

DIVISION 33 – UTILITIES

SECTION 33 45 13 - STORMWATER DETENTION SYSTEM - RAINVAULT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes requirements for the supply, installation, and commissioning of the RainVault underground stormwater detention system, including excavation and backfilling of the system.
- B. RainVault is an underground modular stormwater detention system designed to capture and temporarily detain, retain and infiltrate, or retain and store stormwater runoff, ensuring post-development hydraulics mimic those of the pre-existing conditions to reduce the risk of downstream flooding.

1.02 REFERENCES

- A. Related documents from the project and product manufacturer/s apply to this section:
 - 1. Project Plans & Drawings
 - 2. Technical Specifications
 - 3. Product Installation Guides
- B. Local building codes and regulations governing stormwater management and underground utilities.

1.03 QUALITY CONTROL

- A. To ensure project integrity, all components shall be manufactured in ISO certified facilities.
- B. Installation shall be executed by skilled technicians with successful project experience on large earthwork or stormwater projects of similar size.

1.04 SUBMITTALS

- A. Submit product data, including ISO certification and ultimate compressive strength.
- B. Submit installation instructions.
- C. Alternate product submissions must be provided and approved prior to bid opening. All testing data must exceed performance listed in table 2.01 A4.

1.05 MATERIAL HANDLING

- A. If time between delivery and installation of materials exceeds 30 days, use a tarp or scrap geotextile to cover all materials to protect against UV damage.
- B. In cold weather (< 40 degrees Fahrenheit), plastic materials are more brittle and must be handled with care. Do not install when materials or subgrade are frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. RainVault Modules:
 - 1. The RainVault modules shall be made of recycled polypropylene (PP) material capable of meeting the loading requirements specified within this document (Section 2.01 A4), as dictated by the project loading requirements, as well as all local building codes.

2. Modules shall be designed to interlock securely with adjacent modules forming an open storage vault with no interior obstructions that would limit travel of jet/vac equipment needed to maintain the system.
3. Modules must have an outer shell that can be removed or modified to allow unobstructed flow of runoff from inlet/outlet pipes to mitigate clogging issues.
4. The modules shall have a minimum storage capacity of 32 gallons per module.
5. Modules shall meet the following minimum specification:

Item	Description	Value
Void Area	Volume Available for Water Storage	95%
Unconfined Crush Load VERTICAL	ASTM D 2412 / ASTM F 2418	60 psi
Unconfined Crush Load LATERAL	ASTM D 2412 / ASTM F 2418	35 psi
Service Temperature	Safe Temperature Range	-14 - 167 F
Recycled Content	Use of Grade 1 Post-Industrial Recycled Polypropylene	100%
Biological and Chemical Resistance	Potential for Deterioration	Unaffected by mold, algae, soil-born chemicals, bacteria, and bitumen
Minimum Cover HS-20	Required Cover for HS-20 Loading	15 inches <small>(contact Ripple for traffic applications between 12-15")</small>
Minimum Cover HS-25	Required Cover for HS-25 Loading	16 inches
Maximum Cover	Cover Depth Not to Exceed	8 feet

6. RainVault supplied by: Ripple Stormwater Technologies; P: 904-763-7632 or E-mail: info@ripplestormwater.com

B. Geotextile Fabric:

1. Inner Envelope: Geotextile fabric shall be used to envelope the RainVault system to prevent backfill or soil intrusion into the system.
2. Outer Envelope: Geotextile may be used against the excavation floor and walls to wrap washed stone backfill to realize additional capacity beyond the module volume.
3. Geotextile fabric shall be nonwoven polypropylene with a nominal weight of 8 oz/sy, such as Geotex 801 or N-180.
4. There are occasions when different geosynthetic materials may be substituted for the nonwoven geotextile.
 - i. For infiltration applications, consider using a woven monofilament geotextile such as Geotex 111F or FW-402 on the bottom of the system for both inner and outer envelopes.
 - ii. Geomembrane materials may be used on the bottom and sides of the system (typically replacing the outer envelope) for stormwater harvesting applications or to prevent groundwater intrusion into the system. Use 8 oz/sy nonwoven geotextile on both sides of the geomembrane for added protection of the liner. Recommended geomembrane materials include:
 1. 30 mil PVC
 2. 30 mil LLDPE
5. Systems that include a First Flush Filter section require a 300 lb woven geotextile such as Geotex 315ST beneath the modules for scour protection.

2.02 SYSTEM COMPONENTS

A. Inlet and Outlet Structures:

1. Provide pre-fabricated inlet and outlet structures designed to efficiently convey stormwater into and out of the RainVault system.
2. Inlet and outlet structures shall be manufactured from corrosion-resistant materials and designed to meet local stormwater management requirements.

- All inlet and outlet pipe connections to the RainVault System must be completely open, free of geotextile or module side plates that could interfere with the flow of runoff into the system.

B. Maintenance Ports:

- Provide vertical pipe sections (6" SDR-35 is recommended) connected to the top of the RainVault to allow maintenance access into the system.
- Openings shall be cut ONLY into the cap, top, and middle panels of the RainVault between the structural cones. Bottom panel should not be cut. Pipe should rest on the bottom plate of the RainVault System.
- Bottom of pipe must be cut as shown in drawings to allow access into the system.

C. Base, Backfill and Cover Materials:

- All materials immediately surrounding RainVault modules must be angular, less than 1.5" in diameter, and free of debris or other dissimilar materials.
- 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	clean gravel <5% smaller than No.200 Sieve	GW well-graded gravel, fine to coarse gravel
		gravel with >12% fines	GP poorly graded gravel
			GM silty gravel
	sand ≥ 50% of coarse fraction passes No.4 (4.75 mm) sieve	clean sand	SW well-graded sand, fine to coarse sand
		sand with >12% fines	SP poorly graded sand
			SM silty sand
Fine grained soils 50% or more passing the No.200 (0.075 mm) sieve	silt and clay liquid limit < 50	inorganic	ML silt
		organic	CL lean clay
			OL organic silt, organic clay
	silt and clay liquid limit ≥ 50	inorganic	MH elastic silt
		organic	CH fat clay
			OH organic clay, organic silt
Highly organic soils		PT peat	

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

PART 3 - EXECUTION

3.01 INSTALLATION

A. Preparation:

- Ensure installation area is clear, and that construction sequencing will not require heavy traffic to access the installation area after installation of the RainVault.
- Survey the area and provide 5' offset stakes for all corners. Stakes may be needed for both the excavation and the RainVault modules.
- As a best practice, install all inlet and outlet structures prior to installing the RainVault system.

B. Excavation and Base:

- Excavate the designated area to the dimensions specified in the project plans, ensuring proper alignment and grade. Excavation must exceed RainVault dimensions by at least 12-24" (per plans) on all sides to allow room for backfill.

2. Subgrade must provide a minimum bearing capacity of 2,000 lbs/sf prior to installing base materials and/or RainVault. If subgrade is pumping or appears excessively soft, consult the engineer of record to determine remediation requirements.
 3. If required, place geotextile (per plans) on subgrade and install base materials (per plans, with 3" min) up to RainVault invert.
- C. RainVault Installation:
1. Install the geotextile envelope on the base materials (if required).
 2. Assemble and install the RainVault modules in accordance with the project plans, manufacturer's instructions, and local building codes.
 3. Use the supplied lugs to connect adjacent units and vertical layers.
 4. Install caps on all modules and side plates on all perimeter modules.
 5. Connect all inlet/outlet pipes, ensuring free flow between pipes and modules.
 6. Install vertical inspection ports as shown on plans.
 7. Wrap geotextile fabric around modules, using care around pipe penetrations to prevent soil intrusion into the RainVault system.
- D. Backfill:
1. Backfill as shown in the RainVault installation guide. Ensure proper compaction of the backfill material.
 2. If an outer geotextile fabric is required (installed in step B 3 above), wrap this over the backfill using care around pipe penetrations to prevent soil intrusion into the backfill.
 3. Continue placing quality fill materials as required in project plans. If total cover must exceed 8', notify your RainVault representative immediately.

3.02 COMMISSIONING

- A. Inspect all pipe connections to ensure no geotextile or perimeter plates could impede the flow of runoff are present between the pipe and the RainVault.
- B. Ensure all pre-treatment systems, if required, have been installed prior to commissioning the system.
- C. If construction activities are on-going, ensure all inlet protection devices are installed and properly maintained until the site is fully stabilized. It is NEVER recommended to use the RainVault as a sediment trap during construction. Commissioning of the system should only be performed when the site is fully stabilized and all pre-treatment systems have been installed.

3.03 PROTECTION AND CLEANUP

- A. Remove all debris and excess materials from the construction area upon completion of the RainVault installation.
- B. Fence off Vault area to prevent heavy construction traffic from passing over the system, as this could damage the modules.

PART 4 - MAINTENANCE

4.01 MAINTENANCE REQUIREMENTS

- A. The RainVault System should be inspected quarterly throughout the first year of service, and semi-annually thereafter.

- B. When sediment within the RainVault reaches 6" in depth, backflush the system using standard equipment. Beginning furthest from the system, vacuum the following components:
 - a. Inlets contributing runoff to the RainVault
 - b. Pre-treatment systems
 - c. Inlet and outlet connections
 - d. Maintenance Ports in the First Flush Filter area (if applicable)
 - e. Maintenance Ports outside of the First Flush Filter area
- C. Dispose of removed pollutants as required by local regulations.

END OF SECTION