

# *San Antonio Water System Standard Specifications for Construction*

## ITEM NO. 848

### Sanitary Sewers

**848.1 DESCRIPTION:** This item shall govern the furnishing, installation, adjustment, or replacement of sanitary sewer pipe of the size and type specified in the contract documents.

**848.2 REFERENCED STANDARDS:** Reference standards cited in this Specification Item No. 848 refer to the current reference standard published at the time of the latest revision date.

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 Society for Testing and Materials (ASTM)
  - a. ASTM C 150 - Standard Specification for Portland Cement.
  - b. ASTM C 494 - Standard Specification for Chemical Admixture for Concrete.
  - c. ASTM C 618 - Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.
  - d. ASTM C 937 - Standard Specification for Grout Fluidifier for Pre-placed Aggregate Concrete.
  - e. ASTM C 940 - Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Replaced Aggregate Concrete in the Laboratory.
  - f. ASTM C 1017 - Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.
  - g. ASTM C 1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
  - h. A. ASTM D 618 - Standard Practice for Conditioning Plastics for Testing.
  - i. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
  - j. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
  - k. ASTM D 2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
  - l. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

## **San Antonio Water System Standard Specifications for Construction**

- m. ASTM D 2310 - Standard Classification for Machine-Made Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
- n. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- o. ASTM 2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading
- p. ASTM D 2444 - Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).
- q. ASTM D 2657 - Standard Practice for Heat Fusion Joining Polyolefin Pipe and Fittings.
- r. ASTM D 2680 - Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- s. ASTM D 2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
- t. ASTM D 2992 - Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced-Thermosetting) Resin Pipe and Fittings.
- u. ASTM D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- v. ASTM D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
- w. ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- x. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- y. ASTM D 3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- z. ASTM D 3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- aa. ASTM D 3681 - Method for Determining Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin Pipe in a Deflected Condition.
- bb. ASTM D 3754 - Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
- cc. ASTM D 4161 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- dd. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- ee. ASTM F 679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- ff. ASTM F 714 - Standard Specification for Polyethylene Plastic (PE) Pipe (SDR-PR) Based on Outside Diameter.

## **San Antonio Water System Standard Specifications for Construction**

- gg. ASTM F 794 - Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
  - hh. ASTM F 894 - Standard Specification for Polyethylene (PE) Large-Diameter Profile Wall Sewer and Drain Pipe.
  - ii. ASTM G 62 - Standard Test Methods for Holiday Detection in Pipeline Coatings.
5. American Water Works Association (AWWA)
- a. AWWA C 110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches for Water.
  - b. AWWA C 111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - c. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches for Water Distribution.
  - d. AWWA C 909 - Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.
  - e. AWWA M23 – PVC Pipe – Design and Installation
  - f. W. PPI TR3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.
  - g. AWWA C 300 - Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and other Liquids.
  - h. AWWA C 950 – Fiberglass Pressure Pipe
  - i. AWWA M 45 – Fiberglass Pipe Design
7. National Science Foundation
- a. NSF Standard 61 - Drinking Water System Components - Health Effects.
8. Society of Protective Coatings
- a. SSPC-SP 6 - Steel Structures Painting Council, Commercial Blast Cleaning.
9. Uni-Bell
- a. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.

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

1. Contractor to submit cut sheets prior to commencement of open cut work.
2. Submit proposed methods, equipment, materials and sequence of operations for sewer construction.
3. Plan operations so as to minimize disruption of utilities to occupied facilities or adjacent property.
4. Submit all test reports and pre and post sewer television inspection video.
5. Videos become property of SAWS.

## *San Antonio Water System Standard Specifications for Construction*

**848.4 MATERIALS:** Materials for sanitary sewer pipe and fittings shall be either rigid or flexible. All pipe not listed shall be subject to pre-approval by the Engineer.

1. Rigid Pipe:
  - a. Concrete Pipe: Concrete pipe shall not be used.
  - b. Concrete Steel Cylinder Pipe: Concrete Steel Cylinder Pipe shall not be used.
  - c. Asbestos-Cement (AC) Pipe: AC pipe shall not be used. Refer to Specification Item No. 3000, "Handling Asbestos Cement Pipe."
2. Flexible Pipe: Pipe consisting of materials other than those listed above.
  - a. Any flexible pipe having a deflection of the inside diameter greater than 5% after 30 days of installation will not be accepted.
  - b. Testing shall be as per SAWS Test Specification Item No. 849 - Sanitary Sewer Testing
  - c. Working room for flexible pipe shall be as per Specification Item No. 804 Excavation Trenching and Backfill.
  - d. Polyvinylchloride (PVC) Sewer Pipe: Pipe shall be made from class 12454 materials as described in ASTM D1784.
    - i. For pipes 4 inches to 15 inches in diameter, fittings and joints shall conform to ASTM D3034 and D3212, with the exception that solvent cement joints shall not be used.
    - ii. All pipes that are 18 inches to 24 inches in diameter shall meet the requirements of ASTM F679.
    - iii. **All sanitary sewer PVC pipe shall be green. White pipe is prohibited. Contractor will need to submit information to request an exemption to use white pipe such as letters from suppliers that pipe is not available. Once a project is awarded Contractor should bring this exemption to SAWS attention via RFI. If white pipe is approved it must have appropriate markings and be wrapped with green poly wrap. This shall include all lateral piping as well.**
    - iv. At waterline crossings and where water and sewer mains are parallel and separation distance cannot be achieved as per 30 TAC 217.53, use extra stiff pipe SDR 26 PVC (ASTM D2241) with a minimum pressure rating of 160 psi.
  - e. Fiberglass Reinforced Sewer Pipe, Non-Pressure Type:
    - i. Fiberglass reinforced sewer pipe, non-pressure type, shall be a factory-formed conduit of polyester resin, fiberglass and silica sand built up in laminates and shall conform to the requirements of ASTM D3262, including the appendix and subsequent specifications, and in accordance with SAWS' material specifications.
    - ii. Depths shall comply with requirement of ASTM D3839.
    - iii. Joints for pipe and fittings shall be confined compression rubber gasket bell and spigot type joints conforming to the material and performance requirements of ASTM D4161. Depths shall comply with requirement of ASTM D3681.

## **San Antonio Water System Standard Specifications for Construction**

- iv. Flanges, elbows, reducers, tees, wyes, laterals, and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber reinforced overlays.
- v. For pipe diameters 15 inches or larger, lateral openings 6 inch or greater in size shall be made using PVC sewer saddles conforming to ASTM D2661 or insert a tee connection conforming to ASTM D3034, approved by the Engineer, and found in SAWS' Material Specifications.
- vi. Minimum pipe stiffness shall not be less than SN 72 for direct bury applications
- f. High density, High Molecular Weight Polyethylene Pipe (HDPE):
  - i. HDPE shall meet requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D 1248.
  - ii. Material meeting requirements of cell classification 345434D or E, in accordance with ASTM D 3350, are also suitable for making pipe products under these specifications.
  - iii. Inner wall of pipe shall be of light or gray color for television inspection purposes.
- 3. Pressure Pipe/Force Mains:
  - a. High density, High Molecular Weight Polyethylene Pipe (HDPE):
    - i. HDPE shall meet requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D 1248.
    - ii. Material meeting requirements of cell classification 345434D or E, in accordance with ASTM D 3350, are also suitable for making pipe products under these specifications.
    - iii. Inner wall of pipe shall be of light or gray color for television inspection purposes.
  - b. The pressure rating, size, and pressure class shall be as shown in the contract documents.
  - c. All required joint restraint shall be approved by the Engineer prior to the work being accepted.
  - d. Pressure pipe/Force mains are required to have modified grade 5 material used as bedding.
  - e. Pipes also shall be hydrostatically tested at a minimum of 150 psi after their construction to ensure proper construction.
- 4. Mechanical or compression joints, concrete jointing collars, or non-reinforced rubber adaptors shall be used only as approved by the Engineer.
- 5. All sanitary sewer pipe and fittings utilized within the jurisdiction of SAWS shall be tested by a manufacturer-approved laboratory at the source of supply.
- 6. All shipments of pipe shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a Texas registered professional engineer.

**848.5 CONSTRUCTION:** All sanitary sewer mains shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades, and details

## **San Antonio Water System Standard Specifications for Construction**

shown in the contract documents and as directed by the Engineer. Whenever true line and grade is not attained it will be the Contractor's sole responsibility to remove and reinstall any and all sewer pipe deemed required by the Engineer and shall be done at the Contractor's expense.

1. Successful passage of the Hydrostatic, air test and mandrel test (for flexible pipe, 30 days after installation), as described under TCEQ criteria. In addition sewer pipe must also pass settlement test for the final acceptance of the mains. Settlement Testing shall be performed in accordance with Specification Item No. 849 "Sanitary Sewer Testing".
2. Mains shall be properly backfilled as per Specification Item No. 804, "Excavation Trenching and Backfill" prior to the start of the 30 day testing period.
3. Water Main Crossings: Where gravity or force main sewers are constructed in the vicinity of water mains, the requirements of the 30 TAC§ 217.53 shall be met.
4. For excavation, trenching and backfill requirements see Specification Item No. 804, "Excavation, Trenching and Backfill."
5. Pipe Installation: The Inspector will inspect all pipe before it is placed in the trench and will reject any sections found to be damaged or defective to a degree that would affect the structural integrity of the pipe.
6. Rejected pipe shall be immediately removed from the site of the work and replaced with new acceptable pipe.
7. Sewer main installation should be constructed from downstream to upstream as standard practice.
8. No pipe shall be laid within 10 feet of any point where excavation is in progress. Pipe installation shall proceed upgrade with the bell pointing in the upstream direction of flow.
9. Pipe shall be lowered into the trench without disturbing the prepared bedding or the trench sides.
10. The drilling of lifting holes in the field will not be permitted.
11. Pipe shall be installed by means of a concentric pressure being applied to the pipe with a mechanical pipe puller. Pulling or pushing a joint of pipe in place by using a crane, bulldozer, or backhoe will not be permitted.
12. Pipe shall be "pulled home" in a straight line with all parts of the pipe on line and grade at all times.
13. No side movement or up and down movement of the pipe will be permitted during or after the pulling operation.
14. Should coupled joints of pipe be out of line or off grade, they shall be removed one joint at a time in the presence of the Inspector and brought to the proper line and grade.
15. The lifting or moving of several joints of coupled pipe at one time to close a partially open joint or to fine grade under laid joints of pipe will not be permitted.
16. Contractor shall insure that all existing or proposed manholes or structures shall remain visible and accessible at all times.
17. No manhole or structure covers shall be covered by pavement, equipment, or other obstructions other than a removable, steel plate (min thickness of ½ inch and H-20 traffic bearing rated), temporary lid provided for safety.

## **San Antonio Water System Standard Specifications for Construction**

18. Pipe Separation: Sewer pipe separation distances shall be maintained in accordance with TCEQ rules 30 §217.53. See Drawing Series DD-848.
19. Contractor to obtain the services of a licensed surveyor in accordance with the General Conditions for the purpose of validating the elevations of all sewer main work including the installation of manholes. It is the contractor responsibility to use the latest technology including Laser Beams to establish elevations as per design plans.
  - a. Contractor to provide SAWS with the licensed surveyors report validating the all pipe was installed per design plans and upload report in CPMS.
  - b. If the sewer main or manholes are not constructed per plans it is the contractors responsibility to relay or replace any sewer work at his cost with no additional days granted.
20. **No horizontal or vertical curves shall be permitted in conformance with appropriate regulatory agency requirements.**
21. Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight fitting plug or closure.
22. The interior of laid pipe shall be kept free from dirt, silt, gravel, or foreign material at all times.
23. All pipes in place must be approved by the Inspector before backfilling.
24. When replacing an existing system in place, Contractor shall maintain screens to prevent the entrance of construction debris into the sewer system.
25. Pipe bursting on AC sanitary sewer pipe is not allowed.

**848.6 MEASUREMENT:** All sewer pipes will be measured from center of manhole to center of manhole or end of main.

1. Measurement will be continuous through any fittings in the main, even though the fittings are pay items of the contract.

**848.7 PAYMENT:** Sewer pipe up to 24-inches will be paid for at the contract bid price per linear foot. Sewer pipe larger than 24-inches will be paid for by percentage listed below.

1. For sewer pipe up to 24-inches said price shall be full compensation for furnishing all materials, including pipe, couplings, trenching, pumping, concrete, plugs, laying and jointing, backfilling, select bedding and initial backfill material, tamping, water, labor, tools, equipment, and all weather surface, testing, acceptable densities and must meet all requirement for testing and other incidentals necessary to complete the work.
2. For sewer pipe over 24-inches the contractor will get paid 80% of the bid item cost for furnishing all materials, including pipe, couplings, trenching, pumping, concrete, plugs, laying and jointing, backfilling, select bedding and initial backfill material, tamping, water, labor, tools, equipment, and all weather surface.
3. For sewer pipe over 24-inches the contractor will get paid the remaining 20% percent of the bid item cost for the approved testing results of acceptable densities

**San Antonio Water System Standard Specifications for Construction**

and must meet all requirement for all other testing and other incidentals necessary to complete the work.

4. When the minimum separation distances for any water and sewer piping facilities cannot be maintained per 30 TAC §217.53, Contractor shall install SDR-26 PVC pipe (160 psi pressure rated). Payment for this higher pressure rated pipe shall be made the contract bid price per linear foot complete in place for the type, and size constructed as described above.
5. Sewer pipe fittings, as part of the main line such as wyes and tees, are inclusive in the cost of Specification Item No.854, "Sanitary Sewer Laterals."
6. Pay cuts will be measured from the top of ground prior to the Contractor's operation and along the centerline of the pipe to the invert of the pipe, to be submitted with cut sheets.

**-End of Specification-**