



**FIBERGLASS UNDERGROUND
VERTICAL TANK
INSTALLATION MANUAL
&
OPERATING GUIDELINES**



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1. INTRODUCTION

SAFETY

The following definitions will serve as a guide when reading this manual:

WARNING

Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation, which if not avoided may result in minor or moderate injury.

CAUTION

A caution without the safety alert symbol indicates a potentially hazardous situation, which if not avoided may result in property damage.

- It is the responsibility of the owner, installer and operator to follow all requirements contained in these instructions and to comply with all federal, state, and local safety regulations that may apply to wet well installation and operations.
- No instructions or procedures presented in this document should be interpreted so as to put at risk any person's health or safety, or to harm any property of the environment.

WARNING

Follow OSHA regulations for excavations. Collapse of excavation walls could result in death or serious injury.

- Working in and around excavations is dangerous. The Occupational Safety and Health Administration (OSHA) have specific requirements that must be followed. Prior to beginning work at the site, the installer should obtain a copy of OSHA's Standard, Part 1926 (Construction), Subpart P -Excavations. A copy of this standard is available free of charge at OSHA's Web site (www.osha.gov).
- Careless activity or reckless operation of equipment can cause death, serious injury or property damage.
- It is important to follow the procedures and instructions in this document in order to safely and properly install an FTS wet well. Failure to follow these instructions will void FTS' obligations under the limited warranty and may cause product failure, serious personal injury or property damage. A copy of the relevant FTS limited warranty is found in the printed material that accompanies each tank, and on the FTS website (www.fgtsolutions.com).
- The FTS limited warranty applies only to a wet well installed according to these instructions. Since FTS does not control the parameters of any installation, FTS sole responsibility in any installation is that presented in the limited warranty.
- Comply with all applicable federal, state and local construction, health, safety and environmental codes, and industry standard practices.
- For additional information, contact your state, county and city authorities having jurisdiction, including health, fire or building departments, and environmental agencies. All work must be performed according to standard industry practices and OSHA regulations.
- Federal, state and local codes and regulations always take precedence over an FTS requirement.
- FTS must authorize – in writing and prior to wet well installation – any variation to, or deviation from, these instructions.

- All correspondence regarding variations must be retained for any warranty claim to be valid.
- If you have questions or encounter situations not covered in these instructions, contact FTS at 573-317-9620.

2. PREPARATION FOR INSTALLATION

- Although FTS wet wells are rugged, the wet well owner and/or the wet well owner's representative must take care so that the wet well is not dropped or damaged during delivery, unloading and handling on the jobsite.
- Before unloading the wet well from the truck, the wet well owner and/or the wet well owner's representative must make sure that all tools or other items that may damage the wet well during unloading are removed from the trailer bed.
- When unloading the wet well from the truck, the wet well owner and/or the wet well owner's representative must make sure that the wet well is secured in such a way that it does not roll off the truck.

WARNING

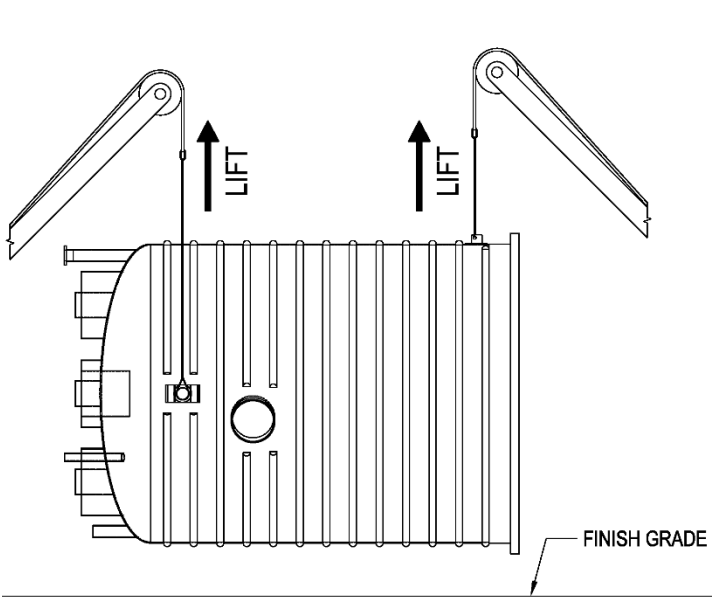
Do not allow driver to release straps securing the wet well to the truck until lifting equipment (such as a crane) is secured to the wet well's lifting lug(s). Failure to do so could result in death or serious injury.

WARNING

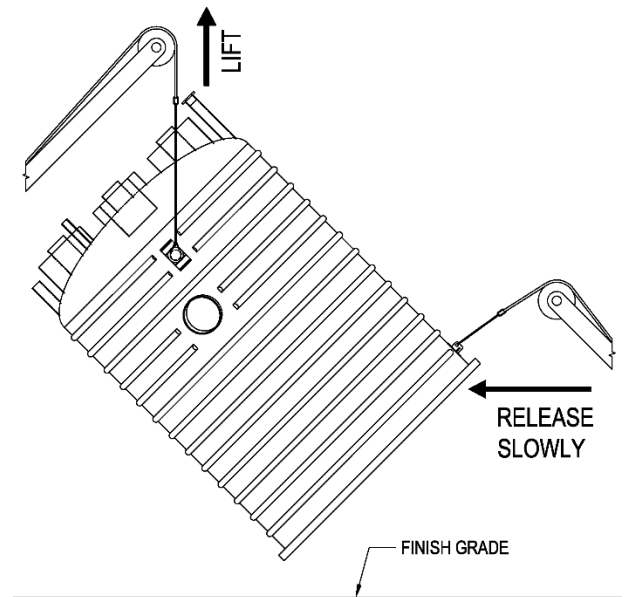
Always chock the wet well. The wet well is heavy and has a large surface area. The wet well will roll on sloped surfaces and could be blown about by the wind. Movement of the wet well could result in death or serious injury.

- Before the wet well is unloaded or relocated on the jobsite, the wet well owner and/or the wet well owner's representative must complete the following steps:
 - Visually inspect the entire exterior surface of the wet well to make sure that no shipping or handling damage has occurred. Look particularly for holes, cracks or deep scrapes. If damage is detected, do not attempt repairs. Contact FTS immediately.
 - Sign the shipping papers accepting the wet well as delivered.
 - Be sure that all equipment used to lift the wet well is rated to handle the load.
 - Select a solid, level area to place the wet well, and clear that area of all rocks, trash and debris.
- When hoisting the wet well follow these instructions: (See figures 2-1 – 2-7.)
 - To unload these wet wells, use the lifting lugs that are situated on top of the wet well in its rotated position. To install the wet well, carefully rotate the wet well to its upright position and then use all lifting lugs situated on top of the wet well in its upright position. (See FIGURES 2-1 – 2.7.)
 - Do not wrap chain or cable around the wet well.
 - Use guide ropes to guide the wet well when needed.
 - Do not roll the wet well to move it.
 - When the wet well is rotated (the wet well is upright), use all top lifting lug(s) provided to lift and install the wet well. (See figure 2-6.)
- Whenever a wet well is temporarily placed aboveground at the site, chock it in place to prevent rolling. Tie the wet well down if high winds are expected.
- Whenever a wet well is temporarily placed above the ground in a situation in which there could be freezing temperatures, always take extra care so that water does not accumulate in a way that could result in damage to the wet well or any internal components.

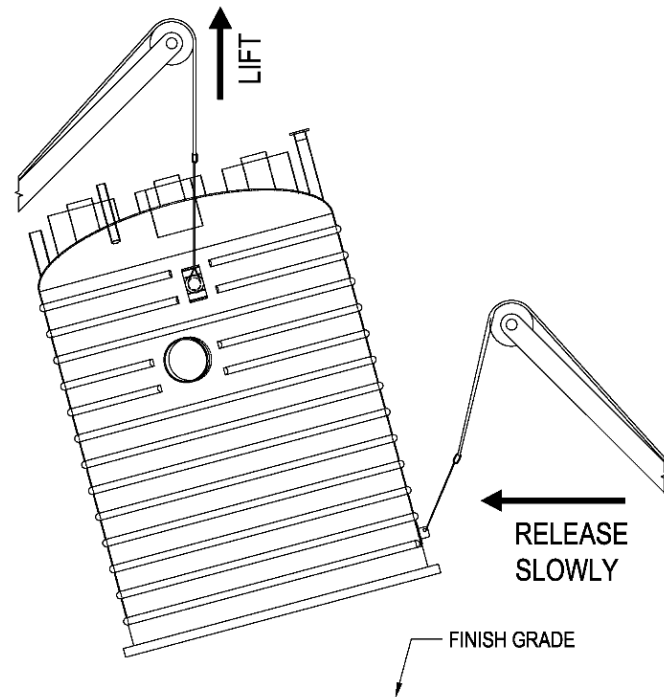
- Excavate a hole large enough to accommodate basin, underground piping, backfill material, and adequate working space.
- When using multiple lifting lugs, the angle of the lifting sling should never exceed 30 degrees. When a situation arises that the angles will be greater than 30-degree, utilize a spreader bar to achieve an acceptable angle degree – see FIGURE 2-5 & FIGURE 2-7.



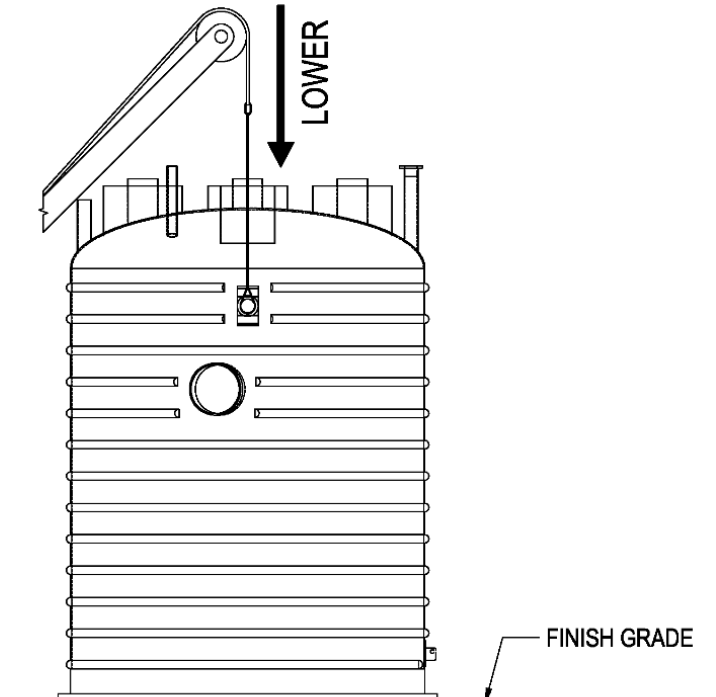
STEP 1
FIGURE 2-1



STEP 2
FIGURE 2-2



STEP 3
FIGURE 2-3



STEP 4
FIGURE 2-4

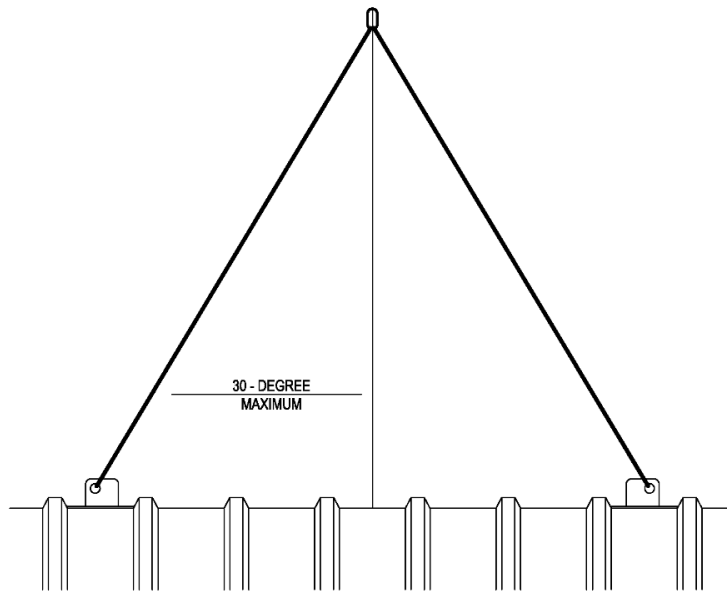


FIGURE 2-5

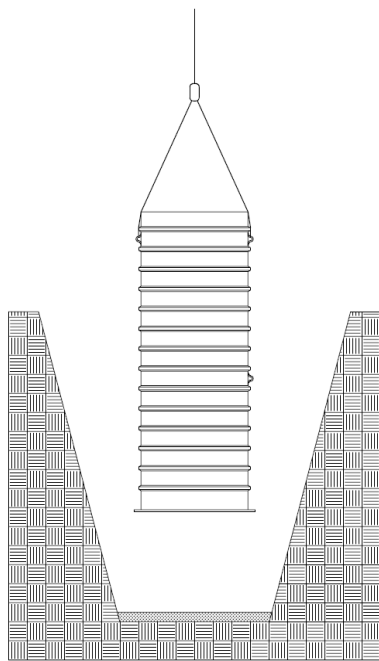


FIGURE 2-6

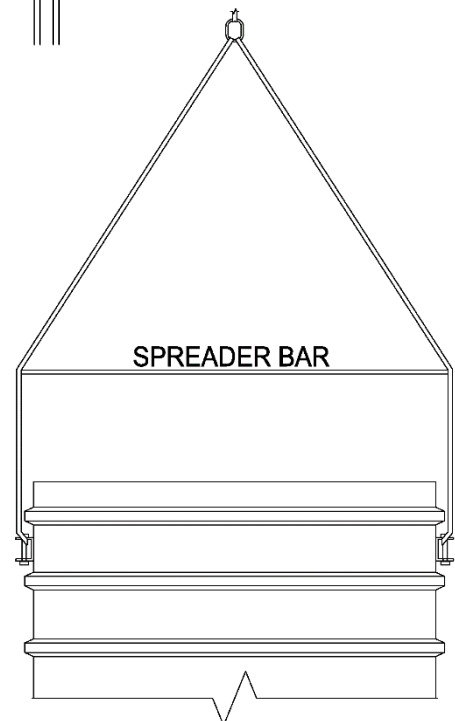








FIGURE 2-7

3. BACKFILL MATERIAL







- FTS wet well must be installed using pea gravel, crushed stone or select backfill as the backfill material. (See FIGURE 3-1.)
- When using rounded stone, the material is to be a mix of rounded particles, sizes between 1/8 inch and 3/4 inch. The rounded stone must conform to the specification of ASTM C-33, paragraph 9.1, sizes 6, 67 or 7.
- When using crushed stone, the material is to be mix of angular particles, sizes between 1/8 inch and 1/2 inch. The crushed stone must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 7 or 8.
- If material which meets these specifications is not available, contact FTS at 573-317-9620.

TABLE 1 – Standard size of coarse aggregate meeting FTS’ rounded gravel Specifications.

Amount of material passing through each laboratory sieve given as percentage of total weight.							
Grade Number	6	100%	90-100%	20-55%	0-15%	0-5%	-
	67	100%	90-100%	-	20-55%	0-10%	0-5%
	7	-	100%	90-100%	40-70%	0-15%	0-5%
Sieve Size							
							
Sieve Size							
							
Sieve Size							
							
	1 inch 25.0 mm	¾ inch 19.0 mm	½ inch 12.5 mm	3/8 inch 9.5 mm	0.187 inch 4.75 mm No. 4	0.094 inch 2.36 mm No. 8	

Note: Standard sizes of coarse aggregate per ASTM D-448, ASTM C-33 and AASHTO M 43.

TABLE 2 – Standard sizes of coarse aggregate meeting FTS’ crushed stone specifications.

Amount of material passing through each laboratory sieve given as percentage of total weight.							
Grade Number	7	-	100%	90-100%	40-70%	0-15%	0-5%
	8	-	-	100%	85-100%	10-30%	0-10%
Sieve Size							
							
Sieve Size							
							
Sieve Size							
							
		1 inch 25.0 mm	¾ inch 19.0 mm	½ inch 12.5 mm	3/8 inch 9.5 mm	0.187 inch 4.75 mm No. 4	0.094 inch 2.36 mm No. 8

Note: Standard sizes of coarse aggregate per ASTM D-448, ASTM C-33 AND AASHTO M 43.

ACCEPTABLE BEDDING AND BACK FILL MATERIALS FOR WET WELLS

- Round stone and crushed stone materials as described in FTS Backfill Guidelines document are essentially self-compacting. However, other materials are suitable for bedding and backfilling around wet wells, provided that these materials are compacted and meet the density requirements.
- Another important characteristic of good backfill materials is hardness or stability when exposed to water or loads. Most natural materials have no problem meeting the hardness requirement. However, materials like soft limestone, sandstone, seashells or shale should not be used as back fill because they may break down over time.
- Terminology in the document is referred from ASTM D 2487: “Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)”. Most unconsolidated materials can be represented by the Unified Soil Classification System (USCS) definitions. The USCS defines materials using two-letter combinations. For example, the USCS symbol “GW” refers to “well

graded gravel". Additionally, mixtures of soils can be referenced with hyphens; for example, "GW-GM" corresponds to "well graded gravel with silt"

TABLE 3 – Shows the relevant USCS symbols for other acceptable backfill and bedding materials. If these materials are used, they must be placed and compacted as shown in Table 4.

First Letter		Second Letter	
Letter	Definition	Letter	Definition
G	Gravel	P	Poorly Graded (uniform particle sizes)
S	Sand	W	Well Graded (diversified particle sizes)
M	Silt	H	High Plasticity
C	Clay	L	Low Plasticity
O	Organic		

TABLE 3

When using approved alternate bedding and backfill material around wet wells, **additional compactive effort is required.**

TABLE 4 – Defines compactive effort terminology and explains in-place and relative density requirements.

Compactive Effort	Definition	Proctor Density (In-Place)	Relative Density
Dumped	No compaction effort (self-compacting).	At least 85%	At least 40%
Slight	Some compactive effort required.	At least 85%	At least 40%
Moderate	Additional compactive effort required.	85% - 95%	40% - 70%
High	High level of compactive effort.	At least 95%	At least 70%

TABLE 4

TABLE 5 – Describes compaction requirements for various acceptable bedding and backfill materials for wet wells.

Material	Description	Compaction Requirement
Crushed Stone/Round Stone	Standard material as described in FTS Backfill guidelines	Dumped
GW, GP, SW, SP	Coarse grained soils with less than 12% fines	Slight
CL, ML, ML-CL	Fine grained material (with liquid limit < 50) with medium to no plasticity. More than 25% coarse-grained particles in the material.	Moderate
GM, GP, SW, SP	Coarse-grained soils with fines	Moderate
CL,ML,ML-CL	Fine grained materials (with liquid limit < 50) with medium to no plasticity. Less than 25% coarse-grained particles in the material.	High

TABLE 5

4. INSTALLATION

GENERAL EXCAVATION PARAMETERS

WARNING

Follow OSHA regulations for tank excavations. Collapse of excavation walls could result in death or serious injury.

- The installing contractor must take all precautions necessary to protect employees working in or near a tank excavation. These precautions should include but are not limited to the following.
- Locate and protect any utility installations near the excavation before opening the excavation.
- Secure the walls of the excavation.
- Protect employees from hazards associated with water accumulation in the excavation.
- Erect barricades, etc. to prevent unauthorized vehicle or pedestrian traffic
- Inspect a minimum of once a day, the excavation and surrounding area.
- For additional information on excavation, trenching and shoring safety practice, consult OSHA's Standard, Part 1926, Subpart P (Excavations), 650-652; and "Fall Protection Rules and Regulations."

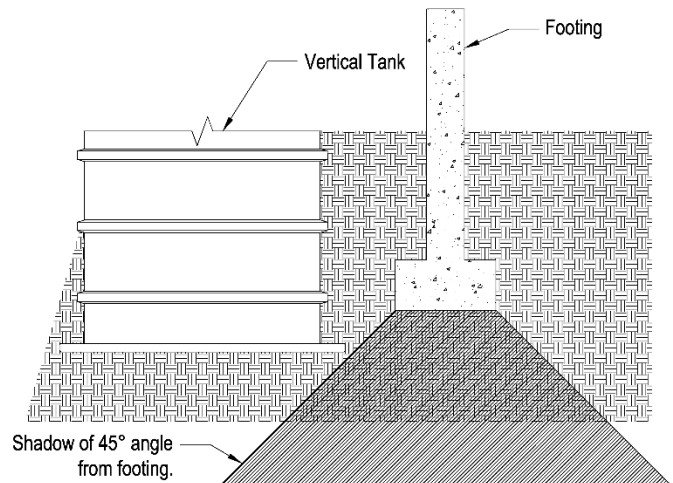


FIGURE 4-1

EXCAVATION AND TANK LOCATION

NOTICE

Improper placement of the excavation may result in damage to the tank and/or property damage.

- FTS recommends that the tank owner seek the advice of a local foundation professional engineer to determine the proper placement of a tank excavation near any existing structure(s).
- The tank owner and/or the owner's technical representative is responsible for determining the proper placement of a tank excavation.
- In general terms, the size of the excavation is determined by:
 - The number of tanks to be installed
 - The size of the tanks to be installed
- The location of a tank can be affected by the location of nearby structures. When selecting a tank site, care must be taken to avoid undermining the foundations of existing structures or new buildings to be constructed. See FIGURE 4-1.
- Ensure that downward forces from loads carried by the foundations and supports of nearby structures (constructed before or after tank installation) are not transmitted to the tanks.
- Typically, the way to check the placement of the tank in relationship to a nearby structure is to do the following:
 - **Step 1** – Determine the depth of burial needed for the tank.
 - **Step 2** – Locate the footing of the structure to be considered.
 - **Step 3** – Determine the line that would fall into the ground from a 45-degree angle drawn downward from the corner(s) of the footing of the foundation that is closest to the tank.
 - **Step 4** – The tank must not fall within the "shadow" of the 45-degree-angle line drawn from the foundation's footing. See FIGURE 4-1.

- **Step 5** – If the tank would fall within this “shadow,” do one of the following to ensure that the tank does not fall within the “shadow”:
- Move the tank away from the existing building.
- Move the foundation of the building to be constructed away from the tank.
- Deepen the footing of the planned building’s foundation.

DRY-HOLE INSTALLATION

- **Step 1** – Prepare a smooth, level bed, 6 inches thick, of approved backfill material, or a concrete pad designed by a project engineer.
- **Step 2** – Place the wet well onto the bed or concrete pad.
- **Step 3** – Test base compaction to 85% density proctor and documented.

WET-HOLE INSTALLATION

- **Step 1** – Before performing Step 1 of the dry-hole installation, pump the water from the hole and continue pumping to maintain minimum water level during wet well installation.
- **Step 2** – Test base compaction to 85% density proctor and documented.
- **Step 3** – During Step 2 of the dry-hole installation, when setting the wet well, partially ballast the wet well until it settles firmly on the prepared bed. The ballast level in the wet well must never exceed the water level in the hole by more than 1 foot until the backfill reaches the top of the wet well.

DRY-HOLE AND WET-HOLE INSTALLATION

- From the edge of the hole, bring the backfill up in the excavation. Approved backfill material must be used at least 12 inches around the entire periphery of the wet well.
- FTS recommends the use of a geotextile fabric to help separate the select backfill from the in-situ soil.
- For further information concerning geotextile specifications and installation procedures, consult the geotextile supplier’s installation guidelines or instructions.
- Polyethylene film is not considered an effective geotextile material. It may tear or degrade while in service.
- The minimum amount of back fill around the periphery of the well is normally determined by the presence or absence of traffic at the site. (See Figure 4.3 and 4.4)

Top Slab Construction Method

- The wet well fiberglass top is designed to support the dead weight, including 6" of granular bedding and 6" of a wet concrete. All load-bearing weight of the concrete pad and the traffic load exerted to the pad must be distributed to the outside perimeter of the wet well. The concrete pad and outside support perimeter shall be designed by the Engineer of Record.

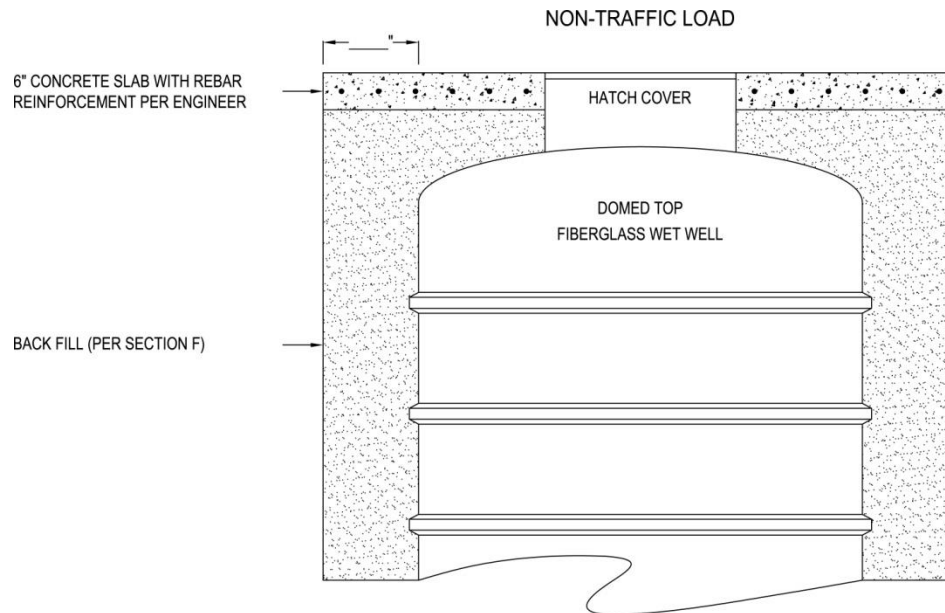


FIGURE 4.3

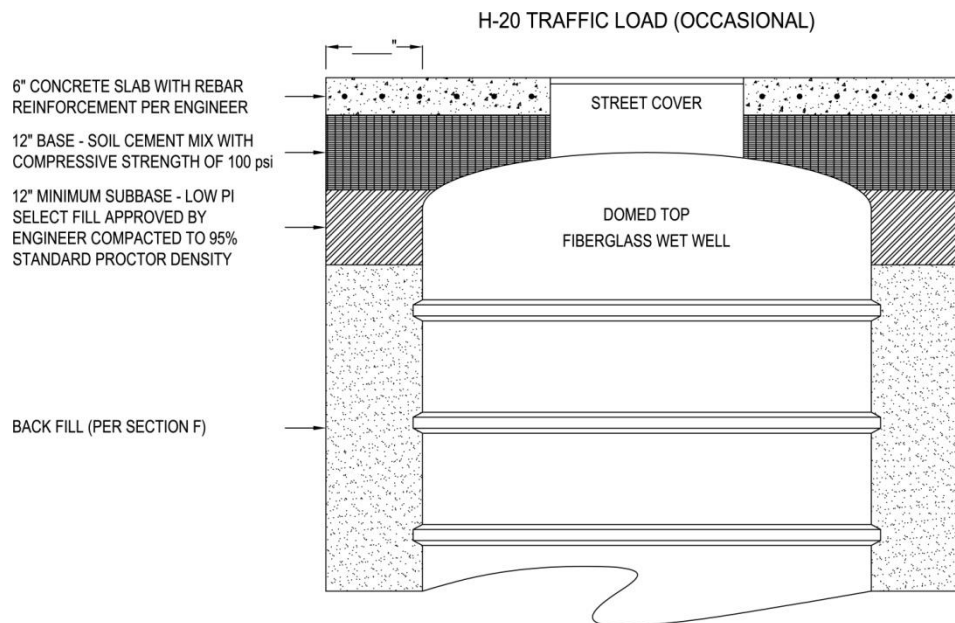


FIGURE 4.4

Self-Supporting Base Construction Methods

- A Self Supporting Fiberglass Base shall be built into the wet well as an integral structural component of the wet well. Self-Support Bases (SSB) are built to a minimum of $<3/8$ " deflection across the full diameter of the bottom. Self-Support Bases (SSB) does not require concrete slabs under the base to provide structural support. When using this method, a minimum of a 6" compacted base must be provided to a minimum of 85% Density Proctor, and field verified by a third party testing lab to fulfill requirements of the FTS's manufacturers limited warranty. (See Figure 4.5)

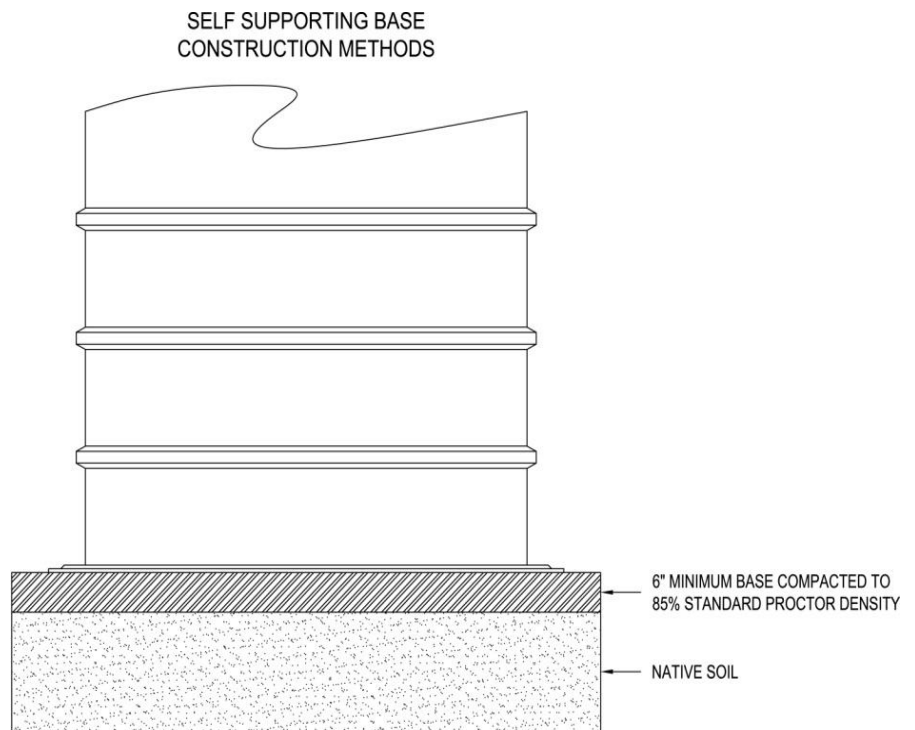


FIGURE 4.5

Fiberglass / Concrete Base Construction Methods

- For combination base designs using closed bottom fiberglass wet wells, the base is designed with C-channel or I-beam ribs that shall be bedded into a base concrete slab. The concrete base shall be designed by the Engineer of Record, to withstand all hydrostatic and vertical structural loads of the wet well. All typical engineering practices should be followed to insure the base design is stable to support all vertical loads. Third part testing for sufficient compaction must be provided to fulfill requirements of the FTS manufacturer's limited warranty. (See Figure 4.6)

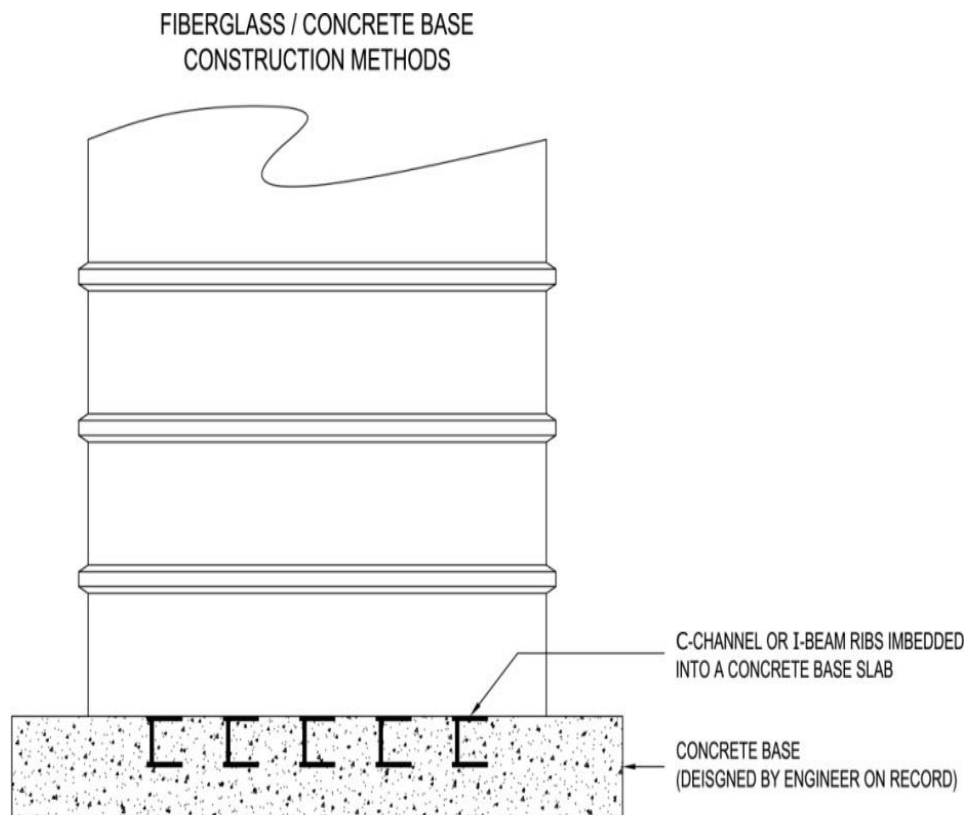


FIGURE 4.6

- To aid in positioning and handling the wet well while constructing the concrete slab, supports or shims may be utilized. (See Figure 4-2)
 - Supports should be made from a material that will not degrade or rot.
 - The wet well must rest on a minimum of 3 evenly spaced supports. The supports should position the wet well bottom above the rebar. Wet well cannot sit on rebar reinforcement.
 - The supports must be in contact with the flat bottom of the wet well at the outside diameter, and must not contact the external structural anchors.
 - The supports must not extend more than 8" from the outside diameter of the wet well toward the center.

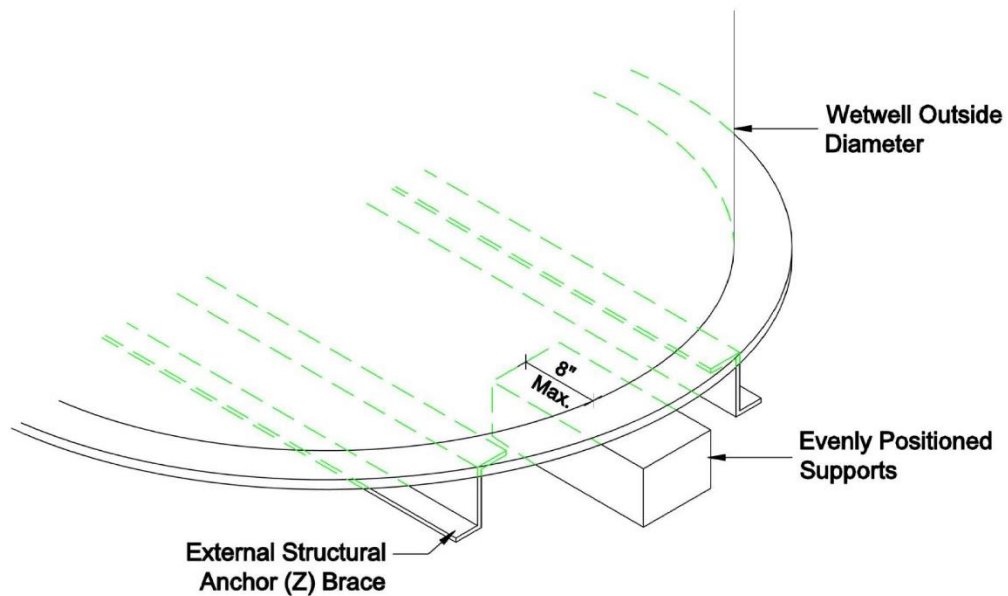


Figure 4-2

5. INSTALLATION OF REHABILITATION INSERTS

The following steps are the installation procedures for a fiberglass rehabilitation insert once it has been delivered to job site.

- Step 1.** Establish jobsite procedures for bypass pumping and well point dewatering as needed.
See Figure 5-1.



FIGURE 5-1

- Step 2.** Remove top slab of existing concrete wet well.
See Figure 5-2.



FIGURE 5-2

- Step 3.** Remove all existing concrete wet well interior pumps, piping, rails, and accessories.
a. Pump out and accumulated sludge, loose mortar, bricks, and trash from existing concrete wet well. See Figure 5-3.

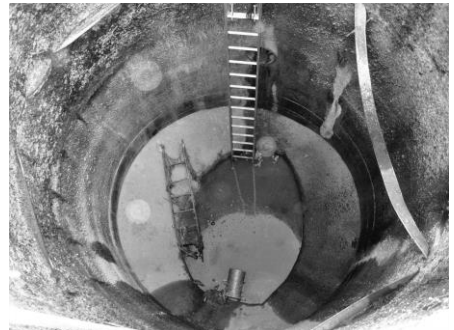


FIGURE 5-3

- Step 4.** Cut off inlet pipe flush with existing concrete wet well.
a. Chip out around existing inlet pipes to accept a new pipe hub and pipe stub, matching the pipe type and diameter. See Figure 5-4.



FIGURE 5-4

- Step 5.** Insert the new fiberglass wet well into the existing concrete wet well for a dry fit.
- Insure that the tank is centered in the hole.
See Figure 5-5.



FIGURE 5-5

- Step 6.** Locate, mark and cut openings for inlet pipes.
- Insert new pipe hubs and stubs over existing inlet pipes in the concrete wet well.
 - Field crew to glass new inlet pipes into place.
See Figure 5-6.



FIGURE 5-6

- Step 7.** Ballast tank with one foot of water in bottom of fiberglass wet well.

- Step 8.** Pump Controlled Low Strength Materials (CLSM) into annular space between fiberglass wet well and the existing concrete wet well.

- CLSM shall meet ASTM D 4832 specifications for Compressive Strength.
- CLSM shall meet ASTM D 6023 specification for Unit Weight.
- CLSM shall meet ASTM D 6103 specification for Flowability.
- Insure that the bottom of the tank is fully settled with 6" of CLSM to support the tank bottom. The Z braces on the bottom of the fiberglass wet well bottom should be fully encompassed with the CLSM. Vibrate as needed. See Figure 5-7.

- Step 9.** Continue filling annular space with CLSM, maintaining 1 foot of ballast water above the grout fill line at all times.



FIGURE 5-7

- Step 10.** Remove ballast water from fiberglass wet well, once CLSM has set up and cured to 90%.
- Step 11.** Install pumps, controls, electrical service, and other mechanical equipment as needed. See Figure 5-8.
- Step 12.** Start-up and test all pumps and controls.



FIGURE 5-8

6. PIPING & CONNECTION

All piping must conform to all applicable codes and standards.

CAUTION

All underground tanks shall be adequately vented to prevent the development of vacuum or pressure when filling or emptying the tank. Failure to properly vent a tank or compartment could cause tank failure and result in death or serious injury and will void manufacturer's warranty.

CAUTION

All connections to the wet well must be flexible. Provisions must be made to accommodate movement and misalignment between the piping and the wet well. Failure to do this may damage the wet well and/or surrounding property and void manufacturer's warranty.

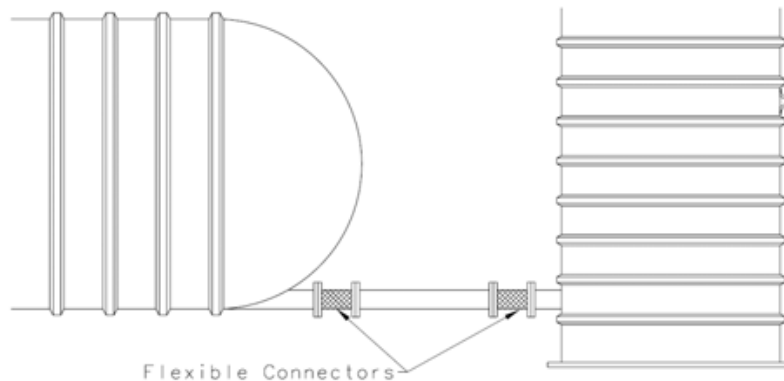


Figure 5-1

7. OPTIONAL HYDROSTATIC TEST

- Seal off influent and effluent piping with watertight caps or plugs.
- Fill the wet well with water at test level openings after the hole is backfilled to top of the wet well.
- Let the water stand in the wet well for a minimum of 1 hour (or longer if required by applicable local codes).
- If the water level drops, check to see that plugs or caps sealing off piping are tight and then add more water to fill air voids back to the standard testing level.
- If water level does not stabilize, there may be a leak in the system. If damage is detected, do not attempt repairs. Contact the FTS by email at kevin@fgtsolutions.com, by Phone 573-317-9620

8. OPERATING GUIDELINES

- Owner must retain the wet well Installation Manual and Operating Guidelines for future reference to operating guidelines.
- In addition to the wet well Installation Manual and Operating Guidelines, follow all federal, state and local laws, regulations, codes and safety precautions that pertain to underground storage wet wells and/or their associated systems.
- Consult the applicable limited warranty for each wet well for further operating guidelines and limitations.
- An FTS wet well is designed to store materials identified in the manufacturer's applicable limited warranty.

CAUTION

Storing materials other than those identified in the manufacturer's applicable limited warranty will void FTS' obligation under the warranty and may cause wet well failure or property damage.

- Maximum temperature for wastewater products is 150° F.
- The minimum temperature for chemicals is 100° F.

CAUTION

Storing a material in a wet well in excess of the allowable temperature may damage the wet well. Failure to follow this caution may damage the wet well and/or surrounding property and void manufacturer's warranty.

- Do not allow anyone to enter the wet well unless it has been properly emptied and vented, and unless the person entering the wet well has been trained in confined-space entry procedures and applicable OSHA regulations.

WARNING

Improper wet well entry could cause fire, explosion or asphyxiation and could result in death or serious injury.

9. RETAINING INSTALLATION MANUAL AND OPERATING GUIDELINES

- After installation, wet well owner must retain the wet well Installation Manual and Operating Guidelines for future reference to operating guidelines.