

San Antonio Water System Standard Specifications for Construction

ITEM NO. 850 SANITARY SEWER STRUCTURES

850.1 DESCRIPTION: This item shall govern for the construction or rehabilitation of all concrete sanitary sewer structures other than standard sanitary sewer structures (Specification Item No. 852). Structures shall be required for all sewer main larger than 24 inches. Structures are defined as greater than 4 ft. in diameter. All material and construction work shall be in accordance with the 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.

850.2 REFERENCED STANDARDS: Reference standards cited in this Specification Item No. 850 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 850, 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) Standard Specification for Construction
3. Texas Commission of Environmental Quality (TCEQ)
 - a. 217 Design Criteria for Domestic Wastewater Systems
 - b. Chapter 213 (“Edwards Aquifer Recharge Zone”)
4. ASTM – American Society for Testing and Materials:
 - a. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
 - b. A536: Standard Specification for Ductile Iron Castings.
 - c. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - d. ASTM C 443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - e. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
 - f. ASTM C 890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 - g. ASTM C 913 – Standard Specifications for Precast Concrete Water and Wastewater Structures.
 - h. ASTM C 990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
 - i. ASTM D638: Test Method for Tensile Properties of Plastics.

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- j ASTM D648: Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.
- k ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft.)
- l ASTM D790: Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- m ASTM D1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
- n ASTM D1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique.
- o ASTM D1693: Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
- p. ASTM D 2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
- q ASTM D 2996 - Standard Specification for Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
- r. ASTM D 2997 - Standard Specification for Centrifugally Cast “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
- 6. American Society of Mechanical Engineers
 - a. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings
- 5. Texas Department of Transportation
 - a. TxDOT’s DMS-4650, “Hydraulic Cement Concrete Curing Materials and Evaporation Retardants.”

850.2 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.

850.3 MATERIALS:

1. All structures shall be watertight and coated with a SAWS-approved sewer coating as listed in current SAWS Approved Products List (APL).
2. Structure covers shall be watertight. Depending upon their specific location, Design Plans and Specifications shall designate locations of vented

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structures/structures.

3. Every structure cover located in the Edward's Aquifer Recharge Zone, shall be watertight.
4. Sewer structure ring and cover castings shall meet the current requirements of AASHTO Designation M306-10 and be listed in most current SAWS APL.
5. All concrete shall conform to the provisions of Specification Item No. 300, "Concrete (Natural Aggregate)," or shall be of the class/type as noted in the contract documents.
6. All reinforcing steel shall conform to the provisions of Specification Item No. 301, "Reinforcing Steel."
7. All membrane curing compound shall conform to the provisions of TxDOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."
8. For new concrete structures, all concrete structure components (cast-in-place or precast structure bases, precast risers, precast cone sections, cast-in-place or precast flat tops, and as applicable) for new structure shall conform to the applicable requirements of ASTM Designation C478, except as modified below.
 - a. All concrete grout used for patching or other similar fill-in work shall be of non-shrink type made with the Komponent[®] admixture, or approved alternate as listed in current SAWS APL, in accordance with the manufacturer's recommended formulation with Portland cement, fine aggregate, water, and water reducer to produce a compressive strengths of approximately 4,800 psi within 7 days and 7,250 psi within 28 days at a 70 °F baseline temperature.
 - b. The structure ring and cover shall be of ductile 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.
 - i. Approved manufacturers, are listed in the SAWS APL, have previously completed required inflow leakage shop testing.
 - ii. The nominal cover diameter shall be 32 inches, with a 30 inch clear opening, as required by TCEQ
 - iii. 24-inch covers to be utilized on existing structures with 24 covers only.
 - iv. Vented structure covers will be specified by the engineer.
 - c. "Throat rings" shall be made of HDPE and have a maximum thickness of 2 inches. No concrete throat rings shall be used.
 - i. The internal diameter shall match that of the ring and cover's opening. HDPE "throat rings" are to be used in

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- conjunction with a UV stabilized internal polyethylene liner for the purpose of providing an infiltration/inflow (I/I) barrier. Approved I/I barrier is listed in SAWS APL.
- ii. Note of Clarification: A minimum of two and a maximum of six “throat rings” may be used at each adjusted existing structure. “Throat rings” are limited to a minimum of two and a maximum of four rings for new structure construction. Throat rings shall be a maximum thickness of two (2) inches.
 - 1) Bitumastic Joint Sealant. flat tops, and between the ductile iron ring (frame) and the uppermost adjustment ring or flat top: See approved APL.
- d. The interior of all rehabilitated structures shall be rendered watertight, chemically resistant, and abrasion resistant through the use of a SAWS approved sewer coating. Approved coatings are listed in SAWS APL.
- i. Prior to coating, all structures shall be hydrostatic tested and/or vacuum tested, and approved by Inspector or Engineer as per testing requirements listed in Specification Item No. 852 Sanitary Sewer Structures.
 - ii. Mortar shall be composed of 1 part Portland Cement, 2 parts sand and sufficient water to produce a workable mixture. When used to plaster structures, it may be composed of 1 part cement to 3 parts sand. Lime up to 10% may be used.
 - iii. For existing structures scheduled to be rehabilitated, contractors shall apply a combination of a cementitious coating first, followed by the epoxy coating. List of current approved coatings is listed in SAWS most current APL.
 - iv. Kerneos SewperCoat 2000 HS and PG and APM Permacast MS-10,000 with ConShield, applied at the required one inch thick application, are the only products approved which do not require a subsequent epoxy coating.
 - v. Other approved materials are located on SAWS website under SAWS Approved Products List. The list is periodically updated and should be checked by the Contractor prior to the start of construction.
9. New structures shall have an antimicrobial additive introduced to the concrete mix in order to provide protection against Microbial Induced Corrosion (MIC).
- a. The liquid antimicrobial additive shall be an EPA registered material and the registration number shall be submitted for approval prior to use in the project.
 - b. Manufacturer shall also provide a State of Texas registration for the antimicrobial.

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- c. Manufacturer shall be approved by SAWS Products Standard Committee and be on the APL
- d. The antibacterial additive shall be used to render the concrete uninhabitable for acid producing bacterial growth.
- e. The antimicrobial shall only be used by precast producers that have been certified by the manufacturer of the antimicrobial additive.
- f. Dosage of the antimicrobial shall be per manufacturer's recommendations.
- g. A ferrous oxide tinting agent shall be used to identify all antimicrobial concrete precast, and shall be dosed per manufacturer's recommendations producing a terracotta tint to the cured concrete.

850.4 CONSTRUCTION: All concrete sanitary sewer structures shall be constructed or rehabilitated in accordance with these specifications and in conformity with the required lines, grades, sections, and details shown in the contract documents or as directed by the Engineer.

- 1. Construction methods shall conform to all applicable terms of Specification Item No. 307, "Concrete Structures."
- 2. Where portions of structures are shown in the contract document details, such portions shall be constructed in accordance with applicable provisions of Specification Item No. 852, "Sanitary Sewer Structures."
- 3. Sanitary sewer structures constructed to function as structures or maintenance access appurtenances to gravity sewer systems shall be constructed to accommodate influent and effluent pipes greater than 24 inches in diameter as shown in Standard Drawing DD-850 Series.

850.5 TESTING: The Contractor shall notify Inspector and Engineer 48 hours prior to beginning of structure testing.

- 1. The Contractor shall perform the testing for all sanitary sewer structures in accordance with the following:
- 2. All structures must pass a leakage test.
- 3. The contractor shall test each structure (after assembly and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer.
- 4. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:
 - a. 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 cone 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

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- structure shall be filled to the top 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: Structures 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 structure shall be temporarily plugged with the plugs braced to prevent them from being drawn into the structure.
 - (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 all 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 structure.
 - (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) With the valve closed, the level vacuum shall be read after the required test time.
 - (10) 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.
 - (11) The required test time is 2 minutes.
- c. Acceptance: 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.
- d. The structure shall be retested as described above until a successful test is attained.
- e. After a successful test, the temporary plugs will be removed.
- f. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.

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(12) Repairs to Existing Structures: Any existing structure which fails to pass the hydrostatic/vacuum test shall be closely examined by the Inspector and the Contractor to determine if the structure can be repaired.

- a. Thereafter, the Contractor shall either repair or remove and replace the structure as directed.
- b. The structure shall then be retested and coated with a SAWS- approved sewer coating as stated above.
- c. The Owner may elect to simply remove and replace the existing structure with a new one.
- d. 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 cone.
- e. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill."

(13) Holiday Testing: Inspect each sanitary sewer structure using high-voltage holiday detection equipment.

- a. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method.
 - b. After abrading and cleaning, additional protective coating material shall be applied to the repair area.
 - c. All touch-up repair procedures shall follow the protective coating manufacturer's recommendations
5. If a sanitary structure fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re- tested.
 6. It shall not be accepted until it passes all tests.
 7. All repairs and re- testing shall be at no additional cost to SAWS.

850.6 MEASUREMENT: Sanitary Sewer Structures will be measured as each structure complete in place.

850.7 PAYMENT: The work, as prescribed by this item, will be paid for at the unit price bid per each for "Sanitary Sewer Structures,"

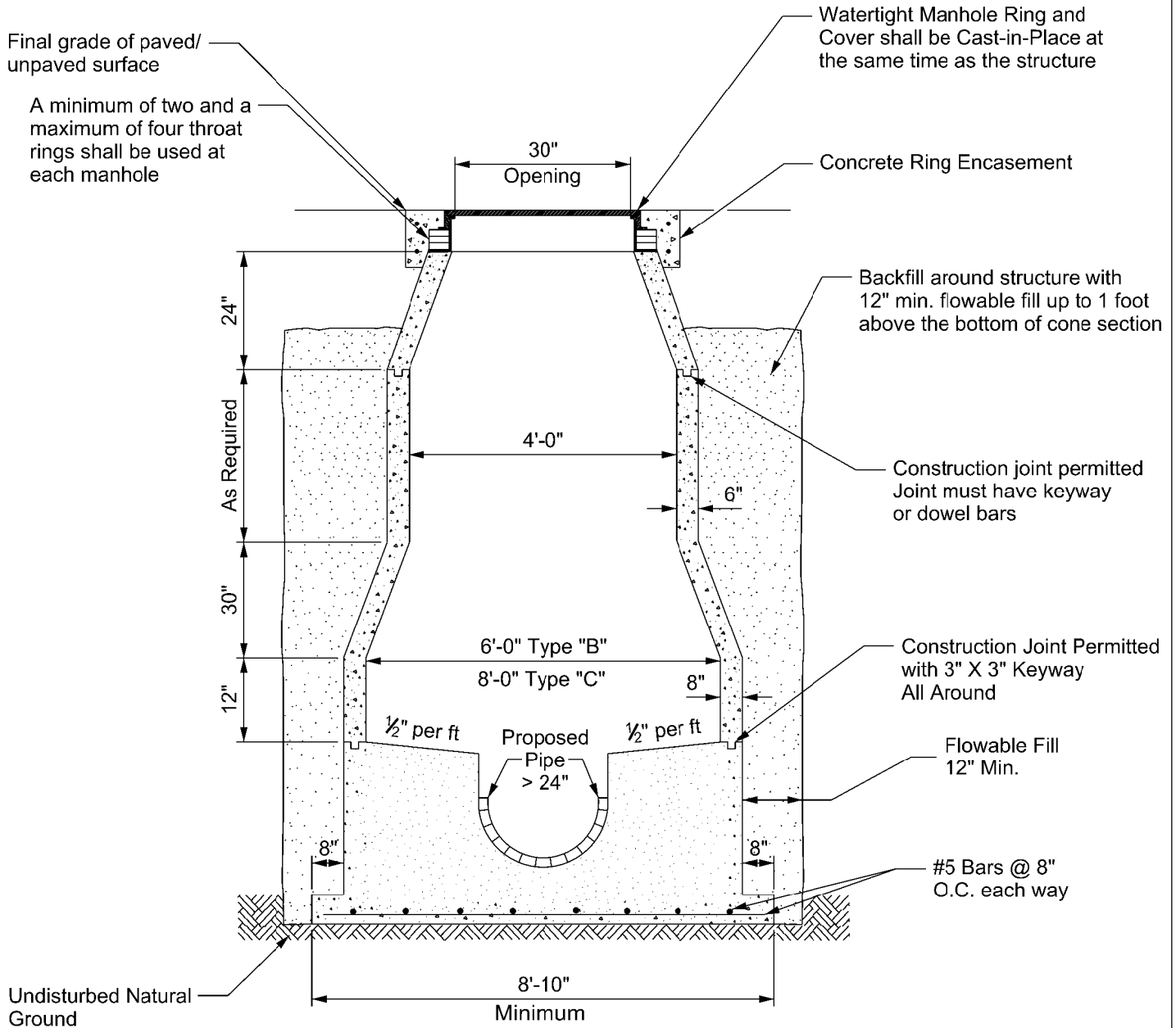
1. Sanitary sewer structures shall be paid at the contract unit price bid for each such structure at the following milestones:
 - a. Milestone 1: Structure setting to include for each such structure, which price shall be full compensation for setting structure base setting to include concrete base encasement with steel reinforcements, and connection of new or existing sewer pipes to the structure as described in this specification. After curing of concrete structure flowline elevation shall be verified and approved by engineer of record prior to payment.

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- b. Milestone 2: Structure riser installation: All structure risers shall be paid at the contract unit price bid for each such structure 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 Structure Encasement and Testing: This pay item includes structure concrete encasement and rebar, hdpe throat rings, UV stabilized polyethylene liner, ring and cover, includes all structure testing in accordance for leakage, separate and independent of the all other sanitary sewer piping prior to payment.
 - d. Extra depth structures shall be paid for at the contract unit price bid per vertical foot as measured above.
 - e. Concrete cradles for pipes shall be measured and paid for at the contract unit price bid as provided for in Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."
4. Gravel subgrade filler for structures shall not be measured separately for payment.

Pay Item	Description	Units
850.6.1.a	Milestone 1: Structure setting	Each
850.6.1.b	Milestone 2: Installation and Acceptance Testing	Each
850.6.1.c	Milestone 3: Sanitary Sewer	Each
850.6.2	Structures deeper than 6 feet	Vertical feet.

End of Specification



SANITARY SEWER STRUCTURE
6' & 8' STRUCTURE TYPE "B" & "C"

Notes:
 The channel depth shall be at least equal to the largest pipe diameter. Structures shall be designed and installed on all mains greater than 24" in diameter.

PROPERTY OF
SAN ANTONIO WATER SYSTEM
 SAN ANTONIO, TEXAS

**TYPICAL SANITARY
 SEWER STRUCTURE**

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SHEET
1 OF 1