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 Sewage Systems (30 TCEQ § 217), or any revisions thereto as applicable. All constructed FRP manholes shall be watertight. Sewer manhole ring and cover castings, throat rings, and miscellaneous specifications and details shall meet the current requirements of AASHTO Designation M306-10 and Item No. 852, “Sanitary Sewer Manholes.”

853.2 SUBMITTALS: Contractor shall submit manufacturer’s product data, instructions, recommendations, shop drawings, and certifications.

853.3 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 D3753-12.

2. 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.

3. Dimension: Manholes shall be a circular cylinder, reduced at the top to a circular manway not smaller than 30 inches (inside diameter). Manholes shall also be produced in whole foot increments of length +/- 2 inches. Nominal inside diameter shall be 48 inches. Tolerance on the inside diameter shall be +/- 1%. The minimum wall thickness for all FRP manholes (all depths) shall be 0.50 inches. Unless otherwise shown in the contract documents or approved by the Engineer, standard sanitary sewer FRP manholes shall be constructed on influent or effluent pipes less than 24 inches in diameter. The maximum vertical height of the diameter adjustment section or cone shall be 36 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. 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.

5. **Class:** Manholes shall be manufactured in one class of load rating. This class shall be AASHTO H-20 wheel load.

6. **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 the Engineer’s request. The most common of these methods include: installation of SDR PVC sewer pipe stub-outs to the 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 the same type and grade as used in the fabrication of the fiberglass manhole. Kor-N-Seal boots may be installed by the 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 the manufacturers’ instructions.

7. **Manhole Bottom:** Manholes are required to have a resin fiber-reinforced bottom. 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. All fiberglass manholes with a fiberglass bottom will have a minimum 3 inch anti-flotation ring. Manhole bottoms shall be a minimum ½ inch thick.

8. **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).

9. **Manhole Rings and Covers:** Refer to Item No. 852, “Sanitary Sewer Manholes” for throat rings and miscellaneous specifications and details associated with ring and cover design and mounting.

10. **Mortar:** Mortar shall be composed of 1 part Portland Cement, 2 parts sand and sufficient potable water to produce a working mixture.
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11. **Membrane Curing Compound:** All membrane curing compound shall conform to the provisions of TxDOT’s DMS-4650, “Hydraulic Cement Concrete Curing Materials and Evaporation Retardants.”

12. **Concrete Encasements:** Concrete encasement shall conform to Item No. 852, “Sanitary Sewer Manholes.” Specifically, refer to Standard Detail Drawing DD-852-03.

13. **Reinforcing Steel:** All reinforcing steel shall conform to provisions of Item No. 301, “Reinforcing Steel.”

14. **Initial and Secondary Backfill Material:** Refer to Item No. 804.5 for all backfill requirements.

**853.4 CONSTRUCTION:**

1. Manholes shall be constructed of materials and workmanship as prescribed 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. 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. Ensure the depth of manhole is sufficient to allow between two and four 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
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, subject to pre-approval by the Engineer. An approved flowable fill material may also be used for backfilling operations.

8. **Backfill Procedure:** Backfill material shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to 98% Standard Proctor Density. Refer to Item No. 804, “Excavation, Trenching and Backfill” for more specific measures for backfill and compaction requirements. 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. **Testing:** All structures must pass a leakage test. The Contractor shall test each structure (after assembly and backfilling) for leakage, separate and independent of the all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer.

Contractor is hereby instructed to conduct either of the two identified tests in the following 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. Additional water may be added over a 24 hour period to compensate for absorption and evaporation losses. At the conclusion of the 24 hour saturation period, the structure shall be filled to the top of the structure and observed. 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. All effort, materials, or other costs shall be solely at the Contractor’s expense.

b. **Vacuum Testing:**

   (1) **General:** Structures shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place. Drop-connections and
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gas sealing connections shall be installed prior to testing.

Test Procedure: The lines entering the structure shall be temporarily plugged with the plugs braced to prevent them from being drawn into the structure. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. 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. No grout shall be placed in horizontal joints prior to testing. 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 structure. 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. The test does not begin until after the vacuum pump is 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 structure will have passed the vacuum test. The required test time is 2 minutes.

(2) Acceptance: Structures will be accepted with relation to vacuum test requirements, if they meet the criteria above. Any structure which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material of which the structure is constructed. Structures shall be repaired on the exterior surface only. The structure shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.

(3) Repairs to Existing Structures: Any existing structure which fails to pass the vacuum test shall be closely examined by the Inspector and the Contractor to determine if the structure can be repaired. Thereafter, the Contractor shall either repair or remove and replace the structure as directed. The structure shall then be retested and coated with a SAWS-approved structural coating as stated above. The Owner may elect to simply remove and replace the existing structure with a new one. Any structure excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the structure/cone. The Contractor also has
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the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, “Excavation, Trenching, and Backfill.”

(4) Measurement and Payment: Vacuum testing of new structures will not be a pay item. The cost of this work will be included in the bid price for the new structure. Each vacuum test of an existing structure shall be a separate pay item. Repairs to existing structures shall be a separate pay item when authorized.

853.5 MEASUREMENT:

1. 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.

2. 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.

2. All manholes shall be paid at the contract unit price bid for each such manhole, which price shall be full compensation for all precast sections or throat rings, UV stabilized polyethylene liner, cones, bases, rings and covers, manhole ring, approved sewer coating, encasement, concrete, flowable fill, mortar, drop pipes, saws cutting of surfaces, and fittings, labor, tools, equipment, all testing, tees, wyes, and incidentals necessary to complete the work.

3. Extra depth manholes (> 6 feet) shall be paid for at the contract unit price bid per vertical foot as measured above.

4. Gravel subgrade filler for manholes shall not be measured separately for payment.

- End of specification -
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saw cutting of surfaces as required, reinforced concrete/concrete, diversion of flow, bypass pumping, trench protection, special shoring and disposal of material excavated, sewer coating, and testing; for furnishing and placing all materials and for all labor, tools, equipment and incidentals necessary to complete the work.