

San Antonio Water System Standard Specifications for Construction

ITEM NO. 853
SANITARY SEWER GLASS-FIBER
REINFORCED POLYESTER (FRP) MANHOLES

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 Administrative Code (TAC) rules to include: 30 TAC 213.5 and design criteria for sewerage systems 30 TAC 217.53, 30 TAC 217.54, 30 TAC 217.54 and 30 TAC 217.55, or any revisions thereto as applicable.

853.2 **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, unsaturated isophthalic 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 of 0.125 inches.
 - b. Dimension: Manholes shall be a circular cylinder, reduced at the top to a circular manway not smaller than 30" inside diameter. Manholes shall also be produced in whole foot increments of length +/- 2 inches. Nominal inside diameter shall be 48". Tolerance on the inside diameter shall be +/- 1%. The minimum wall thickness for all FRP manholes at all depths shall be 0.50 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 24" in diameter. The maximum vertical height of the diameter adjustment section or cone shall be 36".
 - c. Configuration: The Manway 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.

San Antonio Water System Standard Specifications for Construction

- d. Class: Manholes 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 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 lay-up. 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. Insert-a-Tee fittings maybe installed only with the approval of the Engineer and shall be installed per manufacturers' instructions.
 - f. Manhole Bottom: Manholes are required to have resin fiber-reinforced bottom. Deeper manholes may require a minimum of two 1½ inches deep x 3½ inches wide stiffening ribs completely enclosed with resin fiber-reinforcement. All fiberglass manholes with a fiberglass bottom will have a minimum 3 inches 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 inch in height with the following information:
 - Manufacturer's name or trademark
 - Manufacturer's factory location
 - Manufacturer's serial number
 - Manhole Length
 - ASTM Designation
 - Installations assist marks (vertical lines 90 deg. apart at base of manhole).
2. Manhole Rings and Covers: Watertight rings and covers shall be cast iron to the dimensions shown on details.
3. Throat Rings: Adjustment throat rings shall be precast non-reinforced concrete rings having a maximum thickness of 2 inches. The internal

San Antonio Water System Standard Specifications for Construction

diameter shall not be less than 30”, and the width shall be a minimum of 5 inches. Concrete shall conform to the provisions of Concrete (Class “A”), Item No. 300, of the City of San Antonio Specifications. No more than 4 throat rings shall be used on any manhole.

4. Mortar: Mortar shall be composed of 1 part Portland Cement, 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 “Membrane Curing”, Item No. 305, of the City of San Antonio Specifications.
6. Concrete Encasements: Concrete encasement shall conform to the provisions of Concrete (Class “B”), Item No. 300, of the City of San Antonio Specifications.
7. Reinforcing Steel: All reinforcing steel shall conform to provisions of “Reinforcing Steel”, Item No. 301, 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 1½ inch sieve | 100 |
| Passing 1 inch sieve | 95 to 100 |
| Passing ¾ 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 3½ inches at the largest dimension shall be used in the secondary backfill zone. Secondary backfill material shall be primarily composed of compactable soil material.

San Antonio Water System Standard Specifications for Construction

853.3

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's 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 inches x 4 inches 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: The Contractor shall be required to backfill all manholes with an approved flowable backfill in accordance with the requirements of the right-of-way owner having jurisdiction up to 1 foot above the cone section. Secondary backfill material may be used for the remainder of the backfill. This material will be subject to approval by Engineer.
8. Secondary Backfill Procedure: Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to 98% Standard Proctor Density, unless otherwise approved by Engineer.

San Antonio Water System Standard Specifications for Construction

9. Bring to Grade: Construct reinforced concrete ring encasement as identified on details

10. Testing:
 - a. Hydrostatic Testing: Hydrostatic testing shall be conducted by plugging an approved plug into 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. Any losses of water within a 30 minute period shall be considered an unsuccessful test.

 - b. Vacuum Testing:
 1. General: Manholes shall be tested after installation and prior to backfilling with all connections (existing and proposed) in place.

 2. Test Procedure: The lines entering the manhole shall be temporarily plugged with braced plugs in order 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 1inch 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.

San Antonio Water System Standard Specifications for Construction

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 |

3. 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 re-tested as described above until successful tests have been made. After the successful tests, the temporary plugs will be removed.

853.4 MEASUREMENT

1. FRP watertight ring covered sanitary sewer manholes zero feet to 6 feet deeper as designated on the plans shall be measured as the total number of such manholes constructed, including those exceeding 6 feet in depth from the lowest invert elevation to the top of the ring.

San Antonio Water System Standard Specifications for Construction

2. Manholes deeper than 6 feet shall be measured by the number of vertical feet in excess of 6 feet.

853.5

PAYMENT

1. Request for watertight ring cover FRP sanitary sewer manholes shall be paid at the contract unit price bid for each such manhole. The price shall be full compensation for all precast sections or throat rings, cones, watertight rings and covers, manhole reinforced concrete ring encasement, manhole concrete base encasement, concrete mortar, drop pipes and fittings, initial backfill material, labor, tools, equipment testing, tees, wyes, and incidentals necessary to complete the work.
2. Extra depth manholes shall be paid for at the contract unit price bid per vertical foot as measured above.
3. Gravel subgrade filler for manholes shall not be measured separately for payment.

TRAFFIC

NON-TRAFFIC

