

R-TANK INSTALLATION GUIDE

Tools You'll Need

- Laser or Transit
- Measuring Tape (long enough to mark R-Tank® footprint)
- Razor Knife
- Screw Driver / Nut Driver Set (for pipe boots)
- String Line
- Marking Paint
- Reciprocating Saw (to cut in inspection & maintenance ports)

If you're assembling R-Tanks®

- Dead-Blow Mallets
- Work Tables (3/4" plywood placed on R-Tanks® works well)

Materials You'll Need

- R-Tank® Units
- Geotextile
- Geogrid (only for load bearing applications)
- Liner (only if required by plans)
- Base & Backfill Material (per spec section 2.03)
- Pipe Boot Kits (If not using kits, you'll need duct tape and a stainless steel band clamp for each inlet and outlet pipe, and for each inspection or maintenance port.)
- Maintenance Port Kits (If not using kits, you will need non corrosive rigid anti-scour pad [15" x 15" to t below Maintenance Ports.], fabric pipe boot, duct tape, stainless steel band clamp 12" schedule 40 pvc pipe and H20 rated ring and cover.)
- Metallic Tape

Equipment You'll Need

- Forklift and other equipment/tools needed to unload box truck
- Pallet Jack (to unload material from box truck)
- Walk-Behind Trench Roller (Plate compactor may work for smaller projects)
- Low Ground Pressure (LGP) tracked Skid Steer or Dozer (<7.0 psi Gross Operating Pressure)
- LGP Dozer - 10 Ton Max Gross Vehicle Weight and 7.0 psi Max Operating Pressure
- Roller - 6 Ton Max Gross Vehicle Weight

Note: This list does not include equipment or tools needed to excavate or level the or of the excavation.

STEP 1 - EXCAVATION

The excavation limits and the location of the R-Tank® System should be staked out. The design drawings should be used to determine these locations. If the excavation limits are not shown on the plans, then add 2' on each side of the R-Tank® system to determine the limits.

Excavate the designated surveyed area according to plans following all relevant local, state and OSHA guidelines. Typical excavations should include: - Two foot perimeter around R-Tank® to allow for proper compaction of backfill.

- Enough depth to accommodate a minimum 3" base (if required) below the R-Tank®.

Level the bottom of the excavation (Fig. 4) as shown on plans. Most excavations have a flat bottom while some will slope toward the outlet pipe.

Prepare the subgrade according to plans. Base of excavation must be uniform, level and free of debris and soft or yielding subgrade areas. Compact to at least 95% Standard Proctor Density (or as required by Engineer) unless infiltration of stormwater into subgrade is desired. A minimum bearing capacity of 2,000 psf (per spec section 3.02D) must be achieved prior to beginning installation of R-Tanks®.

If the subgrade is pumping or appears excessively soft, the design engineer should be consulted for advice.



Fig. 4 Excavate according to plans, following all governmental regulations.

STEP 2 - ASSEMBLE R-TANK® UNITS

If R-Tank® units arrive on your project in panels they will need to be assembled on-site. Building the units should take 2-3 minutes per segment. This is a conservative estimate used to approximate the total man hours needed for assembly. The estimate includes the workers doing the assembly, as well as material handlers to keep the assembly workers moving.

Unit	Time
Single	2-3 Minutes
Double	4-6 Minutes
Triple	6-9 Minutes
Quad	8-12 Minutes
Pent	10-15 Minutes

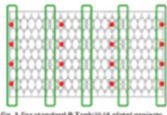


Fig. 1 For standard R-Tank® (4-plate) projects, attach small plates at locations with red dots. For R-Tank® and R-Tank® (5-plate) projects, attach small plates at locations circled in green.

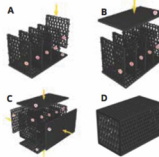


Figure 2 Follow these steps to assemble a 5-plate R-Tank®.

Assembly Instructions – Using the correct number of small plates

(R-TankLD® = 4, R-TankHD® = 5, and R-TankSD® = 5), connect small panels into one large panel (Fig. 2A) in locations shown in Fig. 1. R-TankLD® modules will use the pinhole locations marked with red dots in Fig. 1, while HD and SD units will use pinhole locations circled in green. Use 4-plate LD modules only for non-traffic, green space installations.

Next, working from one end to the other, attach a second large plate on the opposite side of the first (Fig. 2B). Once the top and bottom large plates are attached, two more side plates are attached to complete the sides of the R-Tank® unit (Fig. 2C). This is a SINGLE R-Tank®. For video demonstration of standard 4 plate R-TankLD® assembly go to: <https://www.youtube.com/watch?v=0MTzTVKtQ5Q>

To build a DOUBLE unit (or larger), follow the directions above, starting at "Assembly Instructions:" using the top of the existing unit as the large plate. Completed R-Tank® units should be staged as close to the installation area as possible.

TIP: To increase the speed of the installation, many contractors choose to assemble the R-Tank® units prior to or during excavation and base preparation (Step 1). Other contractors wait until these steps are completed and then perform the assembly IN THE EXCAVATION (Fig 3) allowing completed units to be placed into their final location as they are assembled. Consider which option will work best for your project.



Fig. 3 Installation can be sped up by either assembling the tanks in the excavation or placing the pre-assembled tanks in the excavation.

STEP 3 - PREPARE BASE

A thin layer (3") of material is recommended to establish a level working platform. In regions with sandy soils meeting the requirements noted and where the subgrade elevation is above the groundwater table, imported base materials may not be needed. (For more information see specification section 2.03A.)

Standing water in the excavation will prevent proper base preparation and must be removed, if present. Install base materials. Base materials must meet spec section 2.03A.

Grade and level base as shown on plans with no more than 1/2" variance (+/- 1/4"). Base must be free of debris and large rocks.

TIP: Creating a smooth, level platform will allow for faster installation of R-Tank® modules, as they will fit together evenly, eliminating detail work that can delay your progress.



STEP 4 - PLACE GEOTEXTILE

Geotextile will be required below the R-Tank® on most projects, but not all. Check your plans to ensure that geotextile is to be placed between the base and the R-Tank® units. Cut full-width strips of Geotextile to the proper length and place them over the base, covering the floor of the excavation. The geotextile should extend at least 2' beyond the edge of the R-Tank® footprint.

TIP: Some contractors choose to cut the geotextile strips long enough to wrap up the sides and over the top of the R-Tank® in a single piece (Fig. 5). If space allows and the folded flaps of geotextile will not slow your progress, you may want to consider doing this. If a liner is required on your project, this method should be used to protect the liner.

Geotextiles are flammable. No smoking should be permitted on the geotextile. Adjacent panels of material should be overlapped by 12" or more, as shown on the plans.

Use pins, staples, sandbags or other ballast to hold the geotextile in place, preventing it from blowing or sliding out of position. Patch any holes made in the Geotextile by placing a small patch of fabric over the damaged area. The patch must be large enough to cover the damaged area with at least 12" of overlap on undamaged material. If a liner and/or additional geotextile is required per plans, install these now as shown on the project plans.

TIP: Many contractors find that it is both easier and less expensive to have specialty contractors install the liner (typically used when building a cistern). If you are installing a liner yourself, handle it VERY CAREFULLY to avoid damage.



Fig. 5 Pull wrinkles out of geotextiles so material lays flat.



Fig. 6 Reduced overlaps don't create significant savings and can create delays.

STEP 5 - INSTALL R-TANK® MODULES

Determine the starting location. It is often helpful to use an inlet or outlet pipe to guide you. Using a string line, establish two adjacent edges of the R-Tank® footprint. Ensure that your corner is square. Mark these two edges with marking paint and remove the string line (Fig. 7).

IMPORTANT: If using a liner, be careful not to puncture it with stakes or pins while placing your string line.

Begin placing R-Tanks® in the corner of the marked area. Do NOT place units on their sides, as this will void the warranty. Check your plans to ensure correct orientation of the R-Tanks® (Fig. 8).

Check the plans to ensure the R-Tanks® are running in the correct direction (North/South vs. East/West) to match the footprint shown on plans.

- R-Tank® Width – 15.75"
- R-Tank® Length – 28.15"

TIP: Moving R-Tank® units into the excavation quickly is essential to a profitable installation. Many contractors fabricate a platform that can be lifted by their forklift to quickly move a large number of units with each trip.

R-Tank® units should fit together evenly. Occasional minor gaps between units (< 1/2") or variations in the height of the units (< 1/2") are acceptable (Fig. 9), but reasonable efforts should be made to minimize these variations. If gaps or height variations persist through 3 or more adjacent units, remove the modules and pull back the textile to repair base. No lateral connections between adjacent R-Tank® units are required.

IMPORTANT: Anyone walking directly on top of the units should be instructed to keep their weight over the vertical supports of the tank to prevent damaging the units.

The large side plate of the tanks should be placed on the perimeter of the system. This will require that two ends of the tank area will have a row of tanks placed perpendicular to all other tanks (Fig. 10).

- Option 1: End column should cover 75% of the final module.
- Option 2: End column may extend beyond the final row.

STEP 6 - INSTALL INSPECTION / MAINTENANCE PORTS

All ports should be made from pipe long enough to extend from the bottom of the R-Tank® to finished grade.

They are typically Schedule 40 PVC pipe, but can be formed from other types of pipe, as well.

Identify the location of all ports and remove the R-Tank® from each location.

Inspection Ports (if required):

Typically made from 6" Schedule 40 PVC pipe, cut the pipe to length, leaving enough excess to trim the top when final grade is reached (Fig. 11).

TIP: Inspection Ports are not commonly used. If not shown on your plans skip ahead to Maintenance Ports on page 7.

If the pipe is not already perforated, cut several horizontal slots in the pipe starting at the bottom. Perforations should extend as high as the height of the R-Tank® units being used. No perforations should be visible above the top of the R-Tank® once the port is in place.

Using your reciprocating saw, cut the horizontal R-Tank® plates (Fig. 12) to accommodate the port. If the pipe will not fit between the vertical interior plates, removing the center plate will create adequate space for the port. If space allows, shift the two remaining internal plates to the inner connection points (shown as red dots in Figure 1) to balance the unit.

UNIT	CUT
Single	1 Plate
Double	2 Plates
Triple	3 Plates
Quad	4 Plates
Pent	5 Plates

IMPORTANT: Do not over-cut the R-Tank® plates. Minimize the gaps between the pipe and the R-Tank® plates. This is particularly important with the top plate.

For all units larger than a Single R-Tank®, you will need to disassemble the R-Tank® in order to cut the interior plates. Reassemble the R-Tank® when cutting is completed, and replace the R-Tank® into the proper location.

TIP: If using Prefabricated Pipe Boot Kits, install them onto the pipe now, leaving the band clamps loose so that final adjustments may be made in Step 7.

Install the pipe into the R-Tank® unit.

Seal the opening on top of the pipe with a cap or temporary lid to prevent debris from entering the system.

Maintenance Ports:

Typically made from 12" Schedule 40 PVC pipe (check plans for actual size and type of pipe), cut the pipe to length, leaving enough excess to trim the top when final grade is reached.

TIP: If the location of Maintenance Ports is not shown on your plans, include a port within 10' of all inlet and outlet pipes (a single Maintenance Port can cover multiple pipe connections), and include additional Maintenance Ports as needed to prevent the distance between ports from exceeding 50 feet.

Drill several 1" diameter holes (air vents) into the pipe just below where the top of the R-Tank® will be once the pipe is installed into the tank. Air vents can also be made with a chop saw or grinder by cutting several 3-5" vertical slots into the pipe just below the top of the R-Tank®.

Using a reciprocating saw, cut several 8" triangular notches into the bottom of the pipe as shown on plans (Fig. 14).

To accommodate the maintenance port, remove the center interior small plate (not required for LD). Using your reciprocating saw, cut the horizontal R-Tank® plates in the center, between the two remaining internal plates. All horizontally oriented plates will need to be cut EXCEPT FOR THE BOTTOM PLATE. In total you will need to:

Unit	Cut
Single	1 Large Plate
Double	2 Large Plates
Triple	3 Large Plates
Quad	4 Large Plates
Pent	5 Large Plates

For all units you will need to disassemble the R-Tank® in order to cut and/or move the interior plates.

IMPORTANT: Do not over-cut the R-Tank® plates. Minimize the gaps between the pipe and the R-Tank® plates. This is particularly important with the top plate.

Reassemble the R-Tank® when cutting is completed. Remember to insert the non-corrosive anti-scour pad in the bottom of the R-Tank® (should fit directly below the Maintenance Port), and replace the R-Tank® into the proper location. (Fig. 15)

TIP: If using Prefabricated Pipe Boot Kits, install them onto the pipe now, leaving the band clamps loose so that final adjustments may be made in Step 7.

Install the pipe into the R-Tank® unit (Fig. 16) and make sure it is plumb. Temporarily seal the opening on top of the pipe with a cap or temporary lid to prevent debris from entering the system during construction.



Fig. 7 Use a string line and marking paint to square the system footprint.

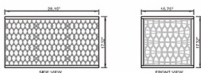


Fig. 8 Make sure the tanks are oriented properly in the excavation.

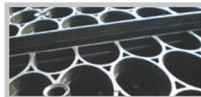


Fig. 9 Minor variations (less than width of top plate) in tank height are acceptable.

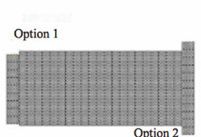


Fig. 10 Plan view showing the end rows turned perpendicular. The corners may not match up perfectly, so two acceptable alternatives are shown. Most plans do not show this configuration. Field adjustments are easily made.



Fig. 11 Installed Inspection Port



Fig. 12 Cut the horizontal plates to accommodate all ports.

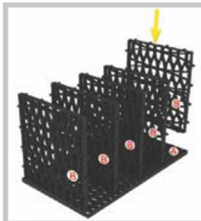


Fig. 13 Additional space for ports can be created by removing the center plate and moving the remaining internal plates toward the center (if possible).

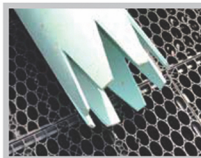


Fig. 14 Cut 8" notches into the bottom of Maintenance Port.

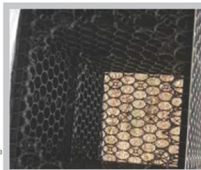


Fig. 15 If after adjusting the internal plates, the pipe will not fit, the top plate can be cut off-center and one of the internal plates can be removed.



Fig. 16 Installed maintenance port



Fig. 17 Install port into R-Tank®.



Fig. 18 Maintain 12" overlap on textile.

STEP 7 - SEAL R-TANKS® WITH GEOTEXTILE

Clean off any debris that may be lying on top of the exposed geotextile around the perimeter of the R-Tank®. Cut strips of geotextile to t over the top and down both sides of the R-Tank® with at least 2' of excess material on each side of the system. This 2' flap should overlay the geotextile placed below the R-Tank® units, creating a clean 24" overlap to seal the system.

Adjacent strips of geotextile should overlap at least 12" or as shown on plans. Use duct tape, sand bags or other ballast to temporarily secure overlaps. Where the geotextile intersects an Inspection or Maintenance Port, cut an "X" into the geotextile and pull it over the pipe. The aps of the "X" should point AWAY from the R-Tank® (Fig. 19). Use a fabric boot and a stainless steel band clamp to seal the flaps to the pipe.

Fold geotextile for outside corners similar to sheets on a bed, and lay excess material at against R-Tank® (Fig. 21). Leave corners loose to avoid creating weak spots in the material. Temporarily secure excess fabric with duct tape.

IMPORTANT: Take special care with Inside Corners on the footprint of the system. Cut geotextile as needed to ensure that it lays flat against the R-Tank®. Use additional pieces of geotextile to seal the corner and any cuts that are made (12" overlap).

Connect Inlet & Outlet Pipes

TIP: If using Prefabricated Pipe Boot Kits, install them onto the pipe now, leaving the band clamps loose so that final adjustments may be made in Step 7.

Where the inlet and outlet pipes connect to the R-Tank®, cut an "X" into the geotextile so that the pipe makes DIRECT contact with the R-Tank®. Pull the flaps of the "X" over the pipe so that the flaps of the "X" point AWAY from the R-Tank®. Use a stainless steel band clamp to seal the flaps to the pipe.

WARNING: Inlet and Outlet pipes must make DIRECT contact with the R-Tank®, allowing water to flow directly into or out of the R-Tank® without filtering through the geotextile. Failing to correctly connect pipes will cause the system to malfunction.

If used, adjust all pipe boots so that the fabric lays snug against the R-Tank®. Tighten the band clamps with a screw/nut driver. Use duct tape to secure the boot flap to the outside of the geotextile envelope. Walk bottom edge of geotextile along the sides of R-Tank to eliminate gaps between the fabric and the bottom corner of the R-Tank®.

STEP 8 - BACKFILL SIDES

Place backfill material (see specification section 2.03 B) around perimeter of the R-Tank®, distributing the material evenly to prevent shoving of the R-Tank® units. All back fill material must meet requirements listed in the specification. Use a trench roller or plate compactor to compact back fill in 12" lifts (Fig. 23).

IMPORTANT: Vibratory compaction of the side backfill (Fig. 23) is a critical step that both compacts the backfill and eliminates the minor gaps between individual R-Tank® units. While some backfill materials will yield a 95% proctor density without compaction, vibratory compaction of the material must be completed to ensure the stability of the system. Skipping this step will void the manufacturer's warranty.

Continue placing and compacting back fill in 12" lifts until the material reaches the top of the R-Tank® units.

STEP 9 - BACKFILL TOP

Dump back fill material adjacent to the R-Tank® and, using your LGP Skid Steer or Dozer, push the material over the R-Tank® system (Fig. 24). Back fill must meet requirements listed in specification section 2.03 B.

Largest Track Dozers that can be used with 12" of cover over R-Tank®

Machine	Operating Weight	Track Dimensions	Ground Pressure
Case 850K LGP	20,700 lbs	28" x 92.6" = 2593 si	4.0 psi
Caterpillar D5K LGP	21,347 lbs	26" x 91" = 2366 si	4.52 psi
John Deere 550J LGP	18,252 lbs	24" x 86" = 2064 si	4.2 psi
Komatsu D39PX-21	19,620 lbs	25" x 93" = 2325 si	4.27 psi
New Holland D95 LGP	20,700 lbs	28" x 93" = 2604 si	4.0 psi

This list is not intended to be all inclusive, but representative.

If your machine is not listed and you cannot find its ground pressure, you'll need to find your vehicle's Operating Weight and measure the area where the tracks contact the ground. Take these dimensions and multiply them (Length x Width), then multiply by 2 (since the machine has two tracks), then divide the Operating Weight by the total square inches of contact area to determine the contact pressure of the machine. If the contact pressure is less than 7.0 psi and the operating weight is less than 20,000 lbs, the machine will work with 12" of cover.

TIP: When pushing backfill over R-Tank® units, work in the direction of the geotextile overlap to avoid shoving material between the fabric layers.

WARNING: A minimum of 12" of material must be maintained between the Dozer tracks and the top of the R-Tank®. For best results, push at least 14" (or more if needed) of backfill over the units so that as the material compacts beneath the dozer, a 12" minimum lift is maintained. It is recommended that the dozer drive straight on and then back straight off of the system during backfill placement. Turning movements are likely to shove the backfill material, reducing the thickness of the lift and potentially damaging the R-Tank® modules.

WARNING: Dump trucks should not drive over or dump material on top of the R-Tank®.

Lightly compact top back fill to 95% standard proctor density or as shown on plans using your walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of 6 tons) may be used. Roller must remain in static mode until a minimum of 24" of cover has been placed over the modules (per spec, section 3.05 AS). Sheep foot rollers should not be used.

WARNING: Some materials will compact significantly while others may shove excessively as you work. Never allow your lift thickness to compact to less than 12" without adding more material.

STEP 10 - PLACE GEOGRID

Geogrid is required for all load-bearing applications (Fig. 25), such as systems placed beneath parking lots and roads. It is not required above systems used in open space where traffic is prohibited, such as sport fields or natural areas.

Geogrid must be placed 12" above the R-Tank®. Overlap adjacent panels by 18" minimum or as specified in plans. Roll out Geogrid over the top of the system, with the edges of the grid extending 5' from R-Tank® footprint or 3' beyond the edge of excavation or more as shown on plans (refer to CAD detail HS20 loads). If metallic tape used to locate the system has been specified, now is a good time to install it.

STEP 11 - PLACE ADDITIONAL COVER AS NEEDED

If additional cover or pavement base is required by the plans, begin placing and compacting material in the same manner as discussed in Step 9. Push cover material parallel to the geogrid for best results (Fig. 26). All cover material must meet requirements of specification section 2.03.

TIP: To achieve proper compaction requirements, it may be beneficial to begin placing material in 6" lifts.

STEP 12 - SECURE THE INSTALLATION

Construction loads are often the heaviest that ever drive over the R-Tank® System, and there are many construction vehicles that exceed the HS20 standard that most detention systems are designed to meet. To prevent damage from these vehicles, the installation should be secured to prevent unauthorized traffic from driving over the system once it has been installed.

Projects nearing completion (within three months) should use warning tape or temporary fencing to secure the installation (Figure 27). For larger projects with ongoing construction activities, consider a more durable method for preventing unauthorized traffic from accessing the system (Figure 28).

Regardless of what method is selected to secure the installation, it must remain in place until construction activity has concluded and no further access of vehicles exceeding the HS20 standard is necessary.

STEP 13 - INSTALL PRETREATMENT DEVICES

Install pre-treatment devices prior to activating R-Tank® System to keep any debris from entering the system (Figure 29).

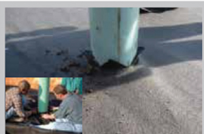


Fig. 19 Cut an "X" into textile to accommodate pipe penetration and seal with a boot.



Fig. 20 Encapsulate R-Tanks® with geotextile.



Fig. 21 Finished envelope should lay flat against R-Tank®.



Fig. 22 Seal the pipe boot with the included band clamps and duct tape.



Fig. 23 Vibratory compaction of side backfill is ALWAYS REQUIRED, regardless of what backfill material is used.



Fig. 24 Use an LGP dozer to push backfill over R-Tank® units.



Fig. 25 Overlap Geogrid 18" or as required by plans.



Fig. 26 Pushing backfill parallel to the Geogrid prevents the grid from shoving.



Fig. 27 Secure the installation with temporary fencing.



Fig. 28 Secured R-Tank® installation using Jersey Barriers.



Fig. 26 Pushing backfill parallel to the Geogrid prevents the grid from shoving.