

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 manholes, complete in place and the materials therein, including manhole ring and covers. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewerage Systems (30 TAC § 217) and Chapter 213 (“Edwards Aquifer Recharge Zone”), or any revisions thereto as applicable.

853.2 REFERENCED STANDARDS: Reference standards cited in this Specification Item No. 853 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 853, unless a date is specifically cited:

1. San Antonio Water System (SAWS):
 - a. Specifications for Water and Sanitary Sewer Construction
 - b. SAWS Materials Specifications
2. City of San Antonio (COSA) Specifications for Construction
3. Texas Commission of Environmental Quality (TCEQ)
 - a. Chapter 217 Design Criteria for Domestic Wastewater Systems
 - b. Chapter 213 (“Edwards Aquifer”)
4. American National Standards Institute (ANSI)
 - a. ANSI B 16.1 – Cast Iron Pipe Flanges and Flanges Fittings.
5. American Society for Testing and Materials (ASTM) International:
 - a. ASTM C581 Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service
 - b. ASTM D695 Test Method for Compressive Properties of Rigid Plastics
 - c. ASTM D785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
 - d. ASTM D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - e. ASTM D883 Terminology Relating to Plastics
 - f. ASTM D1600 Terminology for Abbreviated Terms Relating to Plastics
 - g. ASTM D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
 - h. ASTM D2583 Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor
 - i. ASTM D2584 Test Method for Ignition Loss of Cured Reinforced Resins
 - j. ASTM D3236, Standard Test Method for Apparent Viscosity of Hot Melt Adhesives and Coating Materials
 - k. ASTM D3262, Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe

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- l. ASTM D3681, Standard Test Method for Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition
 - m. ASTM D3892 Practice for Packaging/Packing of Plastics
 - n. ASTM D4161, Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
 - o. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - p. ASTM C 1107- Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
 - q. ASTM D 698- Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600kN-m/m³))
 - r. ASTM D 2665 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
 - s. ASTM D 2996 Standard Specification for Filament –Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
 - t. ASTM D 2997 Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber- Reinforced Thermosetting Resin) Pipe.
 - u. ASTM D 3753 Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells.
 - v. ASTM D 3839 Standard Practice for Underground Installation of "Fiberglass" Pipe
 - w. ASTM F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
6. American Association of State Highway and Transportation Officials (AASHTO).
 - a. AASHTO M306 Standard Specification for Drainage, Sewer, Utility and Related Castings.
 7. American Water Works Association (AWWA)
 - a. AWWA M45 Fiberglass Pipe Design
 8. International Organization of Standardization (ISO)
 - a. ISO9001

853.3 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer's requirements and submittals shall be approved by the Engineer prior to delivery.

1. Submit proposed methods, equipment, materials and sequence of operations for sewer construction.
2. Plan operations so as to minimize disruption of utilities to occupied facilities or adjacent property.
3. Submit test reports.
4. Submit pre and post construction videos. Videos become property of SAWS.

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853.4 MATERIALS: All constructed FRP manholes shall be watertight. Sewer manhole ring and cover castings, HDPE throat rings, and miscellaneous specifications and details shall meet the current requirements of AASHTO Designation M306- 10 and Specification Item No. 852, Sanitary Sewer Manholes.

1. FRP Manholes: All manholes shall be watertight. Glass-Fiber Reinforced Polymer/Polyester Manholes shall be a one-piece monolithic designed unit constructed of FRP or tee-based manhole and single piece riser section.
2. Exterior Surface: If required by manufacturer, the exterior surface of the manhole shall have gray pigment UV inhibitor added for a minimum thickness of 0.125 inches.
3. Dimension: Manholes shall be a circular cylinder, reduced at the top to a circular manway not smaller than 30 inches (inside diameter).
 - a. Manholes shall also be produced in whole foot increments of length +/- 2 inches.
 - b. Nominal inside diameter shall be 48 inches.
 - c. Tolerance on the inside diameter shall be +/- 1%.
 - d. The minimum wall thickness for all FRP manholes (all depths) shall be 0.50 inches.
4. Configuration: The manway reducer must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade.
 - a. The reducer shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, thus providing the required monolithic design to prevent infiltration and/or exfiltration through the manhole for both a monolithic manhole and riser section.
5. Class: Manholes shall be manufactured in one class of load rating. This class shall be AASHTO H-20 wheel load.
6. Manhole Bottom: Manholes are required to have a resin fiber-reinforced bottom.
 - a. Deeper manholes (> 6 feet) may require a minimum of two 1½ inches deep x 3½ inches wide stiffening ribs, completely enclosed with resin fiber-reinforcement.
 - b. All fiberglass manholes with a fiberglass bottom will have a minimum 3 inch anti-flotation ring.
 - c. Manhole bottoms shall be a minimum ½ inch thick.
7. 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;
 - Installation assist marks (vertical lines 90° apart at base of manhole).
8. Manhole Rings and Covers: Refer to Item No. 852, Sanitary Sewer Manholes for HDPE throat rings and miscellaneous specifications and details associated with ring and cover design and mounting. The ring and cover shall be of ductile

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iron construction. The cover shall be solid with no vent or pick holes; hinged with underlying special hinge area leakage protection; the cover secured with four (4) stainless steel bolts; and shall have a recessed “pick bar” for cover opening. Cam lock type covers shall not be allowed.

- a. Approved manufacturers, as listed in the SAWS APL, have previously completed required inflow leakage shop testing and have met a maximum allowable leakage rate criterion of 1 gallon per minute (gpm) at 12 inches of water submergence above the manhole cover.
 - b. The nominal cover diameter shall be 32 inches, with a 30 inch clear opening, as required by TCEQ.
 - c. 24-inch covers to be utilized on existing manholes with 24 covers only.
9. Concrete Encasements: Concrete encasement shall conform to Specification Item No. 852, Sanitary Sewer Manholes. Specifically, refer to Standard Detail Drawing DD-852-series.
 10. Reinforcing Steel: All reinforcing steel shall conform to provisions of Specification Item No. 301, Reinforcing Steel.
 11. Initial and Secondary Backfill Material: Refer to Specification Item No. 804 for all backfill requirements.

853.4 CONSTRUCTION:

1. Manholes shall be constructed of materials and workmanship as described by these specifications, at such places shown in the contract documents and in conformity with the typical details.
2. Fiberglass manholes must be installed according to manufacturer’s installation instructions. Correct manhole installation requires proper concrete foundation, good backfill and proper handling to prevent manhole damage and insure long-term corrosion resistant service.
3. Excavation at manhole location should be at least wide enough to accommodate the slab specified and to provide working room around manhole. Ensure the depth of manhole is sufficient to allow between two and four 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: Lift and Set Manholes per manufacturer’s recommendations. A concrete base encasement with steel reinforcements shall be placed at least 12 inches from the manhole in all directions or as per manufacture’s recommendations and extend over the top of the anti-flotation ring a minimum of 12 inches.
6. Backfill Material: An approved flowable fill material shall be used for backfilling operations. See DD -853 Drawing Series.
7. Testing: All manhole/manhole/structures must pass a leakage test. The Contractor shall perform the testing for all sanitary sewer structures in accordance this Specification (after assembly and final compaction backfill testing) for leakage, separate and independent of the all other sanitary sewer piping, by means of either a hydrostatic test or vacuum test, or other methods approved by the Engineer. Contractor is hereby instructed to conduct either of the two identified tests in the following

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manner:

- a. Hydrostatic Testing: Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the structure and filling the structure to the top of the structure with water.
 - 1) Additional water may be added over a 24 hour period to compensate for absorption and evaporation losses.
 - 2) At the conclusion of the 24 hour saturation period, the structure shall be filled to the top of the structure and observed.
 - 3) Any measureable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed,
 - 4) All effort, materials, or other costs shall be solely at the Contractor's expense.
- b. Vacuum Testing: Manhole shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place.
 - 1) Drop- connections and gas sealing connections shall be installed prior to testing.
 - 2) The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole.
 - 3) The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc.
 - 4) Prior to performing the test, the contractor shall plug lift holes and exterior joints with a non-shrink grout and plug all pipes entering the structure.
 - 5) No grout shall be placed in horizontal joints prior to testing.
 - 6) Contractor shall use a minimum 60 inch/lb torque wrench to tighten the external clamps that secure the test cover to the top of the manhole.
 - 7) The test head shall be inflated in accordance with the manufacturer's recommendations.
 - 8) A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off.
 - 9) The test does not begin until after the vacuum pump is off.
 - 10) With the valve closed, the level vacuum shall be read after the required test time.
 - 11) 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.
 - 12) The required test time is 2 minutes.
- c. Acceptance: Any manhole which fails the initial test must be repaired per manufactures recommendations.
 - 1) The manhole shall be retested as described above until a successful test is attained.
 - 2) After a successful test, the temporary plugs will be removed.
 - 3) To ensure that the plugs have been removed, Contractor shall only remove

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the plugs in the presence of the Inspector.

a. Repairs to Existing Manhole: Any existing manhole/structure which fails to pass the vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired.

- 1) Contractor shall either repair or remove and replace the manhole as directed.
- 2) The manhole shall then be retested and as stated above.
- 3) The Owner may elect to simply remove and replace the existing manhole with a new one.
- 4) Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot above the top of the manhole cone.

853.5 MEASUREMENT: FRP sanitary sewer manholes (0 to 6 feet deep) as designated in the contract documents 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.

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

853.6 PAYMENT:

1. FRP sanitary sewer manholes shall be paid at the contract unit price bid for each such manhole at the following milestones:
 - a. Milestone 1: Fiberglass manhole setting to include for each such manhole, which price shall be full compensation for setting manhole base or monolithic manhole to include concrete base encasement with steel reinforcements as described in this specification. All materials for installation as required by the manufacturer are included for payment. After curing of concrete manhole flowline elevation shall be verified and approved by engineer of record prior to payment.
 - b. Milestone 2: Tee-base Manhole riser installation: All manhole risers shall be paid at the contract unit price bid for each such manhole riser, which price shall be full compensation for all remaining sections, flowable fill (up to 1 foot above cone section), drop pipes, saw cutting of surfaces as required, reinforced concrete, diversion of flow, fittings, labor, tools, equipment, tees, wyes, and incidentals trench protection, special shoring and disposal of material excavated, and for furnishing and placing all materials, all testing, necessary to complete the work prior to payment.
 - c. Milestone 3: Sanitary Sewer Manhole Encasement: This pay item includes manhole concrete encasement and rebar, HDPE throat rings, UV stabilized polyethylene liner, ring and cover, includes all other sanitary sewer piping prior to payment
2. Extra depth manholes (> 6 feet) shall be paid for at the contract unit price bid per vertical foot as measured above.

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Pay Item	Description	Units
853.6.1.a	Milestone 1: Manhole setting	Each
853.6.1.b	Milestone 2: Installation and Acceptance Testing	Each
853.6.1.c	Milestone 3: Sanitary Sewer Manhole Encasement	Each
853.6.2	Manholes deeper than 6 feet	Vertical feet.

- End of specification