

GUIDE SPECIFICATION

VERTICAL ABOVE GROUND FIBERGLASS BRINERS

SINGLE WALL AND DOUBLE WALL

1. Scope

This specification covers the design, manufacture and supply of single and double wall fiberglass reinforced plastic (FRP) bulk briners for above ground, vertical installations in sodium chloride brine applications, with pressures not exceeding 15 psig external and/or 15 psig internal above any hydrostatic head.

2. General

2.1 Acceptable Manufacturers:

- a. BrineMaker, Inc. 800-998-7345 www.brinemaker.com
- b. Pre-Approved equal

2.2 Applicable Codes, Standards and Qualifications – FRP Tanks covered under this specification shall be filament wound or contact molded conforming to the appropriate specifications set forth in this document.

2.2.1 ASTM D3299 - Filament Wound Glass Fiber Reinforced Thermoset Resin Chemical Resistant Tanks

2.2.2 ASTM D4097 - Contact Molded Glass Fiber Reinforced Thermoset Resin Chemical Resistant Tanks (Formerly covered under NBS-PS 1569).

2.2.3 ASTM D2563 – Standard Practice for Classifying Visual Defects in Glass Reinforced Plastic Laminate Parts – Minimum of Acceptance Level III

2.2.4 ASTM C581 – Standard Practice for Determining Chemical Resistance of Thermosetting Resins

2.2.5 API 12P (Modified) – Shop Fabricated, Atmospheric, Vertical, Cylindrical Fiberglass Reinforced Plastic (FRP) Tanks (modified to allow for tanks that exceed 1500 barrels in capacity and fittings that are specified by the owner)

2.3 Briner supplier must be able to document a minimum 10 year successful FRP briner manufacturing track record.

3. Materials

3.1 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 C581 or that has been determined by previous documented service to be acceptable for the service conditions.

3.2 The resin shall contain no pigment, dyes, colorants, fillers (sand/silica) or extenders, except as follows:

3.2.1 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 but may not be used in the inner surface layer.

3.2.2 Resin pastes used to fill crevices before overlay shall not be subject to the limitations of 3.2.

3.2.3 Ultraviolet absorbers shall be added to the exterior surface for improved performance and resistance to weather.

3.3 Reinforcement Materials (Glass):

3.3.1 Chopped Strand Mat - Chopped strand mat shall be constructed from chopped commercial-grade E-CR or 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.

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

3.3.3 Woven Roving - Woven roving shall be in accordance with ASTM Specification D2150.

3.3.4 Surface Mat Veil - The reinforcement used for the inner surface shall be composed of either commercial-grade chemical resistant glass surface mat, an organic-fiber surface mat or carbon veils as recommended by the resin manufacturer for the specified chemical service environment.

4. Laminate Construction Requirements

Structural Tank – The corrosion resistant laminate comprising the structural tank (bottom base, cylindrical shell, top head) shall consist of a corrosion resistant barrier comprised of an inner surface layer and interior layer as well as a structural layer. In *double wall* applications, the laminate shall also comprise an interstitial space between the corrosion resistant barrier and the structural outside wall of the vessel, which can be monitored for leaks in the primary vessel.

4.1. Inner Surface Layer - The inner surface layer directly exposed to the sodium chloride service environment specified, shall be a resin-rich layer 0.010 to 0.020 inches thick, reinforced with suitable chemical-resistant glass fiber surface mat, organic fiber surface mat or carbon veil in accordance with 3.3.4.

4.2 Interior Layer - The inner surface layer exposed to the corrosive environment shall be followed with a layer composed of resin and reinforced only with non-continuous glass-fiber strands applied in a minimum total of 3 oz/ft². The combined thickness of the inner surface and interior layer shall not be less than 0.10 inches.

4.2.1 Glass content of the inner surface layer and the interior layer combined shall be 27%, +/-5% by weight.

4.2.2 The degree of cure of the laminate shall be such as to exhibit Barcol hardness on the inner surface (corrosion barrier) of at least 90% of the resin manufacturer's minimum specified hardness for the cured laminate. Note: use of synthetic veils will reduce Barcol hardness readings.

4.3 Structural Layer - The interior layer, and interstitial space in *double wall* applications, shall be followed by the structural layer which will be Filament Wound.

4.3.1 Filament Wound Structural Layer - Subsequent reinforcement shall be continuous-strand roving in accordance with 3.3.2, that, in combination with 4.1 and 4.2 is needed to satisfy the design requirements. Glass content of this filament-wound structural layer shall be 50 to 80% by weight.

4.4 Top Head - The top head, regardless of shape, shall be able to support a single 250 lb. load on a 4' x 4' area without damage and with maximum deflection of 1/2 % of the tank diameter at the area the load is applied.

4.5 *Double Wall* Tanks – Design shall provide full structural reinforcement of the secondary wall. An interstitial space shall be present for customer to install their leak detection equipment.

4.5.1 A monitoring fitting shall be provided to allow for a monitoring sensor to be installed near the bottom of the interstice.

4.5.2 The annular space shall include a suitable vent to atmosphere.

5. Fittings, Accessories and Options

5.1 Standard Features

Salt Fill Line:	6" tank flange and 4" fully radiused 304SS w/camlok & cap
Brine Outlet:	2" – 4" double flange with internal PVC collection plenum
Top Manway:	24" flanged with neoprene gasket and 304SS hardware and 8" flange in cover
Pressure Relief/Inspection:	8" hinged & spring loaded electro-polished 304SS
Side Manway:	24" flanged with neoprene gasket and 304SS hardware
Drain:	2" double flange with internal diptube & screen
Vent/Dust Collection:	8" flange with ducting, supports, dust bag and hose clamps
Water Inlet:	2" – 4" flange with Internal Spiral Distribution Head
Anchor Lugs:	304SS as required for tank size and location
Lifting Lugs:	304SS as required for tank size

5.2 Optional Accessories:

Salt Level Indication:	3" flange, "bob" device, controller with LED readout and 4-20ma output
Freeze Prevention System:	Heating system with control panel and insulation
Brine Level Control System:	2" double flange, isolation assembly, pressure switch, controller with NEMA 4X enclosure
Brine Concentration Monitor:	Conductivity sensor & controller/readout with relays
FRP Access Ladder:	With boarding rails, or operator deck, or safety cage
Fall Protection System:	OSHA compliant, SS construction, harness
12" Gravel Bed:	NSF / AWWA washed quartz gravel bed (per Morton Salt)
Seismic Design:	Current IBC, OSHPD (hospitals), or governing standard
Food Grade Tank:	Post cure
Dust Bag Housing:	4' x 9' HDPE housing for dust bag protection from the elements
Day Tank:	HDPE tank for process supply

5.3 Lifting Lugs - Lifting lugs shall be provided for all tanks over 50 lbs. in weight. Lifting lugs are to be 304 stainless steel.

5.4 Hold Down Lugs – 304 stainless steel hold down lugs shall be provided on all vertical, flat bottom tanks. The design, number, and attachment of such lugs will be determined by the manufacturer based on wind, seismic and/or any additional loads that may be specified.

5.5 Ladders and Platforms – Ladders and platforms shall be constructed from fiberglass. All ladders and platforms shall be fitted to the individual tanks in the fabricator's factory and disassembled for shipment. Ladders shall conform to OSHA and / or PIP standards and those which exceed 20' in height shall include a safety cage.

5.6 Freeze Protection System - 30°F ΔT or 60°F ΔT Design

5.6.1 – Fiberglass board insulation

5.6.2 – Fiberglass protective overlay

5.6.3 – Heating system including controller

6. Submittals

Briner supplier shall submit the following for review and approval prior to fabrication of the briner vessel:

6.1 Detailed shop drawings of each tank complete with all features and accessories

6.2 Details of all auxiliary equipment

6.3 Wiring diagrams and O & M's for all electronics

6.4 Detailed design calculations of each tank shall be submitted and stamped by a registered Professional Engineer with demonstrated experience in the design of FRP tanks.

6.5 Detailed Hydro-Test Procedure

6.6 Fabricator's QA Manual

6.7 Detailed Shipping, Handling and Installation Instructions.

6.8 A letter from the resin supplier documenting the resin compatibility with the chemical service environment specified.

6.9 Fabricator's standard Inspection Test Plan (ITP) for shop fabricated vessels.

7. Recommended Shipping, Handling, Storage and Installation

7.1 Adhere to manufacturer's recommendations

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