



## FIBERGLASS WET WELLS

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### PART 1: GENERAL

#### 1.1 SCOPE OF WORK

The product listed under this section shall include all labor, materials and equipment necessary to furnish a Fiberglass Reinforced Plastic (FRP) Wet Well. FRP Wet Wells shall be one piece units manufactured to meet or exceed all specifications of ASTM D3753. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements as manufactured by the following approved manufacturers:

- A. Fiberglass Tank Solutions (FTS)

#### 1.2 SUBMITTALS

- A. General - The manufacturer shall supply a complete set of scale drawings detailing dimensions of heights, diameter, elevations to invert, pipe sizes and any other necessary details.
- B. Anti-Flotation (Buoyancy) Calculations - A set of signed and sealed (by a Professional Engineer) anti-flotation calculations shall be provided which meet the following criteria:
  - 1. 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.
  - 2. Assume groundwater is at grade.
  - 3. A factor of safety of 1.2, minimum, must be used.
  - 4. The design calculations shall include the design conditions as noted on the drawings.
- C. Engineering Design Report - Manufacturer shall provide a complete **Composite Engineering Design using a Finite Element Analysis** for the wet well. The calculations shall include:
  - a. Design Inputs
  - b. Design of Cylindrical Shell
  - c. Flat Top Head Design
  - d. Bottom Head Design
  - e. Pump Anchorage on Flat Bottom

- f. Component Weight
  - g. Buoyancy Calculations
  - h. Lifting Trunnion Design
  - i. Access Cover Opening Reinforcement
  - j. Design Summaries and Sketches
  - k. P.E. Stamp for the Design
- D. Mounting Plate Calculations - Pumps shall be anchored to a mounting plate (see details on the drawings). The complete design (signed and sealed by a Professional Engineer) shall be submitted. Mounting plates are not permitted to be bolted through the bottom of the basin.

### 1.3 QUALITY ASSURANCES

Comply with the latest published editions of AWWA and ASTM Standards:

ASTM D883	Standard Terminology Related to Plastics
ASTM D3299	Standard Specification for Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks
ASTM D3753	Standard Specifications for Glass-Fiber-Reinforced Polyester Manholes and Wet Wells
ANSI/ AWWA D120-09	AWWA Standard for Thermosetting Fiberglass- Reinforced Plastic Tanks

## PART 2: PRODUCTS

### 2.1 MATERIALS

- A. Resin – The resins used shall be commercial grade unsaturated 100% polyester resins. Interior corrosion liner shall be a Vinyl Ester resin.
- B. 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.
- C. 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 includes a C-Veil or Nexus liner that will provide a suitable bond with the resin and leaves a resin rich surface.

- D. Interior Materials - A minimum of a 10mm interior laminate layer of the tank construction shall include the reinforcing materials, C-Veil or Nexus, and a commercial grade Premium Vinyl Ester resin for added chemical resistance.
- E. 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. No sand fillers will be allowed.

## 2.2 FABRICATION

- A. 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.
- B. 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.
- C. Interior and Exterior of the lift station shall be either white or light gray in color.
- D. Defects Not Permitted –
  - 1. Exposed fibers – Glass fibers not wet out with resin.
  - 2. Resin runs: runs of resin and sand on the surface.
  - 3. Dry areas: areas with glass not wet out with resin.
  - 4. Delamination: separation in the laminate.
  - 5. Blisters – Light colored areas larger than ½ inch in diameter. Crazing: cracks caused by sharp objects.
  - 6. Pits or Voids – Air pockets.
  - 7. Wrinkles – Smooth irregularities in the surface.
  - 8. Sharp Projection – Fiber or resin projections necessitating gloves for handling.
- E. 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.

- F. Markings – Each wet well shall have wet well data integrated into fiberglass and affixed inside and top outside walls at or near the top. Data on the inside of the wet well should be legible from the top of the completed lift station installation. 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. Data required includes the following as an example:
1. Manufacturer’s Name
  2. ASTM Designation
  3. Production or Serial Number
  4. Production date
  5. Wet Well Depth
  6. Wet Well Diameter
  7. Warranty Length
- F. Wet Well Top Flange - The wet well flange shall have an outside diameter of at least 3.0 inches greater than the diameter of the wet well.

## 2.3 FIBERGLASS CONSTRUCTION METHODS

- A. Wet Well Penetrations – Cutouts/stub-outs must be installed by the manufacturer. Installations in the field are not recommended and may void the manufacturer’s warranty. Penetrations of FRP pipe will be performed using resin and reinforced hand lay-up procedures. All resin and fiberglass shall be the same type and grade as used in the manufacturer of the basin.
- B. 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 a Press Seal Boot with stainless steel band or approved equal.

## 2.4 DESIGN FEATURES

- A. 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. Slab designs will be the responsibility of the design firm of record for the project, to include reinforcement and concrete mix for the specific load requirements. All top loaded

slabs will provide structural loads to be placed on soil backfill outside the shadow of the fiberglass tank.

B. Wet Well Top – Wet well top shall be concrete and designed for 300 PSF or H-20 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.

C. Frame And Covers

1. Access frame and covers shall be suitably sized for pumping units furnished as specified on the Construction plans and details. Access frame and covers shall be constructed of skid-proof aluminum with a minimum load rating of 300 pounds per square foot or H-20 traffic loading in accordance with the drawings. Frame and covers shall be furnished complete with stainless steel staple assembly (not recessed) for the locking mechanism, hold-open device, upper guide holder and cable holder. Access covers shall be hinged to open as indicated on the drawings. Hatches shall be sized to provide a 4-inch minimum clearance between hatch and pump volute (measured from all sides and includes the pump and rail system). Hatches shall be gasketed to minimize water intrusion and odors, with drain piping. All hatch openings shall be provided with aluminum powder coated safety grates.

2. All hinges, fasteners and miscellaneous hardware shall be 316 stainless steel. For tamper proof and security purposes, the hinges shall be bolted to the door(s) with stainless steel carriage bolts and nuts. The nuts shall be welded to the bolts on both the door(s) and frame. The Owner will provide pad locks, as required. Locks shall be easily accessed, no slam-lock-type locking mechanisms will be allowed.

3. Hatches to be installed by tank manufacture in the factory.

D. Interior Piping & Pump Discharges

1. Pump discharge systems shall be constructed using either Ductile Iron, Stainless Steel, or Poly Propylene, per the plans.

2. Pump guide rails shall be Sch. 40 Stainless Steel sized per the plans.

3. All interior piping and guide rail systems shall be installed by tank manufacturer in the factory.

## 2.5 WARRANTY

The fiberglass Manufacturer shall warrant the fiberglass wet well against defects for at least one (1) year after the date of acceptance by the Owner. 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 the Owner. 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 1-year warranty provided to the Owner to be included in submittal package.

## PART 3: INSTALLATION

### 3.1 GENERAL

The FRP wet well shall be installed in the location shown on the plans in accordance with the Manufacturer's recommendations, the Report of Geotechnical Investigation (if applicable) and these specifications. The limit of excavation for the FRP shall 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.

### 3.2 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.

### 3.3 WET WELL INSTALLATION

Bottom of excavation should be compacted in accordance with the Report of Geo Technical Investigation (if available) or to a minimum 95 percent Modified 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.

### 3.4 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 the Owner 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 OSHA Excavation Standards (29 CFR sub- part P 1926.650) at a minimum.

### 3.5 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.

### 3.6 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 the Owner'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 Owner's representative will be the sole judge as to whether these conditions have been met.

### 3.7 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.

### 3.8 BACKFILL MATERIAL

Unless shown otherwise on the drawings, suitable backfill in accordance with the Manufacturer's Installation Guidelines 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), clay or rocks larger than 3/4-inch size. This material will be subject to approval by the Owner's Representative. Backfill material shall be free of vegetation or other extraneous material.

### 3.9 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.

### 3.10 BACKFILL

Backfill shall be placed in accordance with the recommendations contained within the Report of Geotechnical Investigation (if applicable). Otherwise backfill shall be placed at a minimum in layers of not more than 12 loose measure inches and mechanically tamped to at least 95 percent Modified Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

END OF SECTION