



STORMWATER STORAGE SYSTEM
**INSTALLATION
GUIDE**

FERGUSON
WATERWORKS

LD HD SD UD XD

R-TANK® INSTALLATION

PRE-CONSTRUCTION CHECKLIST

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)

Additional tools if R-TANK® modules are not preassembled

- Dead blow mallets
- Work tables (3/4" plywood placed on R-Tank® modules works well)

MATERIALS YOU'LL NEED

- R-Tank® modules
- Geotextile
- Geogrid (if required by plans)
- Liner (if required by plans)
- Base & backfill material (per spec section 2.03)
- Pipe boot kits
- Maintenance port kits
- Metallic tape

ON-SITE STORAGE

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

EQUIPMENT YOU'LL NEED

- Forklift and other equipment/tools necessary to unload box truck
- Pallet jack (to unload material from box truck)
- Walk-behind trench roller or walk-behind plate compactor
- 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 floor of the excavation.



STEP 1: EXCAVATION

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

- A. 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 the engineer specified base below the R-Tank®
- B. Prepare the subgrade according to plans. Base of excavation must be uniform, level, 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-Tank® modules. If the subgrade is pumping or appears excessively soft, the design engineer should be consulted.



Fig. 1 Excavate according to plans, following all governmental regulations.

TIP: Assembling the R-Tank® units (Step 2) during excavation may save time during the installation, but requires additional material handling and space. If time allows, consider assembling modules in the completed excavation to reduce labor/material handling costs.

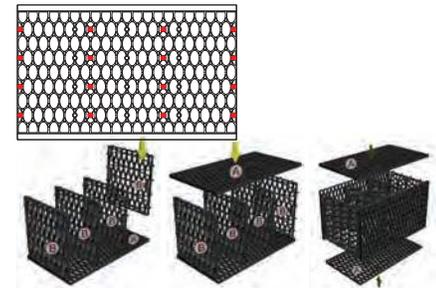
STEP 2: ASSEMBLE R-TANK® UNITS

Complete directions are provided below, and there is a video available by searching YouTube for “R-Tank assembly”. The modules should take 2-3 minutes per segment to build with workers completing the assembly and material handlers assisting. This is a conservative estimate used to approximate total man hours needed for assembly.

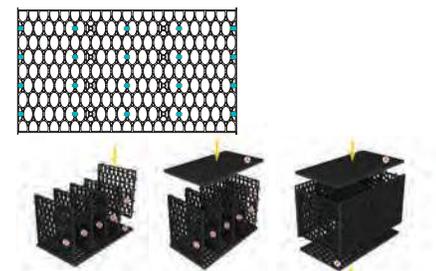


Begin by connecting four (4) small plates to one (1) large plate, using the connection locations shown in red dots. Next, attach a second large plate opposite the first. Finally, add two (2) large plates to the sides, and the single module is complete. To build a double module (or taller), follow the directions above, using the top of the single module as your first large plate to connect additional small plates.

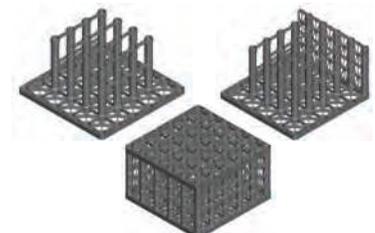
***Warning: R-Tank® LD modules are only for applications not subjected to traffic loads. Contact your local Ferguson representative for more information.**



Begin by connecting five (5) small plates to one (1) large plate, using the connection locations shown in blue dots. Next, attach a second large plate opposite the first. Finally, add two (2) plates to the sides, and the single module is complete. To build a single+mini module (or taller), follow the directions above, using the top of the single module as your first large plate to connect additional small plates.



UD modules have three (3) different plates: a top/bottom plate, a side plate, and an internal plate. Sides have five columns, while the internal plates only have 4. Begin by connecting four (4) internal plates to the bottom plate. Next, add four (4) sideplates, and finish the single module by snapping on the top. To build a double module (or taller), follow the directions above, using the top of the single module as your first bottom plate to connect additional plates.



R-TANK® INSTALLATION

STEP 3: PREPARE BASE

- A. If present, remove standing water in the excavation as it will prevent proper base preparation.
- B. Establish a level working platform. A thin layer (minimum 3") of material is recommended. Check plans to see if geotextile is specified below the base material. Base materials must meet spec section 2.03A.
- C. Grade and level base as shown on plans with no more than 1/2" variance (+/- 1/4"). Base must be smooth and free of debris and large rocks.



Fig. 2 Base must be smooth to ensure units fit together without gaps

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

- A. Check the plans to see if geotextile is required to be placed between the base and the R-Tank® units. It is required on most projects, but not all. If it is not required, skip to Step 5.
- B. Cut 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. Adjacent panels of material should be overlapped by 12" or more, as shown on the plans.
- C. Use pins, staples, sandbags or other ballast to hold the geotextile in place, preventing it from blowing or sliding out of position.
- D. 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.
- E. If a liner and/or additional geotextile is required per plans, install these now as shown on the project plans.



Fig. 3 Pull wrinkles out of geotextiles so material lays flat



Fig.4 Reduced overlaps don't create significant savings and can create delays

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 (see Fig. 3). If space allows and the folded flaps will not interfere with the installation, you may want to consider this option. If a liner is required on your project, this method should be used to protect the liner.

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.



WARNING: GEOTEXTILES CAN BE DAMAGED BY EXTREME HEAT. SMOKING IS NOT PERMISSIBLE ON/NEAR THE SYSTEM, AND TOOLS USING A FLAME TO TACK GEOTEXTILE OVERLAPS, SUCH AS PROPANE TORCHES, ARE PROHIBITED.

STEP 5: INSTALL R-TANK® MODULES

- A.** 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 (see Fig. 5).
- B.** 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 plans to ensure the correct orientation of the R-Tanks® (see 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 (see Fig. 8).
 - R-Tank® units should fit together evenly. Occasional minor gaps between units (< ½") or variations in the height of the units (< ½") are acceptable (see Fig. 6), but reasonable efforts should be made to minimize these variations. If gaps or height variations persist through three 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.

For LD, HD and SD modules: 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 (see Fig. 7).

Option 1: End column should cover 75% of the final module.

Option 2: End column may extend beyond the final row.



Fig. 5 Use a string line and marking paint to square the system footprint

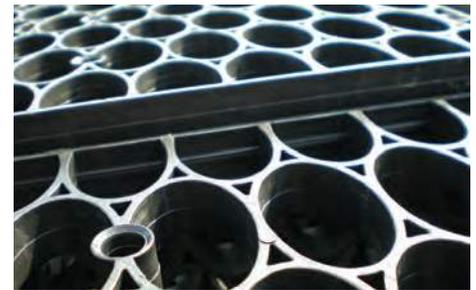


Fig. 6 Minor variations (less than width of top plate) in tank height are acceptable

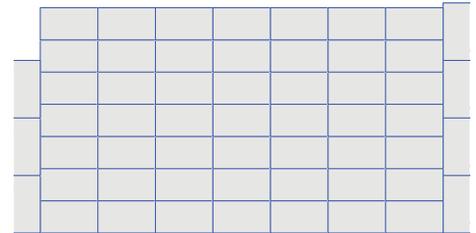
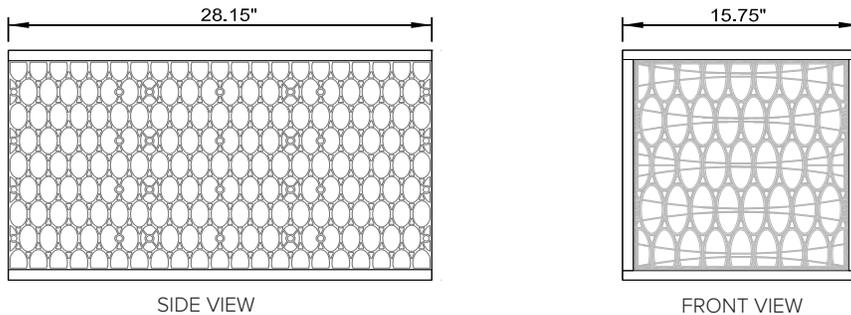


Fig. 7 Plan view showing the end rows turned perpendicular. The corners may not match up perfectly, so two acceptable alternatives are shown. Most plans do not show this configuration. Field adjustments are easily made.

LD/HD/SD



UD

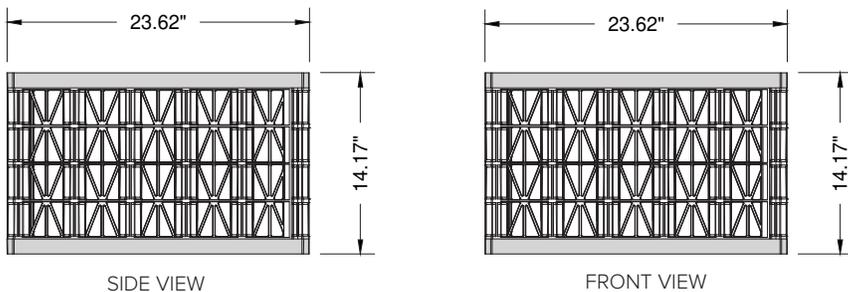


Fig. 8 (To the left) Make sure the tanks are oriented properly in the excavation

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.

R-TANK® INSTALLATION

STEP 6: INSTALL INSPECTION/MAINTENANCE PORTS

- A. Check plans for size and type of pipe (usually 10-12" schedule 40 PVC pipe), and cut pipe to length, leaving enough excess to trim the top when final grade is reached. All ports should be made from pipe long enough to extend from the bottom of the R-Tank® to finished grade.
- B. Drill several 1" diameter holes (air vents) into the pipe right below where the future top of the R-Tank® system and pipe meet when installed. Air vents can also be created with a chop saw or grinder by cutting several 3-5" vertical slots into the pipe at the same location.
- C. For maintenance ports, cut several 8" triangular notches into the bottom of the pipe as shown on plans (see Fig. 9). For inspection ports, cut the "doghouse" opening into the bottom of the pipe, as shown on plans (see Fig. 10). Align opening with treatment row flow direction.
- D. Identify the location of all ports and remove the R-Tank® from each location.
- E. All modules will need to be disassembled in order to cut, remove and/or relocate internal plates. This process will vary based on the module your project is using, as noted on the next page.
- F. Reassemble the R-Tank® when cutting is completed.
- G. 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.
- H. Install the boot onto the pipe, leaving the band clamps loose so that final adjustments may be made in Step 7. Install the pipe into the R-Tank® unit (see Fig. 11 and Fig. 12) and make sure it is plumb.
- I. Temporarily seal the opening on top of the pipe with a cap or temporary lid to prevent debris from entering the system during construction.

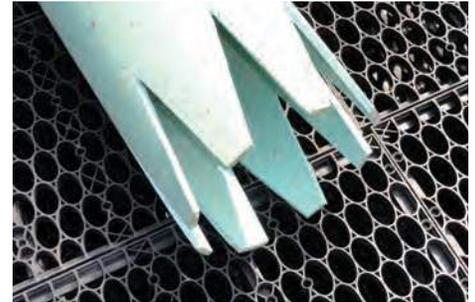


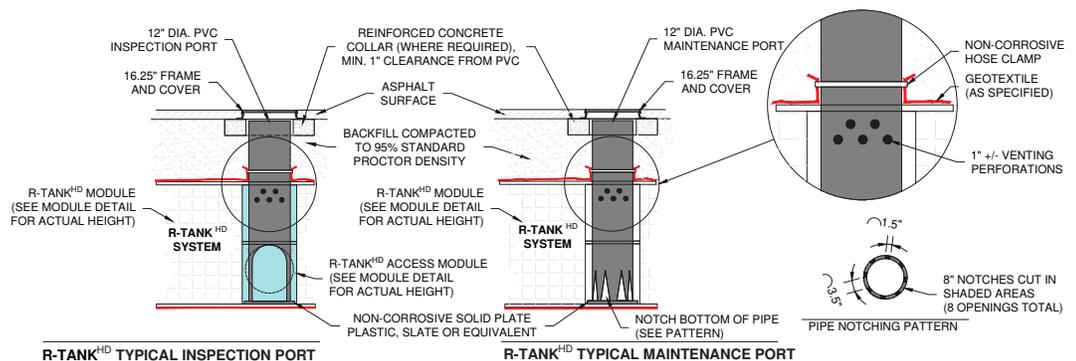
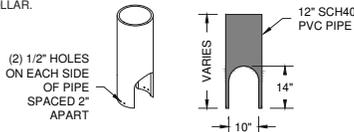
Fig. 9 Cut 8" notches into the bottom of maintenance port



Fig. 10 Inspection port "doghouse" opening

NOTES

1. THE INSPECTION PORT IS USED IN THE ACCESS MODULE TO INSPECT THE LEVEL OF SEDIMENT ACCUMULATION.
2. THE MAINTENANCE PORT IS USED TO PUMP WATER INTO THE SYSTEM AND RE-SUSPEND ACCUMULATED SEDIMENT SO THAT IT MAY BE PUMPED OUT.
3. MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION DURING THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER. FLUSH AS NEEDED.
3. R-TANK^{HD}, R-TANK^{SD}, R-TANK^{TD} AND R-TANK^{LD} MAY BE USED IN TRAFFIC APPLICATIONS.
4. SEE TRAFFIC LOADING DETAIL FOR MINIMUM & MAXIMUM COVER REQUIREMENTS.
5. IF PORT IS LOCATED IN A NON-TRAFFIC AREA, A PLASTIC CAP CAN BE USED IN LIEU OF A FRAME AND COVER WITH CONCRETE COLLAR.



TIP: If the location of Maintenance Ports is not shown on your plans, contact the engineer.

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.

STEP 6: INSTALL INSPECTION/MAINTENANCE PORTS—CONTINUED

LD MODULES

To accommodate the maintenance port, remove the two internal plates and reconnect them at the connection points a few inches closer to the edges of the module. This will provide enough room for a 12" pipe. Using your reciprocating saw, cut a circular hole the same size as the pipe in the center of the horizontal R-Tank plates between the relocated internal plates. All horizontally oriented plates will need to be cut EXCEPT FOR THE BOTTOM PLATE. See Table 1 for the number of horizontal plates that will need to be cut.

HD/SD MODULES

To accommodate the maintenance port, remove the center interior small plate (see Fig. 11). Using your reciprocating saw, cut a circular hole the same size as the pipe in the center of the horizontal R-Tank plates between the internal plates. All horizontally oriented plates will need to be cut EXCEPT FOR THE BOTTOM PLATE. See Table 1 for the number of horizontal plates that will need to be cut for your specific module.

UD MODULES

Use a 10" PVC pipe to create the maintenance port. A 12" pipe will not fit correctly. To accommodate the 10" pipe, remove the two center internal plates. Cut one of the plates in half vertically, so that you are left with two pieces, each with two full columns. Reinsert these pieces into the module on the edges, perpendicular to the full-size internal plates (see Fig. 12). Discard the other internal plate that was removed.

Using your reciprocating saw, cut a circular hole the same size as the 10" pipe in the center of the horizontal R-Tank plates between the internal columns. All horizontal plates will need to be cut EXCEPT FOR THE BOTTOM PLATE. See Table 1 below for the number of horizontal plates that will need to be cut for your specific module.



Fig. 11 For HD and SD modules, make space for the pipe by removing the center plate

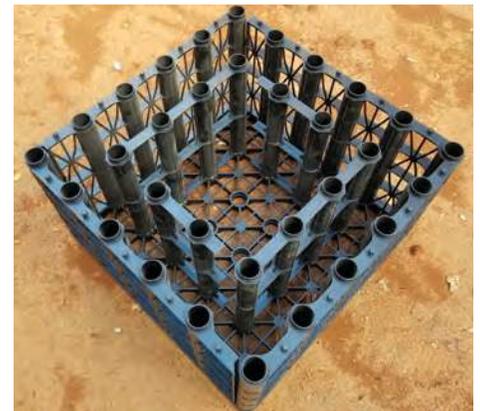


Fig. 12 For UD modules, two internal plates are removed, and two half-pieces are reinserted perpendicular to the other internal pieces.



TABLE 1

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

R-TANK® INSTALLATION

STEP 7: SEAL R-TANK® WITH GEOTEXTILE

- A.** Clean off any debris that may be lying on top of the exposed geotextile around the perimeter of the R-Tank®.
- B.** Cut strips of geotextile to fully enclose the R-Tank® units. The geotextile should overlap at least 12" at all seams or as shown on plans.
- C.** Use duct tape, sand bags or other ballast to temporarily secure overlaps.
- D.** Where the geotextile intersects an Inspection or Maintenance Port, cut an "X" into the geotextile and pull it over the pipe. The flaps of the "X" should point AWAY from the R-Tank® (see Fig. 13). Use a fabric boot and a stainless steel band clamp to seal the flaps to the pipe.
- E.** Fold geotextile for outside corners and lay excess material flat against R-Tank® (see Fig. 15). Leave corners loose to avoid creating weak spots in the material. Temporarily secure excess fabric with duct tape.
- F.** 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.
- G.** Install pipe boot kits onto the inlet and outlet pipes (see Fig. 16). Adjust 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.
- H.** 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®.

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).



Fig. 13 Encapsulate R-Tanks® with geotextile



Fig. 14 Cut an "X" into textile to accommodate pipe penetration and seal with a boot



Fig. 15 Finished envelope should lay flat against R-Tank®



Fig. 16 Install boots onto pipes prior to connecting them to the R-Tank, leaving the clamps loose for final adjustment later



WARNING: INLET AND OUTLET PIPES MUST MAKE DIRECT CONTACT WITH THE R-TANK® (PER STEP 7F), 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.



WARNING: GEOTEXTILES CAN BE DAMAGED BY EXTREME HEAT. SMOKING IS NOT PERMISSIBLE ON/NEAR THE SYSTEM, AND TOOLS USING A FLAME TO TACK GEOTEXTILE OVERLAPS, SUCH AS PROPANE TORCHES, ARE PROHIBITED.

STEP 8: BACKFILL SIDES

- A. 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 backfill material must meet requirements listed in the specs.
- B. Use a trench roller or plate compactor to compact backfill in 12" lifts (see Fig. 17).
- C. Continue placing and compacting backfill in 12" lifts until the material reaches the top of the R-Tank® units.

IMPORTANT: VIBRATORY COMPACTION OF THE SIDE BACKFILL (SEE FIG. 18) IS A CRITICAL STEP THAT BOTH COMPACTS THE BACKFILL AND ELIMINATES 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.

STEP 9: BACKFILL TOP

- A. Dump backfill material adjacent to the R-Tank® and, using your LGP Skid Steer or Dozer (see table below), push the material over the R-Tank® system.
 - Backfill must meet requirements listed in specification section 2.03 B
 - If your machine is not listed in the table 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.
- B. Lightly compact top backfill to 95% standard proctor density (or as shown on plans) using your walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of six 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 A5). Sheep foot rollers should not be used.

LARGEST TRACK DOZERS THAT CAN BE USED WITH 12" OF COVER OVER R-TANK®

MACHINE WEIGHT	OPERATING DIMENSIONS	TRACK PRESSURE	GROUND
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.

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



Fig. 17 Vibratory compaction of side backfill is ALWAYS REQUIRED, regardless of what backfill material is used.



Fig. 18 Use an LGP equipment to place backfill over R-Tank® units.



WARNING: DUMP TRUCKS SHOULD NOT DRIVE OVER OR DUMP MATERIAL ON TOP OF THE R-TANK®.

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.

WARNING: A MINIMUM OF 12" OF MATERIAL MUST BE MAINTAINED BETWEEN THE DOZER TRACKS AND TOP OF THE R-TANK®. FOR BEST RESULTS, PUSH AT LEAST 14" (OR MORE) 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 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.

R-TANK® INSTALLATION

STEP 10: PLACE GEOGRID

- A. Review the shop drawings to determine if geogrid is required.
- B. Geogrid must be placed as shown on plans. Overlap adjacent panels by 18" minimum or as specified. 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 show on plans.
- C. If metallic tape has been specified (used to locate the system), install it now.



Fig. 19 Overlap geogrid 18" or as required by plans.

STEP 11: PLACE ADDITIONAL COVER AS NEEDED

If additional cover or pavement base is required by the plans, begin placing and compacting material as discussed in Step 9. Push cover material parallel to the geogrid for best results (see Fig. 20). All cover material must meet requirements of specification section 2.03C.



Fig. 20 Pushing backfill parallel to the Geogrid prevents the grid from shoving.

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



WARNING: MAXIMUM COVER FOR R-TANK^{LD} SYSTEMS (4-PLATE) IS 3'. USE R-TANK^{HD} UNITS FOR COVER DEPTHS LESS THAN 7', R-TANK^{SD} UNITS FOR COVER DEPTHS UP TO 10', AND R-TANK^{XD} UNITS FOR COVER DEPTHS UP TO 16'. IF YOU SUSPECT THE INCORRECT MODULE IS BEING USED ON YOUR PROJECT, PLEASE CONTACT LOCAL FERGUSON REPRESENTATIVE.

STEP 12: SECURE THE INSTALLATION

Construction loads are often the heaviest loads 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.

- A. Projects nearing completion (within three months) should use warning tape or temporary fencing to secure the installation (see Fig. 21).
- B. For larger projects with ongoing construction activities, consider a more durable method for preventing unauthorized traffic from accessing the system (see Fig. 22).

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.



Fig. 21 Secure the installation with temporary fencing



Fig. 22 Secured R-Tank® installation using Jersey barriers

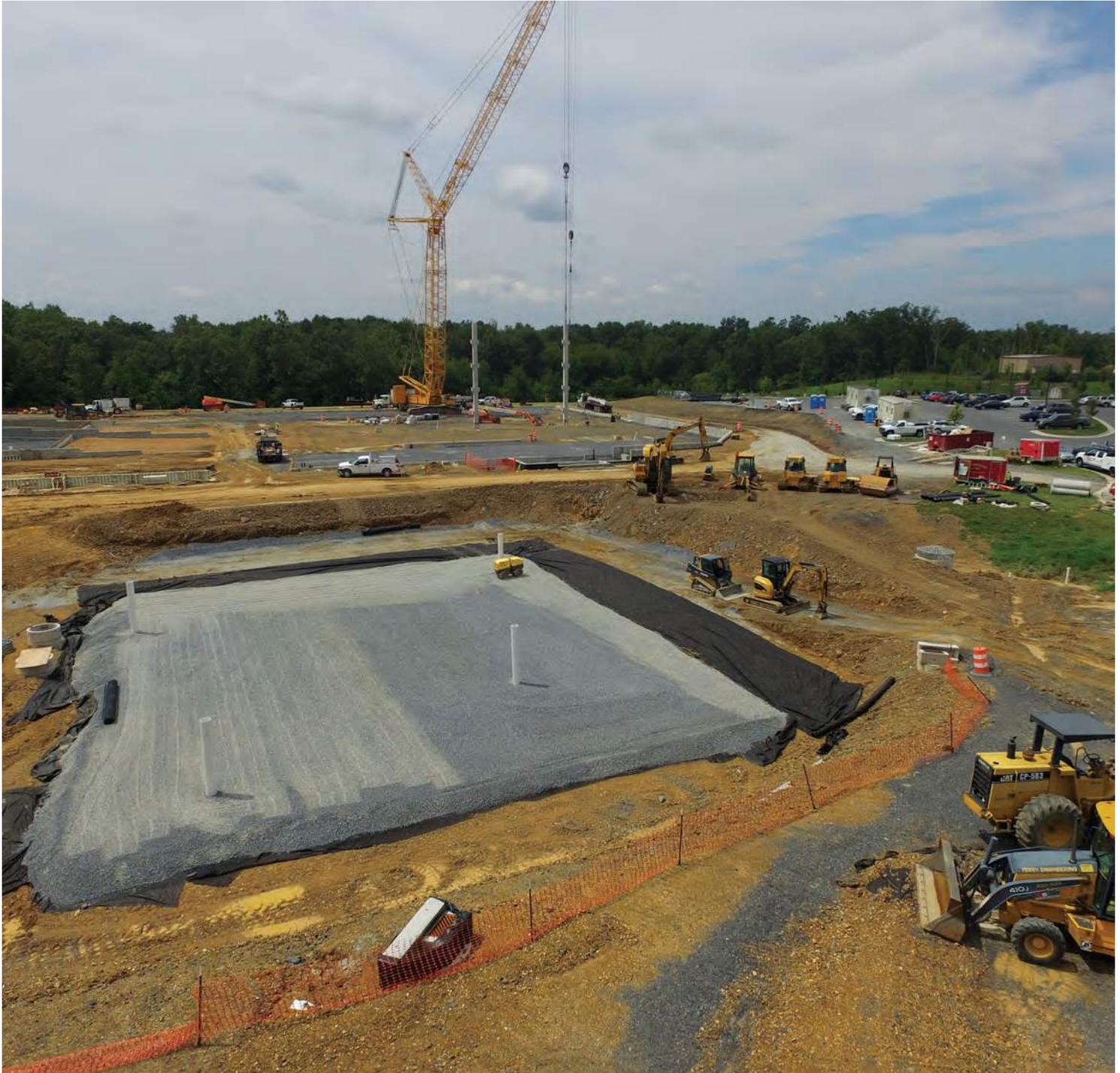
STEP 13: INSTALL PRE-TREATMENT DEVICES

Install any pre-treatment devices prior to activating the R-Tank® System to prevent debris from entering the system (see Fig. 23).

TIP: For more information about pretreatment devices or R-Tank installations, contact local Ferguson representative.



Fig. 23 Trash Guard Plus prevents contamination of your system.





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For more information, contact your local Ferguson representative, or visit the R-Tank product page on our website at [fergusongss.com](https://www.fergusongss.com).