) **DO NOT CUT SIDE PANELS WHILE STILL INSTALLED ON MODULES!** Side panels touch the interior support structure of the system and **MUST BE REMOVED** to be cut.

9. Connect Inlet/Outlet Pipes to the RainVault system.

- a. Pull geotextile forming inner envelope up between RainVault modules and the pipe, and cut and X into the material, pulling flaps back over pipe so that water may flow into the RainVault unobstructed.
- b. Use a stainless steel hose clamp to tie off inner envelope to the pipe.
- c. Use nonwoven geotextile or geomembrane liner (as required by plans) to form a boot around the pipe to prevent backfill materials from entering the system. Use a stainless steel hose clamp to tie off boot to pipe, over the clamp installed in 9b.

10. Install Maintenance Access

- a. Using a scrap piece of 6" SDR-35 pipe and marking paint, mark a cut-out area in the top of the RainVault module, centered between the support cones.
- b. Use a reciprocating saw to cut into cap and top plate of the module, staying close to the marks to ensure a snug fit and NOT cutting the interior support cones. Only the upper and middle portions of the RainVault module should be cut. Do NOT cut bottom plate on the bottom module.
- c. Cut the bottom of the 6" SDR-35 pipe as shown on plans to allow maintenance access into the RainVault system.
- d. Insert 6" SDR-35 pipe into hole, ensuring it is stable and will not topple.

11. Complete Inner Envelope

- a. Pull inner envelope materials installed in Step 6 up sides and over the top of the RainVault system, adding additional material as needed to completely envelope the system.
- b. Overlap edges a minimum of 12" (or as required by manufacturer) or seam as required by plans
- c. Cut a X into the material for maintenance port access, using a stainless steel hose clamp to secure the flaps of the X to the port.
- d. Install geotextile or liner boots around maintenance ports and seal with stainless steel hose clamps.

12. Backfill Top and Sides

- a. Backfill materials must meet the same requirements as the base material in Table 5c.
- b. Place backfill material on top of modules around perimeter first to lock modules in place and prevent shifting.
- c. Backfill sides in 12" – 18" lifts consistently around sides, limiting variations to 18" maximum.
- d. To prevent long-term settling of side backfill, use a plate tamper or trench roller to compact backfill materials.
- e. Use a small skid steer or LGP dozer (10 ton max operating weight) to push backfill material over the top of the system, maintaining a minimum of 12" of cover between tracks and RainVault.
- f. If final depth of top cover is less than 12", there are two options to install this layer:
  - i. Place cover material from outside the system footprint with an excavator, stone slinger, or telebelt.
  - ii. Begin by pushing out 12" of material over the system and use a dozer to back-drag down to the final depth.
- g. Continue backfilling top until the elevation shown on plans is reached.

13. Complete Outer Envelope (if specified)

- a. Using the material installed in Step 4, pull material up over the top of the system to encase the backfill, preventing contaminating the backfill materials. Add material panels as needed to seal the system.
- b. Overlap edges a minimum of 12" (or as required by manufacturer) or seam as required by plans.
- c. If required, install magnetic locator tape around the perimeter of the system.

14. Continue placing additional cover as required by the project plans using a small skid steer or LGP Dozer (10 ton max).

- a. The minimum final cover requirements are determined by the loading requirements of the system as determined by the engineer of record. Standard minimum cover depths are:
  - i. Grass or recreational space (no vehicular loading)      12" Recommended
  - ii. HS20      15" Required
  - iii. HS25      16" Required

- b. The maximum cover, from the top of the system to finished grade, is 8'. If the project plans require greater fill depths, please contact Ripple Stormwater Technologies.
  - c. Only STATIC Compaction of materials over the RainVault is allowed until the total backfill depth exceeds 36". Vibratory compaction may begin at depths over 36".
15. Rope off the excavation to prevent unrelated construction equipment from travelling over the system. Construction vehicles often exceed the engineer's design loads and can damage the system, leading to costly repairs not covered by the product warranty.