

RainTank

Storm Water Detention/Retention/Harvesting



Storm Water Management

RainTank

D-RainTank™ storm water detention and infiltration systems provide underground storage of storm water. After a rain event fills the RainTank, storm water will either infiltrate into the ground, drainage system, or be recycled for irrigation. This system provides an alternative to storm water basins and a more efficient alternative to other underground systems.



Applications

RainTank can be used for a variety of applications including:

- Storm Water Retention/Infiltration
- Storm Water Detention
- Dry Wells
- Leach Fields
- Bioretention
- Storm Water Recycling/Harvesting

Benefits

- High Capacity
 - ♦ 95% void internal area
- Modular Design
 - ♦ Can be placed in any shape to efficiently use space
 - ♦ Stack to depths of more than 7 feet
- High Strength
 - ♦ May be used under parking lots and roads
- Increased Infiltration
 - ♦ Reduces post-construction runoff
- Easy to Transport
 - ♦ Can be supplied unassembled for reduced delivery costs
- Lightweight and Quick to Install
 - ♦ Can be put in place by hand; no cranes required
 - ♦ Reduces site access delays

RainTank is a modular system and can be assembled to a variety of heights from 9 1/2" to over 7'. It is extremely strong and can be placed beneath a variety of surfaces including:

- Parking Lots
- Streets and Access Roads
- Driveways
- Landscaping
- Athletic Fields/Playgrounds
- Swales and Channels



Storm Water Management

RainTank - Solving Tough Problems

Arlington, Virginia - Residential Area

12 residential homes...each house includes approximately 1,000 cf of storm water storage.

Large homes on small lots created enough storm water runoff to threaten the permitting of this Northern Virginia development. Changing the design to incorporate RainTanks beneath all the driveways solved the runoff problem without affecting the affordability of the homes.



Minimum excavation was required to prepare the area for the RainTank system.



Approximately 1,000 cf of RainTank was installed at each residence.

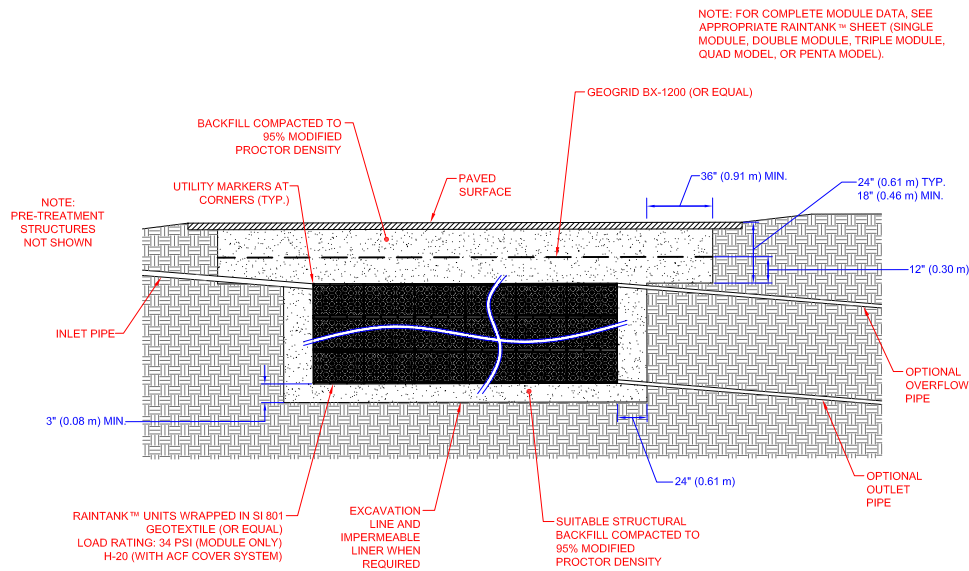


With only two feet of cover above the RainTank, a geogrid helps disperse the traffic load.

Design Considerations

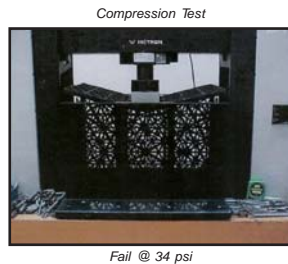
Many factors will determine the depth of the RainTank System and the corresponding amount of cover material, including:

1. RainTank Strength
2. Backfill Materials
3. Outlet Elevation
4. Depth of Water Table / Hardpan
5. Static & Dynamic Surface Loads
6. Construction Loads
7. Lateral Loads



1. RainTank Strength

Independent testing has shown RainTank can withstand up to 34 psi. By considering the full range of factors used to design a project, the system will easily support H2O loads with an adequate factor of safety. (See sample calculation on page 5.)



2. Backfill Materials

If the area above the RainTank will be used for vehicular traffic, then the fill materials should be of granular nature and should be reinforced with Tensar BX-1200 (or a performance equivalent) to spread point load impact. Otherwise, cover material should be free flowing clean sand or granular material. SOIL THAT CAN ABSORB LARGE QUANTITIES OF WATER SUCH AS CLAY SHOULD NOT BE USED.

Backfill materials should be compacted to at least 90% for each 12" layer.

3. Outlet / Overflow Elevation

Many designs incorporate an Outlet to drain the system at a controlled rate and/or an Overflow to prevent flooding in an extreme event. The elevation of these elements may be restricted, and should be considered when determining the elevation of the RainTank.

4. Elevation of Water Table or Hardpan

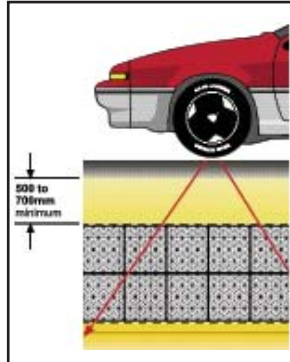
While placing the RainTank below the water table will not cause the system to fail, it will limit its ability to function by reducing the space available to store stormwater. In these situations the RainTank may be placed at a shallow depth, or a liner may be used to prevent groundwater from entering the tanks. A shallow hardpan will limit the depth of excavation that is practical, which will also limit the designer's options for RainTank elevations.

Design Considerations

5. Surface Loads

RainTank is a structural unit which does not rely on properly compacted backfill to support a load, as other systems do. Its 34 psi ultimate bearing capacity was derived from unconfined testing (pictured on page 4).

To determine the load (psi) applied to the RainTank and the resulting factors of safety, use the tire contact area and the distribution angle of the cover material to calculate the area of applied load on the RainTank (A^*). Then, using the wheel load (W) modified with a dynamic factor to account for the movement of the wheel, divide by the area of applied load (A^*) and add the weight of the saturated fill.



This equation can be written as:

$$\sigma_{va} = (W F_d / A^*) + dy$$

W = Wheel Load

F_d = Dynamic Factor for Moving Wheel Load

A^* = Area of Applied Load on RainTank

dy = Total Weight of Fill Materials

Sample Calculation

$W = 8,000$ lbs (32,000 lb axle / 4 wheels/axle)

$F_d = 1.2$

$A^* = 1661$ si (18" cover w/45 degree angle)

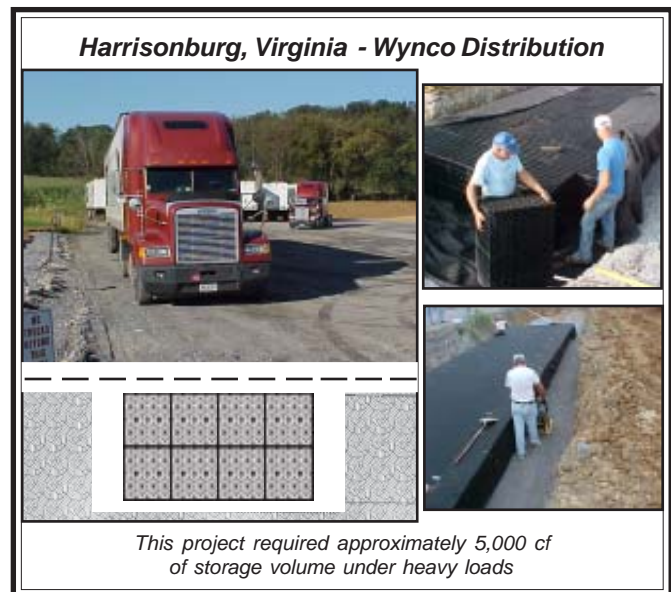
$dy = 1.35$ psi (18 ci saturated sand @ 130 lbs/cf)

$$\sigma_{va} = (8,000 \text{ lbs} \times 1.2 / 1661 \text{ si}) + 1.35 \text{ lbs}$$

$$\sigma_{va} = 7.13 \text{ psi}$$

$$\text{Safety Factor} = 4.77$$

(34 psi ultimate bearing capacity / 7.13 psi applied load)



6. Construction Loads

While achieving proper compaction of the fill materials is critical, the type of compaction equipment used must be carefully considered to avoid localized high impact and penetration of the fill and/or RainTanks. Whenever possible, LIGHT WEIGHT EQUIPMENT SHOULD BE USED.

7. Lateral Loads

The pressure acting on the sides of the units should also be considered, particularly when the bottom elevation of the RainTanks is more than 9½ feet below final grade.

RainTank Project

Villa Riva Condominiums - Jacksonville, Florida

Storm Water Detention beneath grass firelane



RainTank Installation Procedures

Wendy's Restaurant - Morgantown, West Virginia

4,700 cubic feet of storage

Minimum excavation was required to prepare the area for the RainTank system. 3" to 4" of stone was placed on the excavated floor. A footprint of the system was marked to determine the geotextile boundaries.



One person can easily handle a 4' deep tank module. Approximately 4,700 cf of RainTank was installed in this project.



This design incorporated a multi-level discharge system.



The installed modules were wrapped with a geotextile and then proper backfill and compaction were performed.



An initial 1' of cover was placed. Next the geogrid reinforcement along with a final 1' of cover were placed.



Completed job.

Installation of Atlantis Tank Modules

1. Excavate the site to the proper depth (accounting for 3"-4" of base and specified depth of cover material), length and width, allowing adequate room to compact backfill around the perimeter (typically 12" - 24"). If using a liner (optional) to reuse water in the system, install that now. Mark the footprint of the RainTank in the excavation to allow placement of Geotextile and the tanks.
2. Put the geotextile in place and begin installing tanks in the excavation over the filter fabric, butting them tightly against each other. After placement of the tanks, bring geotextile up the sides and over the top of the structure, connecting joints as recommended. Fold excess fabric at corners to lay flat against the structure and secure using tape.
3. Identify locations of inlet, outlet, inspection ports, and any other penetrations. To secure pipe to system, cut X into geotextile, and secure fabric to the pipe with a band clamp. If butting the pipe to the RainTank is not satisfactory, the exterior plate of the RainTank may be cut with a reciprocating saw and the pipe inserted into the tank.
4. Place backfill around RainTanks carefully, and use a powered mechanical compactor to compact backfill around perimeter, being careful to avoid damage to geotextile and (optional) liner. Support pipe in trenches to prevent damage to the pipe.
5. Place a sandy gravel backfill material over wrapped tank (typically between 1' and 3', with 2' typical for traffic applications), compacting with lightweight equipment to a minimum of 90%. Take care when placing backfill on top of the structure to avoid damage to the fabric and tanks.
6. Geogrids should be installed on traffic areas. The geogrid layer is preferably placed 12 inches over the top of the structure, so that it extends beyond the edge of the structure for at least 1 1/2 ft. Joints must be overlapped by a minimum of 1 ft.
7. Place surfacing materials, such as groundcovers, shrubs (do not plant trees above the tank), or paving material over the structure with care.

Horizontal & Vertical Drainage

Ecological Road

The Atlantis philosophy is to resolve water management at the source. That's the concept behind the Ecological Road. This holistic system captures surface runoff from roads and, instead of transporting it to a central storage pond, provides short-term localized storage so that stormwater can be either infiltrated to recharge groundwater, released at a controlled rate, or recycled for irrigation. RainTank provides benefits for everyone, including the developer, the municipality, and the community.

Benefits for the Developer – Economic

- Less expensive than traditional techniques
- Replaces curb & gutter, inlet structures, drainage pipe, and stormwater ponds
- Frees up valuable space

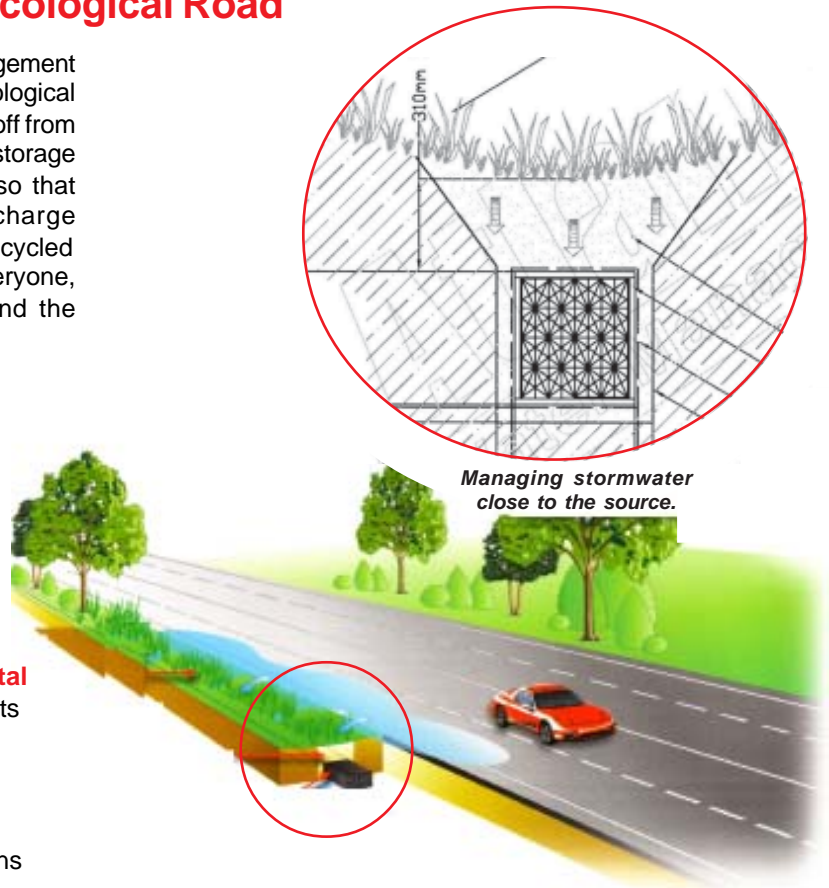
Benefits for the Municipality – Environmental

- Removes a variety of pollutants and nutrients from hydrocarbons to phosphorous
- Encourages infiltration
- Reduces total runoff in detention applications

Benefits to the Community – Quality of Life

- Eliminates breeding grounds for mosquitoes and other vermin
- Completely maintenance-free

Economically sensible, environmentally friendly, and completely sustainable, the Ecological Road is a better way to manage storm water.



Design Options

Santa Monica, CA - Installation of 750 cf of RainTanks installed

There are many ways to incorporate the principles of the ecological road into a project design, as demonstrated by this project.



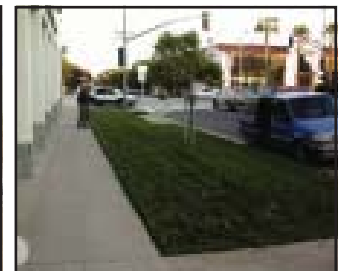
Excavation of the area.



Placement of tanks.



Backfill on top of structure.



Completed job.

Horizontal & Vertical Drainage

Ecological Road



RainTank solves three major issues.

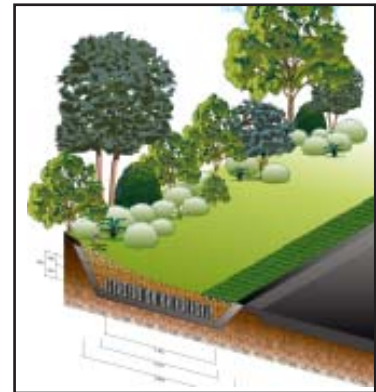
1. Safety
2. Environmental...eliminating water contamination
3. Aesthetic



Safety - A RainTank channel could have prevented this accident.



Environmental - Standing water can lead to poisonous green algae or other environmental hazards in road drainage.



Aesthetic - Replacing concrete ditches with shallow grass swales beautifies the landscape.

LEED™ Points

Using RainTank in a project design can earn as many as 11 LEED credits for your project.

Sustainable Sites – 4 Credits

By temporarily storing large volumes of water in a small footprint, RainTank allows you to maximize open space (credit 5.1) while minimizing the development footprint (credit 5.2). This will also reduce the total quantity of stormwater runoff (credit 6.1). Incorporating RainTank as part of a bioretention system can help remove pollutants from runoff, as well (credit 6.2).

Water Efficiency – 5 Credits

RainTank can be wrapped with a liner, allowing rain water or gray water stored in the system to be reused to irrigate the landscaping (credits 1.1, 1.2 and 2), resulting in reduced demand on the building's potable water resources (credits 3.1 and 3.2).

Materials and Resources – 2 Credits

RainTanks are always made from 100% post-consumer recycled plastics (credits 4.1 and 4.2).

Specifications

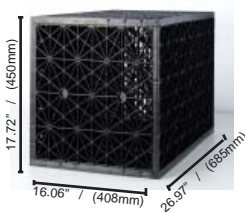
RainTank Dimensions

| Module (Units) | Width (mm) | Width (inches) | Length (mm) | Length (inches) | Height (mm) | Height (inches) |
|----------------|------------|----------------|-------------|-----------------|-------------|-----------------|
| Mini (1/2) | 408 | 16.06 | 685 | 26.97 | 240 | 9.45 |
| Single (1) | 408 | 16.06 | 685 | 26.97 | 450 | 17.72 |
| Double (2) | 408 | 16.06 | 685 | 26.97 | 880 | 34.65 |
| Triple (3) | 408 | 16.06 | 685 | 26.97 | 1310 | 51.57 |
| Quad (4) | 408 | 16.06 | 685 | 26.97 | 1740 | 68.50 |
| Pent (5) | 408 | 16.06 | 685 | 26.97 | 2170 | 85.43 |

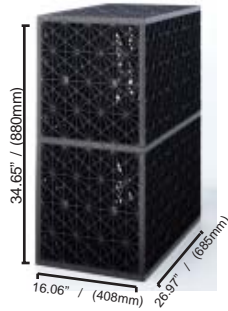
| Module (Units) | Tank | Tank | Water Storage | Water Storage | Number of Plates | | Tank Weight (lbs) |
|----------------|-------------|--------------|---------------|---------------|------------------|--------|-------------------|
| | Volume (cf) | Volume (gal) | Volume (cf) | Volume (gal) | Large | Small | |
| Mini (1/2) | 2.4 | 17.96 | 2.27 | 17.06 | 2 | 4 / 2* | 10 |
| Single (1) | 4.44 | 33.22 | 4.22 | 31.56 | 4 | / 4 | 14 |
| Double (2) | 8.69 | 64.97 | 8.25 | 61.72 | 7 | / 8 | 26 |
| Triple (3) | 12.93 | 96.72 | 12.28 | 91.88 | 10 | / 12 | 38 |
| Quad (4) | 17.17 | 128.47 | 16.31 | 122.03 | 13 | / 16 | 50 |
| Pent (5) | 21.42 | 160.21 | 20.35 | 152.19 | 16 | / 20 | 62 |

*Requires 3 different plates

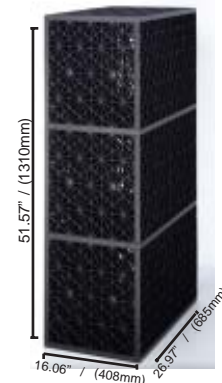
Conversions
 1 cf = 7.4805195 gallon
 1 liter = 0.2641721 gallon
 1 mm = 0.0393701 inches
 1 cf = 0.0283168 cm



Single Module



Double Module



Triple Module

RainTank Specifications

| | |
|--|---|
| Void Ratio | 95% |
| Material | 85% recycled Polypropylene + 10% Atlantis proprietary selected materials. |
| Biological & Chemical Resistance: | Unaffected by molds and algae, soil-borne chemicals, bacterial and bitumen. |
| Unconfined Crush Load | 34 psi |

Long-Term Unconfined Creep Test: 90 Day Dead Load Creep Test

| | Metric | English |
|--------------------------------------|-----------------------|----------------|
| Load Applied | 2.85 t/m ² | 4.06 psi |
| Displacement (90 Days) | 1.7 mm | 0.067" |
| Total Strain After 90 Days | 2.30% | 2.30% |
| Creep Sustained After 90 Days | 0.40% | 0.40% |
| Temperature | 20° (= 3) | 68°F (= 37.4) |

Atlantis Water Management Solutions

Wall Panel Installation



Road Edge Drainage



Turf / Gravel Cell



Strip Filter Pipe™



Drainage Swales



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