

San Antonio Water System Material Standard Specifications

853-01

**SPECIFICATIONS FOR SANITARY SEWER GLASS-FIBER
REINFORCED POLYESTER (FRP) MANHOLES**
REVISED DECEMBER 2011

853.1 **DESCRIPTION:** This item shall govern the construction of FRP sanitary sewer complete in place and the material therein, including manhole ring and covers. All plans, materials and specifications shall be in accordance with the Texas Natural Resource Conservation Commissions rules to include: 30 TAC 313.5 and design criteria for sewerage systems 30 TAC 317.1, 30 TAC 317.2, 30 TAC 317.3 and 30 TAC 317.13, or any revisions thereto as applicable.

853.2 **GOVERNING STANDARDS:** Manholes shall conform to the following design criteria:

ASTM D 3753: Standard Specification for Glass-Fiber Reinforced Polyester Manholes.

AASHTO H-20: Axial Loading.

853.3 **CERTIFICATION:** As a basis of acceptance the manufacturer shall provide a independent certification which consist of a copy of the manufacturer's test report and accompanied by a copy of the test results that the manhole has been sampled, tested, and inspected in accordance with the provisions of the specification of ASTM D 3753 and meets all requirements.

853.4 **SHIPPING AND HANDLING:** Do not drop or impact the fiberglass manhole. Lift manhole with two slings on spreader bar in horizontal position or by use of 4 in. x 4 in. timber inserted crosswise inside the manhole to the underside of the collar with rope or woven fabric slings attached to backhoe or other lifting device. Under no conditions should cables or chains be put around fiberglass manhole. Do not roll the manhole when moving or installation.

853.5 **MANUFACTURE:** Manhole cylinders, man way reducers, and connectors shall be produced from glass fiber-reinforced polyester resin with the construction determined by the particular process of manufacture and configuration. The process may include contact molding, compression molding, pultrusion, etc. The manhole shall provide an area from which a grade ring can be installed to accept a typical metal ring and cover and have the strength to support a traffic load without damage to the manhole.

853.6 **TEST METHODS:** All tests shall be performed as specified in ASTM 3753, Section 8, Titled "Test Methods" and paragraph 853.9 titled "Testing" of this specifications.

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853.7 QUALITY ASSURANCE/QUALITY CONTROL:

1. **Examination:** Each manhole component part shall be examined for dimensional requirements.
2. **Composition Control:** Controls on glass and resin content shall be maintained for all manufacturing processes and for each portion of manhole fabrication. Records shall be maintained of these control checks. Proper glass content may be shown by glass usage checks, by glass and resin application rate checks, in accordance with the material composition test in ASTM D 3753, paragraph 8.8.1.
3. All required ASTM 3753 testing shall be completed and records of all testing shall be kept and copies of test results shall be presented to San Antonio Water System upon written request within a reasonable time period.

853.8 MATERIALS:

1. **FRP Manholes:** All manholes shall be watertight. Glass-Fiber Reinforced Polyester Manholes shall be a one-piece monolithic designed unit constructed of glass-fiber reinforced, supplier certified, and unsaturated isopathlic polyester resin containing chemically enhanced silica to improve corrosion resistance, strength and overall performance. FRP manholes shall be manufactured in strict accordance with ASTM D-3753.
 - a) **Exterior Surface:** For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added for a minimum thickness .125 in. or a UV inhibitor shall be added directly to the resin to prevent photo degradation. Mixing lots of resins from different manufacturers shall not be permitted.
 - b) **Dimension:** The manhole shall be a circular cylinder, reduced at the top to a circular man way not smaller than 22-1/2" inside diameter. Manholes shall be produced in whole foot increments of length +/- 2-in. Nominal inside diameter shall be 48 inches. Tolerance on the inside diameter shall be +/- 1%. The minimum wall thickness for all FRP manholes at all depths shall be .50 inches. Unless otherwise shown on the plans and details or approved by the Engineer, standard sanitary sewer FRP manholes shall be constructed on influent or effluent pipes less than **twenty four (24") inches** in diameter. The maximum vertical height of the diameter adjustment section or cone shall be thirty six (36") inches.

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- c) **Configuration:** The Man way reducer must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade. The reducer shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, this providing required monolithic design to prevent infiltration and/or exfiltration through the manhole.
- d) **Class:** The manhole shall be manufactured in one class of load rating. This class shall be AASHTO H-20 wheel load.
- e) **Stub outs and Connections:** Several methods exist that may be used to connect primary and secondary lines to the manholes, and these shall be performed per Engineer's request. The most common of these methods include: installation of SDR PVC sewer pipe stub outs to manhole, Kor-N-Seal boots or Insert-a-Tee fittings in the manhole wall. Installation of SDR PVC sewer pipe must be performed by sanding, priming, and using resin fiber-reinforced hand layup. The resin and fiberglass shall be same type and grade as used in the fabrication of the fiberglass manhole. Kor-N-Seal boots may be installed by manhole manufacturer using fiberglass reinforced pipe stub out for Kor-N-Seal boot sealing surface. Inserta-Tee fittings maybe installed only with the approval of the Engineer and shall be installed per manufacturer instructions.
- f) **Manhole Bottom:** Manholes require to have resin fiber-reinforced bottom. Deeper manholes may require a minimum of two 1 ½ in. deep x 3 ½ in. wide stiffening ribs completely enclosed with resin fiber-reinforcement. All fiberglass manholes with a fiberglass bottom will have a minimum 3 in. anti-flotation ring. Manhole bottom shall be a minimum of ½ inch thick.
- g) **Marking and Identification:** All manholes shall be marked in letters no less than 1" in height with the following information:
- Manufacturers name or trademark
 - Manufacturers factory location
 - Manufacturers serial number
 - Manhole Length
 - ASTM Designation
 - Installation assists marks (vertical lines 90 deg. apart at base of manhole).

2. **Manhole Ring and Covers:** Watertight ring and covers shall be cast iron to the dimensions shown on details.

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3. **Throat Rings:** Adjustment throat rings shall be precast non-reinforced concrete rings having a maximum thickness of two inches (2”). The internal diameter shall not be less than twenty-four inches (24”), and the width shall be a minimum of five inches (5”). Concrete shall conform to the provisions of Item No. 300, Concrete (Class “A”), of the City of San Antonio Specifications. No more than six throat rings shall be used on any manhole.
4. **Mortar:** Mortar shall be composed of one (1) part Portland Cement, two (2) parts sand and sufficient potable water to produce a working mixture.
5. **Membrane Curing Compound:** All membrane curing compound shall conform to the provisions of Item No. 305, “Membrane Curing,” of the City of San Antonio Specifications.
6. **Concrete Encasements:** Concrete encasement shall conform to the provisions of Item No. 300, Concrete (Class “B”), of the City of San Antonio Specifications.
7. **Reinforcing Steel:** All reinforcing steel shall conform to provisions of Item No. 301, “Reinforcing Steel,” of the City of San Antonio Specifications.
8. **Initial Backfill Material:** The initial backfill material shall be composed of well graded, crushed stone or gravel conforming to the following requirements unless modified by the Engineer.

<u>Crushed Stone or Gravel</u>	<u>Percent</u>
Passing 1-1/2 inch sieve	100
Passing 1 inch sieve	95 to 100
Passing 3/8 inch sieve	25 to 60
Passing No. 4 sieve	0 to 10
Passing No. 8 sieve	0 to 5

9. **Secondary Backfill Material:** Secondary backfill material shall generally consist of material removed from the excavation and shall be free of brush, debris and trash. No rock or stone having a dimension larger than 3-1/2 inches at the largest dimension shall be used in the secondary backfill zone. Secondary backfill material shall be primarily composed of compactable soil material.

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CONSTRUCTION:

1. Manholes shall be constructed of materials and workmanship as prescribed by these specifications, at such places shown on the plans and in conformity with the typical details.
2. Fiberglass manholes must be installed according to manufacturer installation instructions. In addition to these instructions, local codes may apply and should be consulted as applicable in manhole installation. Correct manhole installation requires proper concrete foundation, good backfill and proper handling to prevent manhole damage and insure long-term corrosion resistant service.
3. Prepare excavation at manhole location should be at least wide enough to accommodate the slab specified and to provide working room around manhole. Insure the depth of manhole is sufficient to allow at least two concrete rings for adjustment of ring and cover at top of final grade. Quarter marks have been provided on barrel to facilitate alignment.
4. **Manhole Base:** Use initial backfill material to provide 4 to 6 inches of leveling base.
5. **Set Manhole:** To lift manhole, insert 4" x 4" timber crosswise inside the manhole to the underside of the collar with a rope or woven fabric slings attached to backhoe or other lifting device and lower the manhole. Level manhole and connect sewer lines to manhole. A concrete base encasement shall be placed at least 12 inches from the manhole and shall come over the top of the anti-flotation ring a minimum of 12 inches.
6. **Invert and Bench Area:** The invert and bench area can be formed with wet concrete and finished with an epoxy sealant.
7. **Backfill Material:** Initial backfill material shall be used for backfill around the manhole for a minimum distance of one foot from the outside surface and extending from the bottom of the excavation to the top of the reducer section. Secondary backfill material may be used for the remainder of the backfill. This material will be subject to approval by Engineer.
8. **Backfill Procedure:** Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to 95% Standard Proctor Density, unless otherwise approved by Engineer. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the fiberglass manhole structure.
9. **Bring to Grade:** Construct reinforced concrete ring encasement as identified on details

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TESTING:

1. **Hydrostatic Testing:** Hydrostatic testing shall be conducted by plugging with approved plugs all influent and effluent pipes in the manhole and filling the manhole to the top of the manhole cone with water. Additional water may be added over a 24-hour period to compensate for evaporate losses. At the conclusion of the 24-hour saturation period the manhole shall be filled to the top of the manhole cone and observed. A loss within a 30 minute period shall be considered an unsuccessful test.
2. **Vacuum Testing:**
 - a) General: Manholes shall be tested after installation and prior to backfilling with all connections (existing and proposed) in place.
 - b) Test Procedure: The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test. The required test time is determined from Table 853-1.

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TABLE 853-1

MINIMUM REQUIRED FOR A VACUUM DROP OF 1" Hg (10" Hg – 9" Hg) (Min:Sec)	
Height of M.H. (Dept in Ft.)	48"
0'-20'	:40
22'	:44
24'	:48
26'	:52
28'	:56
30'	1:00
Additional 2' Depts-Add T for each 2'	:04

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- c) **Acceptance:** Manholes will be accepted with relation to the hydrostatic test requirements and the vacuum test requirements if they meet the criteria above. Any manhole which fails the initial test must be repaired or replaced prior to backfilling. The manhole shall be retested as described above until successful tests have been made. After the successful tests, the temporary plugs will be removed.

Approved Manufacturers:

LF Manufacturing
Fluid Containment

Previous Specification Date:

OCTOBER 1998
JULY 1999
DECEMBER 2011