

Section 2577

Fiberglass Wet Wells

PART 1: General

- 1.1 *Design* – The fiberglass wet well shall be designed (signed and sealed) by a Florida Professional Engineer. Wet well weight and soil pressure on concrete base collar may be used to calculate down forces, but pump and piping weights shall not be used. Assume groundwater is at grade. A factor of safety of 1.2, minimum, must be used in anti-flotation calculations. The design shall include the operating conditions as noted on the drawings, a 12 inch minimum thick concrete base inside the wet well, a 12 inch minimum thick outside the wet well reinforced concrete hold-down base which extends 12-inches (minimum) beyond the outside of the wet well, a 10-inch (minimum) thick reinforced concrete top slab, pump access frame and cover and other standard wet well features as shown on the drawings. Pumps shall be anchored to a mounting plate (see details on the drawings). The complete design (signed and sealed by a Florida Professional Engineer) must be submitted in the form of a shop drawing for ECUA's review and approval. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements. Unless approved otherwise by ECUA, the wet well shall be a one piece unit. Wet wells shall be manufactured by LFM, CSI, Xerxes or AFE.
- 1.2 *Materials* –
- 1.2.1 *Resin* - The resins used shall be commercial grade unsaturated polyester resins.
- 1.2.2 *Reinforcing Materials* - The reinforcing materials shall be a commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcements and the resin.
- 1.2.3 *Surfacing Materials* - If reinforcing materials are used on the surface exposed to the contained substance, it shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.
- 1.2.4 *Fillers and Additives* - Fillers, when used, shall be inert to the environment and wet well construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.
- 1.3 *Quality Assurances* - Comply with the latest published editions of AWWA and ASTM Standards
- 1.3.1 *ASTM D883* - Standard Terminology Related to Plastics
- 1.3.2 *ASTM D3299* - Standard Specification for Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks
- 1.3.3 *ASTM D3753* - Standard Specifications for Glass-Fiber-Reinforced Polyester Manholes and Wet Wells

1.3.4 ANSI / AWWA D120-09 - AWWA Standard for Thermosetting Fiberglass- Reinforced Plastic Tanks

1.4 Fabrication -

1.4.1 *Exterior Surface* - The exterior surface shall be relatively smooth with no sharp projections. Hand-work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

1.4.2 *Interior Surface* - The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

1.4.3 *Defects Not Permitted* -

1.4.3.1 *Exposed fibers* - glass fibers not wet out with resin. Resin runs: runs of resin and sand on the surface. Dry areas: areas with glass not wet out with resin. Delamination: separation in the laminate.

1.4.3.2 *Blisters* - light colored areas larger than 1/2 inch in diameter. Crazing: cracks caused by sharp objects.

1.4.3.3 *Pits or Voids* - air pockets.

1.4.3.4 *Wrinkles* - smooth irregularities in the surface.

1.4.3.5 *Sharp Projection* - fiber or resin projections necessitating gloves for handling.

1.4.4 *Installation of Brackets* - Manufacturer or manufacturer certified field personnel shall glass in all stainless steel fasteners and brackets, discharge piping brackets, etc. Manufacturer of wet well shall be responsible for integrity of all field glassing.

1.4.5 *Markings* - Each wet well shall have wet well data integrated into fiberglass and affixed to top inside and top outside walls. Data required includes manufacturer's name, ASTM designation, production and/or serial number, production date, length and diameter, and warranty length. Product data shall not be written in ink or paint. Production/serial numbers shall be kept on file by manufacturer for a minimum of 20 years and shall be accompanied by project data for future reference and recall. The following is an example:

ABC Manufacturing ASTM D3753
Serial # ABC20083461
Production date: October 22, 2008
Depth = 22'
Diameter = 10'
20 Year Warranty

1.5 *Physical Requirements -*

- 1.5.1 *Load Rating* - The complete wet well shall have a minimum dynamic-load rating of 16,000 ft-lbs when tested in accordance with ASTM 3753, Section 8, test methods D 790 and D 695. To establish this rating the complete wet well shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.
- 1.5.2 *Stiffness* - The wet well cylinder shall have a minimum pipe-stiffness value as shown in the following table (at a minimum) when tested in accordance with ASTM D3757, Section 8.

Length - Ft.	F/AY - PSI
10 to 20	2.01
21 to 30	3.02
31 to 40	5.24

Physical Properties:		
	Hoop Direction	Axial Direction
a. Tensile Strength (psi)	18,000	5,000
b. Tensile Modules (psi)	0.8×10^6	0.7×10^6
c. Flexural Strength (psi)	26,000	4,500
d. Flexural Modules (psi)		
(no ribs - 48", 60", 72") (psi)	1.4×10^6	0.7×10^6
(with ribs - 96", 144") (psi)	0.7×10^6	0.7×10^6

1.6 *Fiberglass Construction Methods -*

- 1.6.1 *Handling* - The wet well shall not be dropped or impacted. Wet wells shall be chocked if stored horizontally. If wet wells must be moved by rolling, the ground transverses shall be smooth and free of rocks, debris, etc. FRP wet wells may be lifted by the installation of three lifting lugs as specified by the manufacturer on the outside surface near the top or by a sling or "choker" connection around the center. Use of chains or cables in contact with the wet well surface is prohibited. Wet wells may be lifted horizontally using one support point.
- 1.6.2 *Wet Well Installation* - Bottom of excavation should be compacted to 95% Standard Proctor Density. Pour reinforced concrete base a minimum of one foot deep and at least two feet in diameter larger than the fiberglass wet well outside diameter. As soon as the concrete has set-up enough to support the fiberglass wet well, lower the wet well into place. (Wet wells with fiberglass bottoms, should have rebar inserted into bottom reinforcement.) Pour a minimum of one foot of reinforced concrete on the inside, also a minimum of one foot deep and two feet from the fiberglass wet well wall on the outside of the fiberglass wet well. Insert "RAMNEK" type sealant on the outside of the fiberglass wet well around the bottom where the fiberglass and concrete come together.
- 1.6.3 *Wet Well Cutouts* - Cutouts in wet well wall should be made with proper cutting tools such as jigsaw or hole saw. Do not use axe or other impact-type tools.

1.6.4 *Pipe Installation* - Discharge wall penetrations are to have sleeves large enough to accept O.D. of pipe discharge flange. All discharge sleeves shall be sealed via a gas tight-water tight Link Seal system or approved equal. Influent pipe connections shall be made with an NPC Kor-N-Seal Boot with stainless steel band or approved equal.

1.7 *Design Features* -

1.7.1 *Top Slab Support* - Pour reinforced concrete slab support a minimum of two feet outside of fiberglass wet well wall and minimum of six inches thick.

1.7.2 *Design* - Fiberglass wet well system to be designed, signed and sealed by a Professional Engineer registered in the State of Florida. Resistance to floatation and traffic or pedestrian loading requirements shall be addressed in the design.

1.7.3 *Wet Well Top* - Wet well top shall be concrete and designed for 300 psf or H-2O Traffic loading as noted on the drawings. Hatches shall be as specified in this specification and as detailed on the contract drawings. Bottom of top slab and around side of hatch opening shall be fiberglass lined and shall meet all the requirements of this specification.

1.8 *Warranty* - The fiberglass manufacturer shall warrant the fiberglass wet well against defects for at least twenty (20) years after the date of acceptance by ECUA. Defects are defined as cracking, delaminating, or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to the satisfaction of ECUA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty. Manufacturer's recommended installation procedures to assure 20-year warranty provided to ECUA to be included in submittal package.

PART 2: Excavation

2.1 *General* - The limit of excavation shall be such to allow for placing and removing forms, installing sheeting, shoring, bracing, etc. The Contractor shall pile excavated material in a manner that will not endanger the work and will avoid obstructing sidewalks, driveways, power poles, etc. Drainage shall be kept clear.

2.2 *Vertical Sides (Sheeting, Shoring and Bracing)* - When necessary to protect existing or proposed structures or other improvements, the Contractor shall maintain vertical sides of the excavation. The limit shall not exceed three feet outside the footing on a vertical plane parallel to the footing except where specifically approved otherwise by the Engineer. The Contractor shall provide and install any sheeting, shoring, and bracing as necessary to provide a safe work area as required protecting workers, structures, equipment, power design and adequacy of all sheeting, shoring, and bracing. For excavations deeper than 20 vertical feet, which utilize sheeting, shoring or bracing, the sheeting, shoring and bracing plan shall be designed by a Florida Professional Engineer, (signed and sealed). This plan shall be submitted to ECUA for review and approval, prior to construction. The construction of sheeting, shoring and bracing shall be in accordance with the approved plan. All major field modifications shall be approved by the Professional Engineer. The sheeting, shoring, and bracing shall be removed as the excavation is backfilled in such manner as to prevent injurious caving. Excavation shall meet the Florida Trench Safety Act (an OSHA requirement) and OSHA Excavation Standards (29 CFR sub- part P 1926.650) at a minimum.

- 2.3 *Sloping Sides* - Where sufficient space is available, the Contractor shall be allowed to back slope the sides of the excavation. The back slope shall be such that the excavation shall be safe from caving. The type of material being excavated shall govern the back slope used, but in any case the back slope shall be no steeper than 1 foot horizontal to 1 foot vertical without sheeting or shoring.
- 2.4 *De-Watering* - The Contractor shall keep excavation free from water by use of cofferdams, bailing, pumping, well pointing, or any combination as the particular situation may warrant. All de-watering devices shall be installed in such a manner as to provide clearance for construction, removal of forms, and inspection of exterior of form work. It is the intent of these specifications that the foundation be placed on a firm dry bed. The foundation bed shall be kept in a de-watered condition a sufficient period of time to ensure the safety of the structure. The excavation shall be protected from excessive rainfall, drainage and drying. The excavation shall be inspected and approved by ECUA's representative before work on the structure is started. It is the intent of these specifications that the Contractor provides a relatively smooth, firm foundation bed for footing and slabs that bear directly on the undisturbed earth without additional cost, regardless of the soil conditions encountered. The Engineer will be the sole judge as to whether these conditions have been met.
- 2.5 *Unauthorized Excavation* - Excavation for slabs, footings, etc., that bear on earth shall not be carried below the elevation shown on the drawings. In the event the excavation is carried on below the indicated elevation, the Contractor shall bring the slab, footing etc., to the required grade by filling with concrete having a minimum compressive strength of at least 3,000 PSI at 28 days.

PART 3: Backfill

- 3.1 *Backfill Material* - Unless shown otherwise on the drawings, suitable soil (A-3 sand only, no clay or rocks larger than 3/4" size) shall be used for backfill around the wet well for a distance of two feet from the outside surface and extending from bottom of the excavation to the bottom of the top slab. The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the Engineer. Backfill material shall be free of vegetation or other extraneous material. Excavation materials which are to be used for fill or backfill may be stockpiled on site. Top soil should be stockpiled separately and used for finish grading around the structure.
- 3.2 *Schedule Of Backfilling* - The Contractor may begin backfilling of wet well as soon as the concrete has been allowed to cure and the forms removed.
- 3.3 *Backfill* - Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to at least 95% Standard Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.