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 manholes (Item No. 852). Structures shall be required for all sewer main larger than 24 inches. 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), or any revisions thereto as applicable. All structures shall be watertight and coated with a SAWS-approved sewer coating. Structure covers may be either watertight or water resistant, depending upon their specific location. Every structure cover located in the Edward’s Aquifer Recharge Zone, shall be watertight. Sewer manhole ring and cover castings shall meet the current requirements of AASHTO Designation M306-10.

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

850.3 MATERIALS:

1. Concrete: All concrete shall conform to the provisions of Item No. 300, "Concrete (Natural Aggregate)," or shall be of the class/type as noted in the contract documents.

2. Reinforcing Steel: All reinforcing steel shall conform to the provisions of Item No. 301, "Reinforcing Steel."

3. 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.”

4. Structure Ring and Covers: The standard structure ring and cover shall be ductile iron and manufactured to the dimensions shown herein. The ring and cover shall be hinged. Lifting slots cast into the covers shall be provided for lifting purposes. A water-resistant (cam lock) ring and cover shall be used in areas of minimal infiltration potential to allow venting. A watertight (bolt down) ring and cover must be used in areas of high infiltration potential, such as in the Edward’s Aquifer Recharge Zone, an identified 100-year floodplain, or as otherwise directed by the Engineer. The nominal cover diameter shall be 32 inches, with a 30 inch clear opening, as required by TCEQ. Rings shall have a minimum of four 1 inch holes/slots for anchoring purposes. Rings shall be a minimum of 4-
1/2 inches in height, or as otherwise accepted by the Engineer. Slots for embedment/lightening are not allowed in ring flanges.

Water-resistant Rings and Covers: Rings and covers shall have two hinges for added stability. The hinge shall have a drain to allow for proper debris and foreign object removal. Prior to acceptance of the work, a stainless steel keyed “cam” lock shall be provided by the Contractor to the Inspector. When the key is inserted in the cam, it shall remain in the lid while the cam is in the open (unlocked) position. When in the closed (locked) position, the key can be removed. When not in use, the cam lock key hole shall be covered with a plastic plug to prevent infiltration of debris. The cover shall positively lock at 90° to prevent accidental closure and open fully to 120°. The cover shall also include a single multi-tool lifting slot adjacent to the edge of the cover to facilitate opening/lifting/prying once it is unlocked. Covers shall be provided with a continuous vulcanized (one piece) EPDM gasket with a shore durometer of 70 ±5 permanently attached to the cover.

Watertight Rings and Covers: Rings and covers shall be the same as above for water-resistant version, except the covers shall be bolted to the ring instead of secured with the cam lock mechanism. No vent hole(s) shall be provided. A minimum of four 1/2 inch diameter, stainless steel, hex head bolts shall be provided for each cover. The 4 bolt holes in the covers shall be evenly spaced and provided with a minimum 1-½ inch diameter counter sink for the bolt heads. On the fastened and bolted position, the bolt heads shall not extend above the surface or the cover. Washers of a size and material as approved by the Engineer shall be provided for the bolts to insure air and water tightness.

The finished ring and cover shall have the bearing surfaces machined ground and sets of rings and covers shall be marked in such a way that they can be matched for assembly in the field. All covers shall have the words "SAN ANTONIO WATER SYSTEM Sanitary Sewer" cast thereon. Ring and cover shall have the approved foundry’s name, part number, country of origin preceded by “Made in” (example: MADE IN USA) in compliance with the country of origin law of 1984, and production date (example: mm/dd/yy) for tracking purposes. Each casting must be marked with DI and ASTM A536 or A536 80-55-06 to verify the materials used. Castings without proper markings shall be rejected.

5. **Mortar:** Mortar shall be composed of 1 part Portland Cement, 2 parts sand and sufficient water to produce a workable mixture. When used to plaster
manholes, it may be composed of 1 part cement to 3 parts sand. Lime up to 10% may be used.

6. **Throat Rings**: Throat rings shall be made of either HDPE or reinforced concrete rings having a maximum thickness of 2 inches. The internal diameter shall match that of the ring and cover’s opening. Concrete shall conform to the provisions of Item No. 300 "Concrete (Natural Aggregate).” If concrete throat rings are to be utilized, they must be used in conjunction with a UV stabilized polyethylene liner. I/I barrier must meet the following ASTM standards: ASTM D790/1505 Density of Polyethylene Materials, ASTM D1238-10 Melt Flow index, ASTM 638-10 Tensile Strength @ Yield (50mm/mm), ASTM 790-10 Flexural Modulus, ASTM 648-07 Heat Deflection Temperature @IGEPAL, ASTM 1693-12 EsCR, 100% IGEPAL/10% IGEPAL. A minimum of two and a maximum of four throat rings may be used at each manhole installed.

7. **Coating**: After all structures have been constructed or rehabilitated, and all testing has passed, they shall be considered watertight. Afterward, they shall be coated with a SAWS-approved sewer coating.

For new structures, or existing ones scheduled to be rehabilitated, contractors shall apply a combination of both products with the cementitious coating first, followed by the epoxy coating. Kernoes SewerCoat 2000 HR regular, with the required one inch thick application, is the only product yet approved which satisfies the requirement of applying the combination of both the cementitious coating and epoxy coating. Other approved materials are as follows:

a. **Cementitious coating**: With required one inch thick application:

   (1) Permaform CR-9000;
   
   (2) Strong - Seal MS-2C;
   
   (3) Standard Cement Material Inc. Reliner;
   
   (4) Quadex Aluminaliner;
   
   (5) ConShield Biotech Armor.

b. **Epoxy coating**: With specified thickness application:
San Antonio Water System Standard Specifications for Construction

(1) Raven 405 Series High Build Epoxy Liner: Required thickness – 125 mils;

(2) Spray Wall polyurethane System: Required thickness – 125 mils;

(3) Carboline Plasite 4500: Required thickness – 125 mils.

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.

Construction methods shall conform to all applicable terms of Item No. 307, "Concrete Structures.” Where portions of structures are shown in the contract document details, such portions shall be constructed in accordance with applicable provisions of Item No. 852, "Sanitary Sewer Manholes.” Sanitary sewer structures constructed to function as manholes 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-850-01.

850.5 TESTING: The Contractor shall perform the testing for all sanitary sewer structures in accordance with the following.

1. Leakage 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
San Antonio Water System Standard Specifications for Construction

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 gas sealing connections shall be installed prior to testing.

(2) 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.

(3) 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.

(4) 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 the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, “Excavation, Trenching and Backfill.”

(5) 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.

2. Holiday Testing: Inspect each sanitary sewer structure using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning, additional protective coating material shall be applied to the repair area. All touch-up repair procedures shall follow the protective coating manufacturer’s recommendations.

If a sanitary sewer structure fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer’s recommendations and re-tested. It shall not be accepted until it passes all tests. 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.

850-6 April 2014
PAYMENT: The work, as prescribed by this item, will be paid for at the unit price bid per each for "Sanitary Sewer Structures," which price shall be full compensation for furnishing and placing all materials, manipulations, bases with pipe cradles, rings and covers, cones, throat rings, I/I barrier, testing precast sections, concrete, flowable fill, manhole ring encasement, mortar, diversion of flows within structure installation, labor, tools, equipment and incidentals necessary to complete the work. Note: No separate payment for coating.

Concrete cradles for pipes entering and leaving a structure shall be measured and paid for at the price bid as provided for in Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."

- End of Specification -
SANITARY SEWER STRUCTURE
8' & 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.

Backfill around structure with 6" min flowable fill up to 1 foot above cone section. (Amount will vary per project) An option exists to backfill with approved secondary material, subject to provisions of item No. 804.5.2.c.

Concrete Ring Encasement
Secondary Backfill

Construction joint permitted Joint must have keyway or dowel bars

6' - 0" Type "B"
8' - 0" Type "C"

1/2" per ft Proposed pipe > 24"
1/2" per ft

Undisturbed Natural Ground

Watertight Manhole Ring and Cover shall be Cast-In-Place at the same time as the structure

Final grade of paved/upaved surface

A minimum of two and a maximum of four throat rings shall be used at each manhole

30" Opening

As Required

Minimum

#6 Bars @ 8" O.C. each way

Construction joint permitted with 3" x 3" keyway all around

8" 8" 8" 8" 30° 30° 24" 12" 6" 6' - 0" 8' - 0" 4' - 0"

8' - 10"