



# TYPICAL SPECIFICATIONS FOR FIBERGLASS TANKS

The following specification for FRP Chemical Storage Tanks has been developed to assist the specifier and the buyer in detailing their own specification for equipment that meets the minimum design parameters and construction elements necessary in FRP tank manufacture. While primarily written for atmospheric, vertical, cylindrical tanks, many of the design parameters are applicable for any style or design tank. Other bulletins specifically address the design considerations necessary for above and below ground horizontal tanks. Tanks requiring other special consideration, such as pressure or vacuum operation, are dealt with on an individual basis.

## 1 SCOPE

1.1 Fiberglass chemical storage tanks, appurtenances, and accessories shall be provided as shown on the plans and as specified herein. Piping and valves are specified in other sections.

## 2 GENERAL

2.1 Tanks shall be filament wound or contact molded conforming to the following appropriate ASTM specifications:

2.1.1 Filament Wound Tanks shall be designed and fabricated in accordance with ASTM Specification D3299-00, "Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks".

2.1.2 Contact Molded Tanks shall be designed and fabricated in accordance with ASTM Specification D4097-01, "Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks".

2.2 Tanks shall be as manufactured by Justin Tanks LLC.

## 3 MATERIALS

3.1 Resin - The resin used shall be a commercial-grade; corrosion-resistant Thermoset that has either been evaluated in a laminate by test in accordance with ASTM C-581 or that has been determined by previous documented service to be acceptable for the service conditions.

3.1.1 The resin shall contain no pigment, dyes, colorants, or filler, except as follows:

3.1.1.1 A Thixotropic agent that does not interfere with visual inspection of laminate quality, or with the required corrosion resistance of the laminate, may be added for viscosity control.

3.1.1.2 Resin pastes used to fill crevices before overlay shall not be subject to the limitations of 3.1.1.

3.1.1.3 Ultraviolet absorbers shall be added to the exterior surface for improved weather resistance. Insulated tanks, where specified, shall have a light gray-pigmented exterior gel coat layer.

### 3.2 Reinforcement:

3.2.1 Chopped Strand Mat - Chopped strand mat shall be constructed from chopped commercial-grade E-type glass strands bonded together using a binder. The strands should be treated with a sizing that is chemically compatible with the resin system used.

3.2.2 Continuous Roving - Continuous roving shall be a commercial-grade of E-type glass fiber with a sizing that is chemically compatible with the resin system used.

3.2.3 Woven Roving - Woven roving shall be in accordance with ASTM Specification.

3.2.4 Surface Mat - The reinforcement used for the inner surface shall be either a commercial-grade chemical resistant glass surface mat or an organic-fiber surface mat as recommended by the resin manufacturer for the intended service.

## 4 LAMINATE CONSTRUCTION REQUIREMENTS

4.1 Structural Tank - The laminate comprising the structural tank (bottom, cylindrical shell, and top head) shall consist of a corrosion-resistant barrier comprised of an inner surface, interior layer, and a structural layer. The tank bottom shall be integral with the bottom tank shell. No tank bottom attachment joints are allowed.

4.1.1 Inner Surface - The inner surface exposed to the chemical environment shall be a resin-rich layer 0.010 to 0.020 inches thick, reinforced with a suitable chemical-resistant glass fiber surface or with an organic fiber surface mat, in accordance with 3.2.4.

4.1.2 Interior Layer - The inner surface layer exposed to the corrosive environment shall be followed with a layer composed of resin, reinforced only with non-continuous glass-fiber strands applied in a minimum total of 3 oz/ft<sup>2</sup>. The combined thickness of the inner surface and interior layer shall not be less than 0.10 inches.

4.1.2.1 Glass content of the inner liner & the interior combined shall be 27 % ±5% by weight.

4.1.2.2 The degree of cure of the laminate shall be such as to exhibit a Barcol hardness on the inner surface of at least 90% of the resin manufacturer's minimum specified hardness for the cured laminate.

#### 4.1.3 Structural Layer:

4.1.3.1 Filament Wound Structural Layer - Subsequent reinforcement shall be continuous-strand roving in accordance with 3.2.2, that, in combination with 4.1.1 and 4.1.2 is needed to satisfy the design requirements. Glass content of this filament-wound structural layer shall be 50 to 80% by weight. Only those constructions evaluated for design properties shall be used.

4.1.3.2 Contact Molded Structural Layer - Subsequent reinforcement shall be comprised of 1.5 oz/ft<sup>2</sup> chopped strand mat or equivalent weight of chopped roving, or shall be comprised of chopped strand mat or chopped roving and such additional number of alternating plies of 24 oz/yd<sup>2</sup> woven roving to a thickness as required to meet the physical properties that are used for the design. Each successive ply or pass of reinforcement shall be well-rolled prior to the application of additional reinforcement. Where woven roving is used, chopped strand glass reinforcement shall be used as alternating and final layers. All woven roving and chopped strand shall be overlapped. Laps in subsequent layer shall be staggered at least 2.25 inches from laps in the preceding layer.

### 5 FITTINGS AND ACCESSORIES

5.1 Hold Down Lugs - Hold down lugs shall be provided on all vertical flat bottom tanks. The design, number, and attachment of such lugs are the responsibility of the fabricator, based on the wind, seismic, and other loads specified.

5.2 Support Ring with Legs or Lugs - Support rings with legs or lugs shall be provided on all vertical dish bottom tanks. The design, number, and attachment of such legs or lugs are the responsibility of the fabricator based upon the wind, seismic, and other loads specified.

5.3 Lifting Lugs - Lifting lugs shall be provided for all tanks.

5.4 Manways - All closed top tanks shall be provided with a minimum 24-inch diameter top access manway and cover. All tanks with a straight shell height greater than 12 feet shall be provided with a minimum 24-inch diameter flanged side manway with bolted cover. Bolted manways shall be provided with 1/8 inch thick full-face neoprene gaskets and zinc plated bolting.

5.5 Flanged Nozzles - All flanged nozzles shall be of a hand lay-up construction with the pipe stub molded integrally with the pipe flange. Compression molded or cemented on flanges is prohibited. Nozzles 4 inch in diameter and smaller shall be gusseted conically or with four (4) 3/8 inch thick plate gussets. Plate gussets shall be suitably laminated to the flange backside, hub, pipe neck, and tank wall.

5.6 Threaded Fittings - Threaded fittings shall be used only where indicated herein or on the plans. Where specified, threaded fittings shall be installed with laminates inside and outside as required for flanged nozzles in the referenced ASTM specifications. Threaded fittings shall be of glass-fiber reinforced resin with molded threads.

## 6 HANDLING AND INSTALLATION

6.1 Tanks shall be handled and installed in accordance with the fabricator's instructions.

## 7 SUBMITTALS

7.1 The fabricator shall submit the following for review and approval prior to fabrication of the tanks.

7.1.1 Detailed scale drawings of each tank complete with all accessories.

7.1.2 Detailed handling and installation instructions.

7.1.3 Design calculations for each tank where stipulated herein.

## 8 TESTS

8.1 Tanks are to be tested for the degree of surface cure using Barcol hardness and acetone sensitivity methods as indicated in the referenced ASTM Specifications.

8.2 Tanks are to be visually inspected for laminate quality and workmanship as indicated in the referenced ASTM Specifications.

8.3 After the tank has been installed, a hydrostatic test shall be performed by the purchaser.

## OPTIONAL SECTIONS

When insulation or insulation with heat tracing is required, the following sections are inserted as sub-paragraphs at the end of Section 2 on page 1.

2.3 Insulation - Tank top and sidewalls shall be insulated with 2 inches of 2-lb/ft<sup>3</sup> polyurethane foam board insulation. The insulation shall be over wrapped with a minimum 100-150 mil thick glass-fiber resin laminate with a light gray pigmented exterior gel coat protective coating 10 mils thick.

2.4 Heat Tracing - Tank shall be provided with 120 V fully grounded electric heat tracing panels to maintain the temperature of the tank contents at \_\_\_°F at an outside temperature of \_\_\_ °F (-10, -20, etc.). The system shall be provided with a NEMA 4X control box with electronic thermostats, one to control the panels and one to control tank high limit temperature.

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