



R-TANK SPECIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- Drawings, technical specifications and general provisions of the Contract as modified herein apply to this section.

1.2 DESCRIPTION OF WORK INCLUDED

Provide excavation and base preparation per geotechnical engineer's recommendations and/or as shown on the design drawings, to provide adequate support for project design loads and allow for excavation shoring and shoring. Cooperations shall be in accordance with the owner's OSHA requirements.

Provide and install R-Tank™, R-Tank™, R-Tank™, or R-Tank™ system (hereinafter called R-Tank) and all related products including fill materials, geotextiles, geogrids, inlets and outlet pipe with connections per the manufacturer's installation guidelines provided in this specification.

Provide and construct the cover of the R-Tank system including: stone backfill, structural fill, cover, and pavement sections as specified.

Protect R-Tank system from construction traffic, after installation until completion of all construction activity in the installation area.

1.3 QUALITY CONTROL

- All materials shall be manufactured in ISO certified facilities.
- Installation Contractor shall demonstrate the following experience:
 - A minimum of three R-Tank or equivalent projects completed within 2 years, and
 - A minimum of 25,000 cubic feet of storage volume completed within 2 years.
- Installation Contractor shall be required to be waived if the manufacturer's representative provides on-site training and review during construction.
- Installation Personnel: Performed only by skilled workers with satisfactory record of performance on bulk earthworks, pipe, chamber, or pond/landfill construction projects of comparable size and quality.
- Contractor must have manufacturer's representative available for site review if requested by Owner.

1.4 SUBMITTALS

- Provide R-Tank layout drawing. Drawing shall include typical section details as well as the required base elevation of stone and tanks, minimum cover requirements and tank configuration.
- Submit manufacturer's product data, including compressive strength and unit weight.
- Submit manufacturer's installation instructions.
- Submit the sample for review. Reviewed and accepted samples will be returned to the Contractor.
- Submit material certificates for geotextile, grout, base course and backfill materials.
- Any proposed alternate products must be submitted for review and approved prior to bid opening. Review package should include third party reviewed performance data that meets or exceeds criteria in Table 2.01 B.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect R-Tank and other materials from damage during delivery, and store UV sensitive materials under protect from sunlight when time from delivery to installation exceeds two weeks. Storage of materials should be on smooth surface, free from dirt, mud, and debris.

Materials should be performed with equipment appropriate for the materials and site conditions, and may include hand, track, hand, shovel, excavator, extension lifts, etc.

Cold weather:

- Grout must not be taken when handling plastics when air temperature is 40 degrees or below or plastic becomes brittle.
- Do not use frozen materials or materials mixed or coated with ice or snow.
- Do not use frozen ground or wet, saturated or muddy subgrade.

1.6 PREINSTALLATION CONFERENCE

Conduct a meeting of the installation and construction conference shall occur with the representatives from the design team, the general contractor, the excavation contractor, the R-Tank installation contractor, and the manufacturer's representative.

1.7 PROJECT CONDITIONS

Excavation and installation of the R-Tank system with other on-site activities to eliminate all non-installed related construction traffic over the completed R-Tank system. No loads heavier than the design loads shall be allowed over the system, and in no case shall loads higher than a standard AASHTO HS20 (or HS25, depending on design criteria) be allowed over the system at any time.

Protect adjacent work from damage during R-Tank system installation.

Construction of the R-Tank system shall be in place and functional prior to the completion of the R-Tank system. Additional pre-installation efforts may be needed if site is operational during construction due to increased sediment loads.

Contractor is responsible for any damage to the system during construction.

PART 2 - PRODUCTS

2.01 R-TANK UNITS

R-Tank - Injection molded plastic tank plates assembled to form a 95% void modular structure of predestined height (custom for each project).

R-Tank units shall meet the following Physical & Chemical Characteristics:

PROPERTY	DESCRIPTION	R-Tank™ 12" x 12" x 12"	R-Tank™ 12" x 12" x 12"	R-Tank™ 12" x 12" x 12"	R-Tank™ 12" x 12" x 12"
Compressive Strength	ASTM D2122 12" x 12" x 12"	30.0 psi	33.0 psi	40.0 psi	50.0 psi
Flexural Strength	ASTM D2122 12" x 12" x 12"	10.0 psi	11.0 psi	13.0 psi	16.0 psi
Flexural Modulus	ASTM D2122 12" x 12" x 12"	1.0 x 10 ⁶ psi	1.1 x 10 ⁶ psi	1.3 x 10 ⁶ psi	1.6 x 10 ⁶ psi
Impact Strength	ASTM D2122 12" x 12" x 12"	1.0 ft-lb	1.1 ft-lb	1.3 ft-lb	1.6 ft-lb
Water Absorption	ASTM D2122 12" x 12" x 12"	0.01%	0.01%	0.01%	0.01%
Chemical Resistance	ASTM D2122 12" x 12" x 12"	Good	Good	Good	Good

Supplier: Ferguson Waterworks 2831 Carver Road Richmond, VA 23234 (703) 804-4836 / (804) 743-7777 www.ferguson.com

2.02 GEOSYNTHETICS

Geotextile: A geotextile envelope is required to prevent backfill material from entering the R-Tank system.

Geogrid: A geogrid is required. The standard geogrid shall be an 8' or 12' square yard nonwoven geogrid (ASTM D669 or N90) or equivalent.

Identification: When water is infiltrated through the geotextile as a function of the system design, a proven monofilament (ASTM D4002 or equivalent) shall be used.

Construction of the installation shall be in place and functional prior to the completion of the R-Tank system. Additional pre-installation efforts may be needed if site is operational during construction due to increased sediment loads.

Contractor is responsible for any damage to the system during construction.

2.03 BACKFILL & COVER MATERIALS

Backfill: Backfill shall be 3/4" or smaller and 1.5" in diameter) or (on GW, SW, GP or SW as classified by the Unified Soil Classification System) shall be placed below the R-Tank system (1" minimum). Material must be free from lumps, debris, and any sharp objects that could cut the geotextile. Material shall be within 1 percent of the optimum moisture content and 95 percent of the maximum dry density as determined by the Standard Proctor test.

Side and Top Backfill: Material must be free from lumps, debris, and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

1. Traffic Application: Free material must be used adjacent to (24" minimum) and above (the first 12") the R-Tank system.

2. For HD and SD, backfill materials shall be free draining stone (angular and smaller 1.5" in diameter) or (on GW, SW, GP or SW as classified by the Unified Soil Classification System).

3. For UD modules with less than 14" top cover, backfill materials shall be free draining stone (angular and smaller 1.5" in diameter). The use of soil or backfill on the sides and top of UD modules is not permitted unless the modules are installed outside of traffic areas with a cover depth of 14" or more. Top backfill material must be placed to a minimum of pavement base or 12" maximum must be consistent with side backfill.

4. For R-Tank modules installed in green spaces and not subjected to vehicular loads, backfill materials may only follow the guidelines for Traffic Applications above, or the top backfill layer (1" minimum) must consist of AASHTO #20 sieve benched or 30-40% (by volume) topsoil to aid in establishing vegetation.

5. For R-Tank modules installed in green spaces and not subjected to vehicular loads, backfill materials shall be placed in accordance with the general requirements of SMI, SP, SW, GP, or SW as classified by the Unified Soil Classification System. Structural fill shall have a maximum of 25 percent passing the No. 20 sieve, shall have a maximum dry density of 10 percent and a maximum Plasticity Index of 4 or less and be within 1 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

PART 3 - EXECUTION

3.01 ASSEMBLY OF R-TANK UNITS

- Assembly of modules shall be performed in accordance with the R-Tank Installation Manual, Section 2.

3.02 LAYOUT AND EXCAVATION

- Installer shall stake out, excavate, and prepare the subgrade area to the required plan grades and dimensions, ensuring that the excavation is at least 2 feet greater than R-Tank dimensions in each direction allowing for installation of geotextile, R-Tank modules, and free draining backfill materials.
- All excavations must be completed with OSHA approved excavated soils and sufficient working space.
- Excavations shall be prepared to prevent erosion and sediment damage from construction traffic by establishing a perimeter with highly visible construction tape, fencing, barricades, or other means until construction is complete.
- Size of the excavation shall be based on the volume of fill, and free of lumps or debris and soil or yielding subgrade areas. A minimum 20,000 pounds per square foot bearing capacity is required.
- Standard Applications: Compact subgrade to a minimum of 95% of Standard Proctor (ASTM D698) density as required by the Owner's engineer.
- Infiltration Applications: Compact subgrade to a minimum of 95% of Standard Proctor (ASTM D698) density as required by the Owner's engineer.
- Unusable Soils or Conditions: All questions about the base of the excavation shall be directed to the owner's engineer, who will approve the R-Tank installation prior to placement of stone. The owner's engineer shall determine the required bearing capacity of the R-Tank subgrade, no case shall a bearing capacity of less than 2,000 pounds per square foot be required.
- Do not start installation of the R-Tank system until satisfactory subgrade conditions are corrected and the subgrade conditions are approved by the owner's engineer.

3.03 PREPARATION OF BASE

- Place a thin layer (3" unless otherwise specified) of bedding material (Section 2.03 A), over the subgrade to establish a level working platform for the R-Tank modules. Level to within 1/8" of the required grade. Do not show on the plan or elevation drawings. The required bedding materials and the requirements of 2.03 A are accepted by the owner's engineer.
- Grading Applications: Stake out or otherwise compact bedding material until the base is level and undisturbed.
- Infiltration Applications: Bedding materials shall be prepared in accordance with the standard documents.
- Grading Applications: Stake out the R-Tank system on the excavation floor using spray paint or chalk line to ensure a 2' perimeter is available around the R-Tank system for proper installation and compaction of backfill.

3.04 INSTALLATION OF THE R-TANKS

- When a geotextile wrap is specified on the stone base, use strips to length and install in excavation, removing wrinkles and moving the material flat. Overlay geotextile a minimum 12" or as recommended by manufacturer. Use tape, special adhesives, sandbags or other ballast to secure overlay. As geotextile can be damaged by extreme heat, smoking is not permissible under the geotextile, and tools using a flame to back the overlays, such as propane torches, are prohibited.
- When an impervious liner for containment is specified, install it first per manufacturer's recommendations and the standard documents. The R-Tank units shall be separated from impervious liner by a non-woven geotextile fabric installed in accordance with Section 2.04 D.
- When the R-Tank modules are placed side by side, in accordance with the design drawings, no lateral connections are required. It is advisable to use a string line to form square corners and straight angles along the perimeter of the R-Tank system. The modules are to be oriented as per the design drawing with required dots as shown on plan.
- For UD, HD, and SD installations, 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. If this is not shown in the construction drawings, it is a simple field adjustment that will have minimal effect on the overall system layout and HD installation. Refer to R-Tank Installation Guide for more detail.
- For UD installations, there is no perpendicular end row required.
- Wrap the R-Tank top and sides in specified geotextile. Cut strips of geotextile so that it will cover the sides and top, encapsulating the entire system in placed bedding until the entire system is covered. Overlay geotextile 12" or as recommended by manufacturer. Tape great care to avoid damage to geotextile and, if specified, impervious liner during placement.
- Identify locations of inlet, outlet and any other penetrations of the geotextile (and optional liner). These connections should be installed flush (flushed up to the R-Tank) and the geotextile fabric shall be cut to enable hydraulic continuity between the R-Tank and the R-Tank units. These connections shall be secured using metal bolts and nut and washers. Support pipe in trenches during backfill operations to prevent pipe from settling and damaging the geotextile. Impervious liner (if

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