

Underground Stormwater Detention System (USDS) Material & Installation Specifications

Technical Specification:

PART 1 - GENERAL

1.01 General Provisions

- A. The Conditions of the Contract and all Sections of Division 1 are hereby made a part of this Section.

1.02 Description of Work

A. Work Included:

1. Provide excavation and base preparation per Geotechnical Engineer's recommendations and/or as shown on drawings, to provide adequate support for project design loads and safety from excavation sidewall collapse. See 2.02 Materials.
2. Provide Underground Stormwater Detention System (USDS) and all related products including storage media, geotextiles, geogrids, inlet and outlet pipe with connections and installation per the manufacturer's instructions furnished under this section.

B. Related Work:

1. Subgrade excavation and preparation under Section 02300 - Earthwork.
2. Subsurface drainage materials - Section 02700 - Subsurface Drainage and Structures, as needed.

1.03 Quality Assurance

- A. All materials must be manufactured in ISO certified facilities.

- B. Installation: Performed only by skilled work people with satisfactory record of performance on bulk earthworks, pipe, chamber, or pond/landfill construction projects of comparable size and quality.

1.04 Submittals

- A. Submit manufacturer's product data and installation instructions.

- B. Submit product sample for review. Reviewed and accepted samples will be returned to the Contractor.

- C. Submit material certificates for geotextile, geogrid, base course and backfill materials.

1.05 Delivery, Storage, and Handling

- A. Protect all materials from damage during delivery and store UV sensitive materials under tarp to protect from sunlight – including all plastics - when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris.

- B. Handling is to be performed with equipment appropriate to the materials and site conditions, and may include hand, handcart, forklifts, extension lifts, etc.

1.06 Project Conditions

- A. Review manufacturer's recommended installation procedures and coordinate installation with other work affected, such as grading, excavation, utilities, construction access and erosion control to prevent all non-installation related construction traffic over the completed USDS installation, especially with loads greater than design loads.

B. Cold weather:

1. Do not use frozen materials or materials mixed or coated with ice or frost.
2. Do not build on frozen ground or wet, saturated or muddy subgrade.
3. Care must be taken when handling plastics when air temperature is at 40 degrees or below as plastic becomes brittle.

- C. Protect partially completed installation against damage from other construction traffic when work is in progress and following completion of backfill by establishing a perimeter with highly visible construction tape, fencing, or other means until construction is complete.

- D. Protect adjacent work from damage during USDS installation.

- E. Pre-Treatment Systems to remove debris and heavy sediments MUST be in place and functional PRIOR to operation of the USDS. Additional measures may be needed if unit is operational during construction.

PART 2 - PRODUCTS

2.01 Availability

- A. The underground storage system must:
- Be modular in nature
 - Fit into the footprint of the specified system
 - Have a minimum of 5 years of use in the United States
 - Have a minimum of 1 million cubic feet installed and performing
 - Meet the following requirements:

Test	Value	Unit
Net Void Area	95	%
Service Temperature	-20 - 130	Degrees Fahrenheit
Unit Weight (Single Segment w/ two internal plates)	> 13.5	lbs
Opening Size	< 1.5	square inches
Rib Orientation	Linear & Parallel	
Unconfined Crush Strength* (5" x 5" plate)	34	psi
Unconfined Crush Strength* (11" x 16" plate)	45	psi
Unconfined Crush Strength* (16" x 27" plate)	30	psi
Diagonal Strength* (16" x 27" plate)	19	psi
90 Day Creep Strain	< 0.5	%

*All tests performed on units with two internal plates

- B. Approved Products include Atlantis Matrix D-RainTank[®]

Manufactured by:

Atlantis Corporation Pty Ltd
Unit 3, 19-21 Gibbes Street
Chatswood, NSW –2067 Australia

Distributed by:

StormWater Structures, Inc.
1930 Aldine Western Rd.
Houston, TX 77038
Phone: 832-446-1001

2.02 Materials

- A. Base of Excavation: Shall be smooth, level and free of lumps or debris. Compact to at least 95% Standard Proctor Density (or as required by Engineer) unless infiltration of stormwater into subgrade is desired. A thin layer (3") of material (See Section C) is recommended to establish a level working platform. (May not be needed in areas with sandy soils meeting requirements of Section C below.) A CBR >5 must be achieved prior to beginning installation of RainTanks. If the base is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice. In many cases a stabilization geotextile and 6" of compactable material that drains well will be sufficient to amend the bearing capacity of the soil.
- B. Geotextile: Most applications require ACF N080 or equivalent nonwoven geotextile with a nominal weight of 8 oz per square yard. Applications requiring water to infiltrate/exfiltrate through the geotextile as a primary mode of introducing or removing water from the USDS should use a woven monofilament such as Propex 111F or equivalent. Geotextile should be appropriate for the soil type and depth, and completely wrap the USDS.

- C. Side Backfill: Structural fill, sand or other free-draining materials < 1.5” in diameter and compactable to 95%. Must be free from lumps, debris and any sharp objects that could cut the geotextile. Material is used for base, backfill along the sides of the structure, and top cover. Must be compacted with powered mechanical compactor in lifts that do not exceed 12” to provide a settlement-free surface. Even when “self-compacting” backfill materials are selected, a vibratory compactor must be used.
- D. Top Backfill: Use Side Backfill material for first 12” above the USDS. Top backfill should be between 12”(300mm) minimum and 36” (500mm) maximum depth compacted in 6” lifts. To support H20 loads, top cover should be 18” minimum depth (24” recommended), reinforced with a geogrid 12” above the USDS. Material above the geogrid may vary based on the intended use of the surface area. In no case should clays be used to backfill the USDS.
- E. Geogrid: Use Huesker Fornit 30 or equivalent to reinforce backfill above the USDS to support H20 loads (otherwise, not required). Geogrid should extend 3 feet beyond the excavation footprint.
- F. Utility Marker: If required, use metallic tape at corners of install to mark the area for future utility detection.

PART 3 - EXECUTION

3.01 Inspection

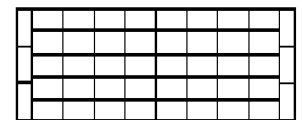
- A. Examine prepared excavation for smoothness, compaction and level. Check for presence of high water table, which must be kept at levels below the bottom of the USDS structure at all times. A CBR >5 must be achieved prior to beginning installation of RainTanks. If the base is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice. In many cases a stabilization geotextile and 6” of compactable material that drains well will be sufficient to amend the bearing capacity of the soil. Do not start installation of the USDS until unsatisfactory conditions are corrected.
- B. Installation commencement constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Project Manager or Engineer for resolution prior to installation.

3.02 Preparation

- A. Using Side Backfill Material (Section 2.02 C) level the base of the excavated area as per engineering detail to establish a working platform for the USDS.
- B. It is helpful to identify the outline of the structure on the floor of the excavation, using spray paint or chalk line, to ensure squareness during module placement.

3.03 Installation of the USDS

- A. If a liner is being used in the system to harvest stormwater or prevent groundwater intrusion, install per manufacturer’s recommendations and per engineering detail.
- B. Lay geotextile on the base of the excavation and sidewalls with extra material on side to wrap the top of the USDS. If engineering drawings do not require geotextile on the base of the excavation, place fabric a minimum of 20”(500mm) inside the excavated area to secure the material.
- C. Install the USDS. If RainTank modules are being used, the large side plate of the tank should be placed on the perimeter of the system. This will typically require that the two ends of the tank area will have a row of tanks placed perpendicular to all other tanks.
- D. Wrap the USDS in geotextile fabric from the sides and the top to prevent soil entry into the system. Overlap geotextile 12” or as recommended by manufacturer. Take great care to avoid damage to (optional) liner during placement.
- E. Identify locations of inlet, outlet, inspection ports, and any other penetrations of the geotextile and (optional) liner, securing pipe into boots with stainless steel pipe clamps. Support pipe in trenches during backfill operations to prevent damage to geotextile, (optional) liner or pipe.
- F. Backfilling with recommended backfill, compacting in 12” (max) lifts. Place backfill CAREFULLY to avoid shoving or damaging system components. Use a powered mechanical compactor to compact backfill on structure sides with care to avoid damage to geotextile or (optional) liner.



- G. Backfill above system should be compacted in 6" lifts (do not use drivable rolling compactors with 6" of cover). Alternately, a single 12" lift of backfill may be placed and compacted over the system so long as compaction goals can be obtained. When backfill reaches an elevation 12" above the USDS, place a layer of geogrid directly over the top of the backfill (required only when there will be traffic loads (H20 loads) above the system), extending 3' beyond the excavation walls.
- H. Place sufficient sandy gravel backfill (Section 2.02 E) material over geogrid to ensure support of design loads. Place cover backfill in 6" lifts and compact with vibrating plates or walk-behind rollers (do not use drivable rolling compactors) to a minimum of 95% Standard Proctor Density, with a minimum depth of 6" (12" is recommended) and a maximum depth of 36" or as specified on engineering drawings. Take care to PLACE backfill on top of structure to avoid damage to structure, geotextile or (optional) liner, using low pressure tire or track vehicles.
- I. Ensure that all unrelated construction traffic be kept away from the limits of excavation until the project is complete and final surface materials are in place.
- J. Place surfacing materials, such as groundcovers (no large trees), or paving materials over the structure with care to avoid displacement of cover fill and damage to surrounding areas.
- K. Backfill depth over USDS must be a MINIMUM of 18" prior to Proof Rolling area directly above USDS. If backfill depth is less than 18" and proof rolling is required, contact engineer or manufacturer's representative for assistance.

3.04 Cleaning

- A. Perform cleaning during the installation of work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

PART 4 - USING THE SYSTEM

4.01 Maintenance Requirements

- A. Maintenance efforts should be focused on pretreatment systems. Ensuring these structures are clean and functioning properly will prevent contamination of the USDS system and stormwater released from the site. Pre-treatment systems should be inspected as directed by the manufacturer (for proprietary systems) or at least quarterly for the first year of use, yearly thereafter. Maintain as needed using acceptable practices or following manufacturer's guidelines (for proprietary systems).
- B. If the USDS system included Inspection or Maintenance Ports, it will be necessary to inspect the system for accumulation of sediments. This is done by removing the cap of the port and using a measuring device long enough to reach the bottom of the USDS and stiff enough to push through the loose sediments, allowing a depth measurement.
- C. If sediment has accumulated beyond an acceptable level, it will be necessary to flush the USDS. This can be done by pumping water into the Maintenance Port or adjacent structure, allowing the turbulent flows through the USDS to re-suspend the fine sediments. If multiple Maintenance Ports have been installed, water should be pumped into each port to maximize flushing efficiency. Sediment-laden water can be pumped out and either captured for disposal or filtered through a Dirtbag™ if permitted by the locality.

END OF SECTION