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)

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 (NO CLAY, 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 fit 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)
  - For Larger Projects (>10,000cf):
    - 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 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.
EXCAVATION - CONT.

Prepare the subgrade according to plans. Base of excavation must be smooth, level and free of debris. 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. In many cases a stabilization geotextile and 6” of compactible material that drains well will be sufficient to amend the bearing capacity of the subgrade.

STEP 2 - ASSEMBLE R-TANK UNITS

If R-Tank units arrive on your project in flat 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.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini</td>
<td>2-3 Minutes</td>
</tr>
<tr>
<td>Single</td>
<td>2-3 Minutes</td>
</tr>
<tr>
<td>Double</td>
<td>4-6 Minutes</td>
</tr>
<tr>
<td>Triple</td>
<td>6-9 Minutes</td>
</tr>
<tr>
<td>Quad</td>
<td>8-12 Minutes</td>
</tr>
<tr>
<td>Pent</td>
<td>10-15 Minutes</td>
</tr>
</tbody>
</table>

Assembly Instructions – Using the correct number of small plates (R-Tank = 4, R-Tank\textsuperscript{HD} = 5, and R-Tank\textsuperscript{SD} = 5), connect small panels into one large panel (Fig. 2A) in locations shown in Fig. 1. Standard R-Tank 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 standard 4-plate units 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-Tank assembly go to: https://www.youtube.com/watch?v=o9v1kVLEqys&feature=youtu.be

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.

**TIP:** ACF offers an on-site assembly service. Call to request a quote, 800-448-3636.
R-TANK INSTALLATION

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 2.03 B.)

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 2.03B.

Grade and level base as shown on plans with no more than 1/2" variance. 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.
PLACE GEOTEXTILE - CONT.

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.

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 INSTALLATION

INSTALL R-TANK MODULES - CONT.

R-Tank units should fit together evenly. Occasional minor gaps between units (< ½”) or variations in the height of the units (< ½”) 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.
INSTALL INSPECTION / MAINTENANCE PORTS - CONT.

**UNIT** | **CUT**
---|---
Mini | 1 Plate
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.

Using your reciprocating saw, cut several 8” triangular notches into the bottom of the pipe as shown on plans (Fig. 14). Drill several air vents into the pipe just below where the top of the R-Tank will be once the pipe is installed into the tank.
INSTALL INSPECTION / MAINTENANCE PORTS - CONT.

To accommodate the maintenance port, remove the center interior small plate. 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:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Cut</th>
<th>Move</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini</td>
<td>1 Large Plate</td>
<td>2 Small Plates</td>
</tr>
<tr>
<td>Single</td>
<td>1 Large Plate</td>
<td>2 Small Plates</td>
</tr>
<tr>
<td>Double</td>
<td>2 Large Plates</td>
<td>4 Small Plates</td>
</tr>
<tr>
<td>Triple</td>
<td>3 Large Plates</td>
<td>6 Small Plates</td>
</tr>
<tr>
<td>Quad</td>
<td>4 Large Plates</td>
<td>8 Small Plates</td>
</tr>
<tr>
<td>Pent</td>
<td>5 Large Plates</td>
<td>10 Small Plates</td>
</tr>
</tbody>
</table>

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.

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 fit 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 flaps 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 flat 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).

**TIP:** If using Prefabricated Pipe Boot Kits, install them onto the Inlet and Outlet Pipes, leaving the band clamps loose so that final adjustments may be made. (Fig. 22)

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 sides of R-Tank to eliminate gaps between the fabric and the bottom corner of the R-Tank.

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**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.
**R-TANK INSTALLATION**

**STEP 8 - BACKFILL SIDES**

Place Backfill material (same as Base Materials in Step 3 and as noted in 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 specification.

Use a trench roller or plate compactor to compact backfill 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 backfill in 12” lifts until the material reaches the top of the R-Tank units.

**STEP 9 - BACKFILL TOP**

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

### Largest Track Dozers that can be used with 12” of cover over R-Tank

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

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.
BACKFILL TOP - CONT.

**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 without a minimum of 36” of cover and Geogrid reinforcement.

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 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 A5). 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 show on plans (refer to CAD detail HS20 loads).
R-TANK INSTALLATION

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.

If metallic tape used to locate the system has been specified, now is a good time to install it.

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

WARNING: Maximum cover for standard R-Tank systems (4-plate) is 3’. Use R-TankHD units for cover depths less than 7’, R-TankSD units for cover depths less than 10’, and R-TankXD units for cover depths up to 16’. If you suspect the incorrect module is being used on your project, please contact ACF Environmental at 800-448-3636.

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.

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. 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. 29 TrashGuard Plus prevents contamination of your system.