Design Tanks

OPERATION and MAINTENANCE of STORAGE TANKS

Your new storage tanks have been manufactured using the finest materials, state of the art design, and manufacturing techniques. Customer process requirements will dictate actual operation, but the vessel will perform to design conditions found on the tank identification label. Extreme care should be taken to prevent exceeding these conditions. Keep all high heat sources or open flame away from the tank as materials of construction are flammable unless a flame retardant resin has been used.

Inspection for damage in transit is the customer's responsibility. If damage has occurred, a claim should be filed with the carrier by the customer. If no claim is filed, the customer accepts all future responsibility for damaged tanks.

SITE HANDLING INSTRUCTIONS

Design Tanks vertical storage tanks shall be handled and installed according to this specification. Improper installation may cause tank damage.

It is the responsibility of the owner and contractor to make changes to meet unusual local conditions.

HANDLING:

Do not drop, slide, or roll tank. Hoist off the truck using lifting lugs provided at the top and bottom of the tank or alternate method (for tanks purchased without lift lugs). Ropes or cable shall each be at an angle of 45° or more from the horizontal. A spreader bar may be used to assure this angle.

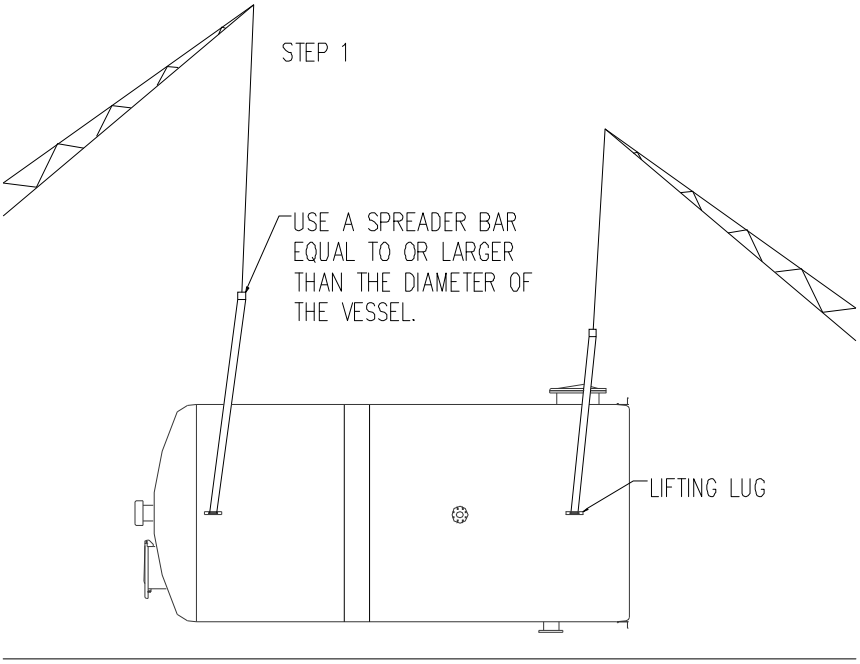
Tanks should have guidelines to prevent uncontrolled swinging.

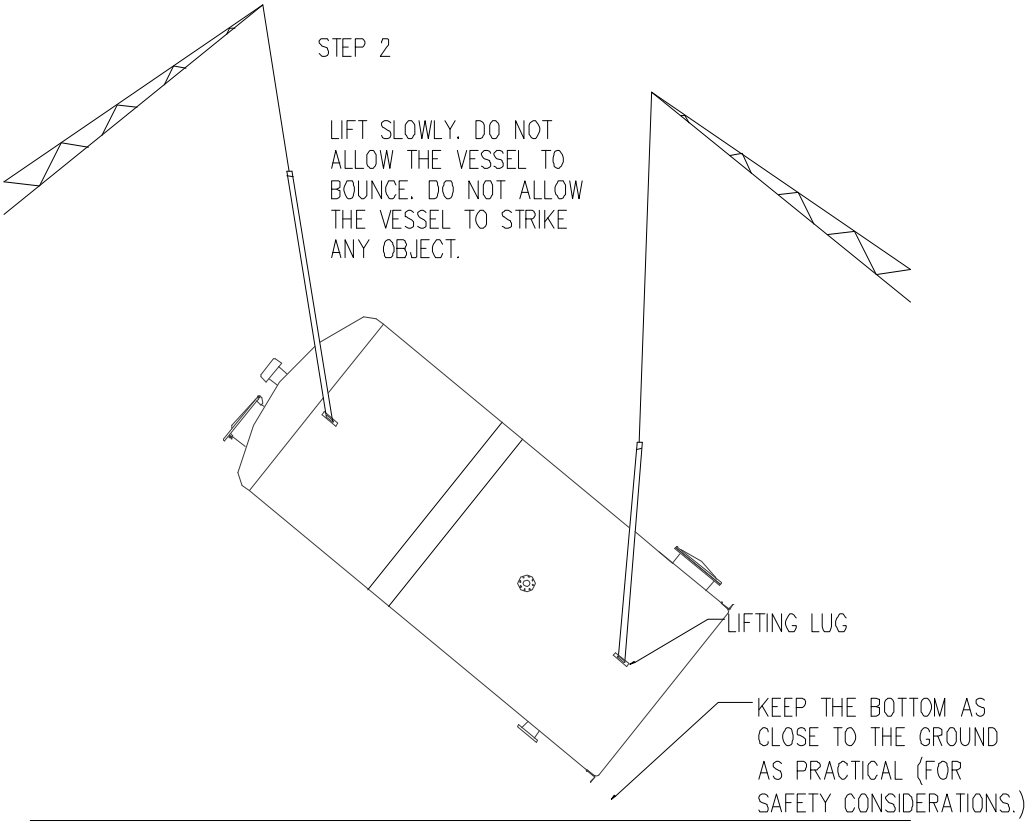
A pad should be placed under the pivot point prior to installation. It shall be padded and tied down so that it cannot roll.

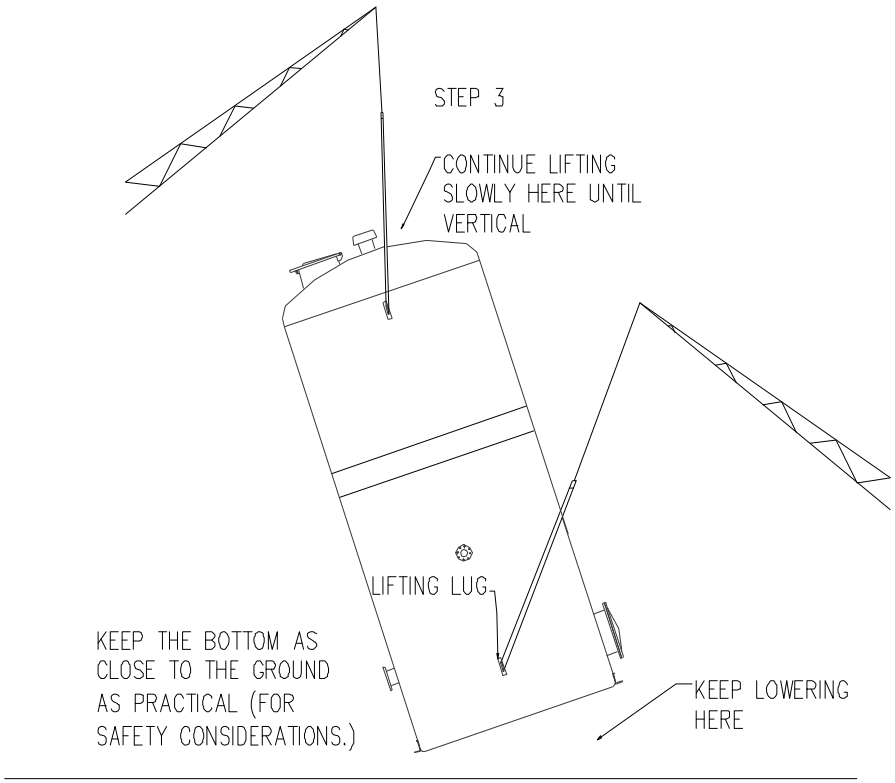
CAUTION:
DO NOT ALLOW HEAVY OBJECTS TO SWING AGAINST TANKS. THE TANKS SHALL NOT BE DROPPED OR ALLOWED TO STRIKE ANY OTHER OBJECTS. DAMAGE CAUSED BY DROPPING OR STRIKING OTHER OBJECTS MAY RESULT IN CRACKING THE INNER CORROSION RESISTANT LINER AS WELL AS THE EXTERIOR OF THE TANK. NO CHAINS OR CABLES ARE ALLOWED AROUND TANKS UNDER ANY CIRCUMSTANCES. DO NOT LIFT OR MOVE TANKS BY ATTACHMENT TO FITTINGS.

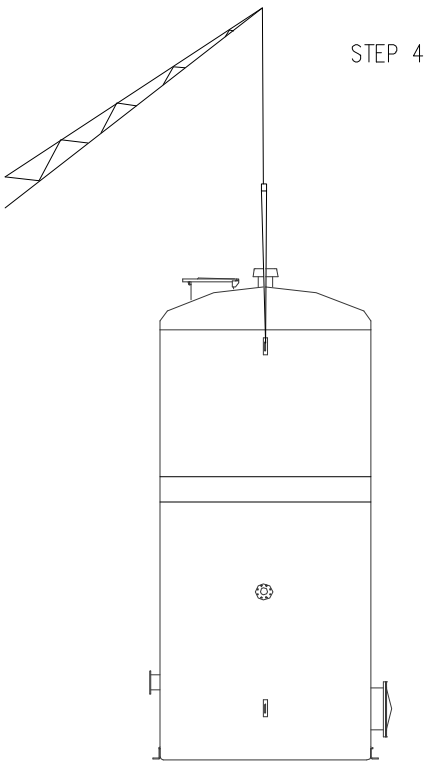
ALTERNATE METHOD:

Two canvas or large diameter rope slings suspended from a spreader bar may be used to lift tanks from the truck.


STEP 1
USE A SPREADER BAR EQUAL TO OR LARGER THAN THE DIAMETER OF THE VESSEL.
LIFTING LUG


STEP 2
LIFT SLOWLY. DO NOT ALLOW THE VESSEL TO BOUNCE. DO NOT ALLOW THE VESSEL TO STRIKE ANY OBJECT.
LIFTING LUG
KEEP THE BOTTOM AS CLOSE TO THE GROUND AS PRACTICAL (FOR SAFETY CONSIDERATIONS.)





Two cranes should be used to rotate a tank from horizontal (shipping position) to vertical (erected position). The procedure to rotate from horizontal to vertical is as follows:

1. The use of a spreader bar is required for lifting the top end of the tank. Attach the straps on the spreader bar to two lift lugs (which are 180 degrees apart).
2. Use a nylon strap to choke the bottom end of the tank.
3. Utilization of a chinstrap to prevent the lower strap from slipping is strongly recommended.
4. Position the cranes to lift the tank from the trailer (see step #1 of the attached diagram).
5. Lift the tank slowly and assure that the tank clears any obstructions. Once the tank clears the trailer, have the trailer pull out slowly from under the tank.
6. Lift the top end of the tank as the bottom is lowered (keep the tank bottom as close to the ground/grade as possible). Continue this process until the tank is suspended in its vertical position (see steps #2 and #3 of the attached diagram).
7. Do not allow the tank to bounce. Do not allow the tank to strike any objects.

INSTALLATION: Concrete pad

Proper fill soil conditions, pad design, and construction is the responsibility of the customer.

A. Site selection – site soil must have sufficient load bearing characteristics and adequate drainage.

B. Design of pad – Concrete pad thickness and reinforcement should be designed for minimal deflections under a fully loaded tank.

□ 1. Pad surface must be free of cracks, depressions and vertical projections so that the tank has continuous bottom support. We recommend 1/8" levelness in ten feet. Special attention must be given to the bottom edge of the tank. This edge **MUST** be in complete contact with the pad. If it is not, please contact Design Tanks at 888-366-8265 for specific instructions on shimming under tank.

□ 2. In order to provide continuous contact between the tank bottom and the foundation, and to compensate for surface irregularities in the foundation and the tank bottom, cushioning comprised of a minimum of two layers of 30-pound roofing felt is to be laid over the entire foundation in alternating directions. Sweep the foundation before applying the cushioning, and take care to prevent gravel or foreign objects from getting into the foundation when applying the cushioning. Also inspect the bottom prior to setting it on the cushioning to make certain that no gravel or foreign object is accidentally adhering to the tank bottom.

□ 3. When connecting piping to flanges on the tank, recognize that the tank may settle under some load. Some flexibility must be built into the piping since very rigid mounting may transmit excessive force into the tank fittings when that occurs. This is especially critical on **side bottom drain flanges**.

□ 4. After making pipe connections, load the tank 1/4 to 1/3 full of water. While loaded, shim under the hold down lugs just filling the void and then tighten the anchor bolts. Any suitable hard, long lasting material such as steel or stainless plate should be used. Do not tighten the anchor bolts without shimming under the lugs to avoid damaging stresses on the tank.

FITTING ATTACHMENTS:

□ A. Nozzles have standard ANSI 150 LB hole pattern flanges.

□ B. A torque of 35 ft-lbs. is required with a 40-50 durometer gasket (approximately 1/8" thick).

□ C. Valves and piping attached to the tank nozzles shall be independently supported.

FLANGE BOLTING RECOMMENDATIONS:

□ A. Inspect the flange-sealing surface. Check for dents, scratches or corrosion. Be sure that the finish is adequate for the style of gasket being used.

☐ B. Inspect the gasket. Verify to be sure the gasket material is compatible with the intended service. Check for defects and shipping or storage damage.

☐ C. Inspect and clean bolts, nuts and washers.

☐ D. Lubricate bolt threads and the nut contact surfaces. Do not install the bolts and nuts without lubrication. The lubricant should be compatible with the service temperature.

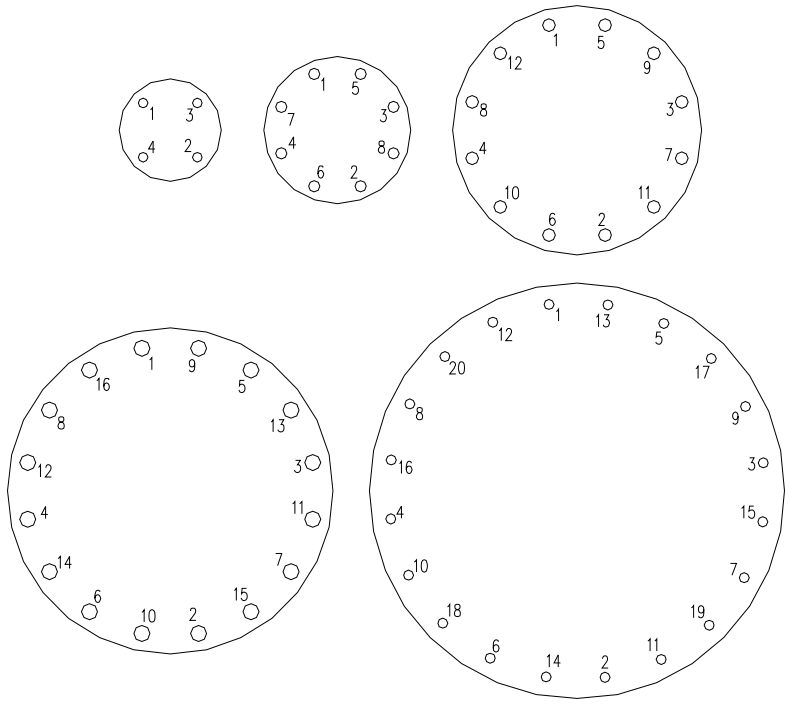
☐ E. For flanges installed vertically, installation is started by the bolts on the lower part. Install the gasket then the other bolts.

☐ F. Tighten the bolts approximately 30% of the final torque following the sequence shown in the diagrams below. Number the bolts to facilitate following the tightening order. If the correct tightening sequence is not followed, the flanges may be misaligned, making it impossible to have a uniform seating of the gasket.

☐ G. Repeat step F, elevating the torque from 50% to 65% of the final value.

☐ H. Continue tightening in the recommended sequence until the final value is reached. The same bolt normally has to be tightened more than once.

☐ I. All gaskets relax after seating. Retightening is recommended 24 hours after installation to compensate for the relaxation.



FIELD INSTALLATION OF A REPLACEMENT SIDE MANWAY GASKET

A. Make certain that the flange face and blind are clean. This may require removal of old gasket remnants which may be difficult. Acetone may be useful in addition light scraping with a putty knife. It is **extremely important** that <u>no surface</u> be scratched in the process of removing the old gasket.

B. Inspect the gasket. Verify to be sure the gasket material is compatible with the intended service. Check for defects and shipping or storage damage.

C. After both surfaces are clean and dry it, prepare the blind for positioning of the gasket.

Place the blind on a horizontal surface and spray a very small amount of photographic adhesive on the surface of the blind where the gasket will be installed.

D. Place the gasket on the blind so that the holes in the gasket align with the holes in the blind. It's important to get this alignment as close as possible, because even minor adjustments after it is in place may be difficult depending on how much adhesive was applied.

E. Finally, install the blind with gasket onto the flange and install bolts and tighten them per the pattern above.

TANK INSTALLATION INSTRUCTIONS SIDE BOTTOM DRAIN FLANGE DESIGN:

☐ A. Handle tank according to Design Tanks site handling instructions.

☐ B. Set tank carefully on concrete pad. Pad must be constructed with an edge cutout of the dimensions shown on the specific drawing that applies.

☐ C. Inspect the side bottom drain when tank is in position. All bottom bond area around the flange pipe must rest inside the cutout. Pay special attention to the bond closest to tank center being sure it is clear of the concrete. If the bonding is riding on any edge of the cutout, reposition the tank to remove that contact.

☐ D. When connecting piping to flanges on the tank, recognize that the tank may settle under some load. Some flexibility must be built into the piping since very rigid mounting may transmit excessive force into the tank fittings when that occurs. This is especially critical on side bottom drain flanges.

☐ E. After making pipe connections, load the tank 1/4 to 1/3 full of water. Place a barrier across the pad cutout and fill with self-leveling grout. Fill until there is support against the length of the flange pipe under the tank bottom. It is not necessary to fill outside the plane of the tank wall. Filling the entire cavity up against the bond area is permissible, so long as grout does not overflow the cutout under the tank where a ridge could form. This would result in bottom damage. Allow the grout to cure hard before completely filling the tank.

☐ F. While loaded as in step E, shim under hold-down lugs just filling the void and then tighten the anchor bolts. Any suitable hard, long lasting material such as steel or stainless plate should be used. Do not tighten anchor bolts without shimming under the lugs to avoid damaging stresses on the tank.

USE LIMITATIONS:

☐ G. Tanks are sold for a specified chemical storage application. Because other chemical environments may damage the tank, consult Design Tanks prior to making a change of chemicals.

☐ H. Standard tanks are not designed for vacuum or pressure other than the liquid head. To prevent accidental pressure or vacuum, the tank shall be positively vented to the atmosphere at all times. The vent shall be as large as the largest inlet or outlet.

☐ I. Agitators, mixers, coils, and other accessories must be supported as recommended and approved by Design Tanks.

☐ J. Do not allow stored materials to freeze.

☐ K. In working around the tank care should be exercised to prevent tools or other objects from striking the tank or being dropped inside the tanks.

☐ L. Do not gouge, craze, or damage the inside of the tank through misuse of tools. The inner laminate provides the tank's chemical resistance.

MAINTENANCE OF FIBERGLASS TANKS

Maintenance requirements of this vessel are limited to external and internal cleaning and inspection.

WARNING! Before entering any tank, see **Safety Precautions Section** in this document. Internal cleaning and inspection can occur during scheduled system shutdowns. Tank interior must be thoroughly cleaned prior to entering to perform a visual inspection. Inspect the interior by the following:

Fiberglass liners – Inspect for cracking, de-lamination or other signs of deterioration. Especially check the bottom knuckle radius areas and all nozzles to tank wall penetrations.

Your storage tank is for stationary use only. Do not use it for transportation of any product.

Prior to any repairs or modifications to the vessel, please contact **Design Tanks** at 888-366-8265.

PREVENTIVE MAINTENANCE:

A. Periodic inspection of the inside of the tank is important when assessing performance.
    1. Once a year is a good frequency for aggressive service conditions. Every two years in less aggressive service (such as water, etc.).
    2. Look for a shiny interior surface on newer tanks (less than 5 years old). More aggressive chemicals may show changes specific to that chemical.
    3. Inspect all secondary laminates at joints, manways, seams, and fittings. Confirm that the surface is shiny and watch for exposed fibers.
    4. Look closely at the area where the tank bottom meets the sidewall. This area is referred to as the knuckle radius of the tank and is the area of the highest stress.
    5. Today's digital cameras make the keeping of a photo log quite simple. By taking photos of the same areas every time an inspection is made, an excellent record of change can be documented.
    6. Barcol hardness testing may be a useful tool to give a quantitative measure of what could be expected after a specific service period. The resin manufacturer may have values that could be expected after a period of time in a specific service.

STORAGE TANK SAFETY PRECAUTIONS

The following emphasizes some of the precautions while working and operating equipment around FRP tanks.

1. OSHA considers storage tanks as confined spaces. Tanks may have a nitrogen atmosphere lacking adequate oxygen to sustain life. Never enter a tank without following your company's Confined Space Entry Procedure. Always have a partner outside watching through the man-way (holewatch).
2. If the storage tank has any in or out flow of fluids, or any pumps remain connected, verify that all valves and pumps have been turned off and preferably tagged out per your company's safety procedures.
3. While tank is in operation, a vacuum could be formed by drawing down the internal contents faster than they can be replaced. Know what the vacuum rating is of the tank. Always maintain the same number of inches of fluid on the bottom of the tank, which equals this vacuum rating.
4. When draining, be sure adequate venting is allowed to avoid excessive vacuum.
5. Nozzle gussets will aid in supporting the flanges for making connections with service piping. Never depend upon the nozzle to support any length of pipe. Do not stand on tank nozzles.

6. If the tank has to be lifted or moved during its lifetime, follow instructions found in this document under **Site Handling Instructions**.
7. Protect the exterior shell of the tank from deep scratches by forklifts or other such equipment.
8. Do not use storage tanks for any other contents than what is specified on the data label.
9. Design Tanks product storage tanks are not to be used for transporting material.

When in doubt, call **Design Tanks** at 888-366-8265.

TANK REPAIR:

Tanks may be repaired in the field. All questions or instructions in this regard are to be referred to **Design Tanks** at 888-366-8265 or the area sales representative.

612 W. Blackhawk St. - Sioux Falls, SD 57104 - Telephone 888-366-8265 or (605)-965-1600