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

All plans, materials and specifications shall be in accordance with the Texas Administrative Code (TAC) rules to include: 30 TAC § 213 (“Edwards Aquifer”), and 30 TAC § 217 (“Design Criteria for Sewerage Systems”) or any revisions thereto as applicable.

848.3 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:** Ductile iron pipe shall, for the purpose of this specification, be known as rigid 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.

   Unless directed otherwise by the Engineer, a "GO, NO-GO" Deflection Testing Mandrel built in accordance with the detail drawing, as shown in the DD-848 Standard Drawing Series, and 30 TAC § 217, shall be furnished at the Contractor's expense and shall be used in testing pipe deflection for acceptance. Refer to SAWS Specification Item No. 849, “Air and Deflection testing,” for more information about mandrel deflection testing.

   b. **Working room:** The working room for flexible pipe shall be a minimum of 6 inches.

   c. **Pipe Stiffness:** All mains are to be SDR 26 PVC (ASTM D3034-08) with a pressure rating of 115 psi.

   d. 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 D2241-09) with a pressure rating of 150 psi. This shall include all lateral piping as well.

e. All sanitary sewer piping shall pass the low pressure test, as described in 30 TAC § 217.57.

3. **Concrete Pipe:** Concrete pipe shall not be used.

4. **Asbestos-Cement (AC) Pipe:** AC pipe shall not be used. Refer to Item No. 3000, “Handling Asbestos Cement Pipe.”

5. **Fiberglass Reinforced Sewer Pipe, Non-Pressure Type:** Fiberglass reinforced sewer pipe, non-pressure type, shall be a factory-formed conduit of polyester resin, continuous roving fiberglass and silica sand built up in laminates and shall conform to the requirements of ASTM D3262-11, including the appendix and subsequent specifications, and in accordance with SAWS’ material specifications. Depths shall comply with requirement of ASTM D3681-12.

**Coupling Joints:** 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 D4161-01. Depths shall comply with requirement of ASTM D3681-12.

**Fittings:** 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. 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 D2661-11 or service connections conforming to ASTM D3034-08, approved by the Engineer, and found in SAWS’ Material Specifications.

Minimum pipe stiffness shall not be less than 115 psi for direct bury applications.

6. **PSM Polyvinylchloride (PVC) Sewer Pipe:** Pipe shall be made from class 12454-B materials as prescribed in ASTMD1784-11. For pipes 4 inches to 15 inches in diameter, fittings and joints shall conform to ASTM D3034-08 and D3212-07, with the exception that solvent cement joints
shall not be used. All pipes that are 18 inches to 36 inches in diameter shall meet the requirements of ASTM F679-08.

7. **Pressure Pipe/Force Mains:** Pipe shall be made from Class 1254-A or 1254-B, as defined in ASTM D1784-11. All pipe, fittings, and joints shall meet or exceed the requirements of ASTM D2241-09, with the exception that solvent cement joints shall not be used. The pressure rating, size, and pressure class shall be as shown in the contract documents. Pipe shall have an integral bell and gasket seal with the locked-in type gasket reinforced with a steel band or other rigid material conforming to ASTM F477-10. The joint shall comply with the requirements of ASTM D3139-98(2011). All required joint restraint shall be approved by the Engineer prior to the work being accepted. Pressure pipe/Force mains are required to have modified grade 5 material used as bedding. Pipes also shall be hydrostatically tested at a minimum of 100 psi after their construction to ensure proper construction.

8. Mechanical or compression joints, concrete jointing collars, or non-reinforced rubber adaptors shall be used only as approved by the Engineer.

9. **Ductile Iron Pipe and Fittings:** Ductile iron pipe shall be centrifugally cast of 60-42-10 iron and shall conform to the requirements of the latest revision of ANSI Standard A21.51/American Water Works Association (AWWA) C151-09. Ductile iron pipe may be "thickness designed" in accordance with requirements of the latest revision of ANSI Standard A21.50/AWWA C150-08. Thickness design shall be based on standard laying conditions 4 or 5 in accordance with conditions at the site. Fittings for ductile iron pipe shall have not less than the thickness, class, or pressure rating specified for ductile iron pipe. Fittings shall be furnished with all necessary glands, gaskets, bolts, etc. as may be required to complete the joints.

Rubber gasket joints for mechanical joints or push on type joints shall conform to the requirements of ANSI Standard A21/AWWA C111-12.

All ductile iron pipe and fittings shall be cement mortar-lined or polyethylene-lined. The cement mortar lining shall be in accordance with ANSI A21.4/AWWA C104-08. Contractor shall also be required to protect the pipe by externally wrapping it in accordance with Item No. 814, “Ductile Iron Pipe.”

The polyethylene lining material for pipe and fitting shall be virgin
polyethylene complying with ANSI/ASTM D1248-12, compounded with inert filler and with sufficient carbon black to resist ultraviolet rays during storage of the pipe and fittings. The polyethylene shall be bonded to the interior of the pipe or fitting by heat. Polyethylene lining in pipe and in fittings shall be 40 mils nominal thickness. Minimum lining thickness shall be 30 mils.

10. **Concrete Steel Cylinder Pipe**: Concrete Steel Cylinder Pipe shall not be used.

11. All sanitary sewer pipe and fittings produced within the jurisdiction of SAWS shall be tested by a SAWS-approved laboratory method at the source of supply. All shipments of pipe not tested 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.

848.4 **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 shown in the contract documents and as directed by the Engineer. Successful passage of the air test and mandrel test (for flexible pipe, 30 days after installation), as described under TCEQ criteria, shall be required for the acceptance of the mains.

1. **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.

2. For excavation, trenching and backfill requirements see Item No. 804, “Excavation, Trenching and Backfill.”

3. **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. Rejected pipe shall be immediately removed from the site of the work and replaced with new acceptable pipe. The Contractor shall commence installation of the pipe at the downstream end of the sanitary sewer line and proceed non-stop in a forward upstream direction. 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. Pipe shall be lowered into the trench without disturbing the prepared foundation or the trench sides. The drilling of lifting holes in the field will
not be permitted. 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. Pipe shall be “pulled home” in a straight line with all parts of the pipe on line and grade at all times. No side movement or up and down movement of the pipe will be permitted during or after the pulling operation. 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. 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.

Also, Contractor shall insure that all existing or proposed manholes or structures shall remain visible and accessible at all times. No manhole or structure covers shall be covered by pavement, equipment, or other obstructions other than a removable, temporary lid provided for safety. Inspector shall cause all work to be suspended until this requirement is met without any valid claims of costs or schedule delays.

4. Pipe Separation: Sewer pipe separation distances shall be maintained in accordance with TCEQ rules 30 §217.53.

a. A sewer collection system that parallels a public water supply pipe must have a vertical separation of at least two feet between outside diameters of the pipes.

b. A sewer collection system that parallels a public water supply pipe must have a horizontal separation of at least four feet between outside diameters of the pipes.

c. A sewer system that crosses a public water supply pipe shall have a minimum separation distance of six inches between outside diameters of pipes. All sewer collection piping must be below a public water supply pipe.

d. A sewer collection system that crosses over a public water supply pipe shall be encased in a joint of at least 150 psi pressure class pipe.

(1) Pipe shall be centered on the crossing;

(2) Pipe shall be sealed at both ends with cement grout or
manufactured seal;

(3) Pipe shall be at least 18 feet long;

(4) Pipe casing shall be at least two nominal sizes larger than the wastewater collection pipe. Steel or PVC pipe may be used for casing of at least 150 psi pressure class.

(5) Pipe shall be supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.

5. Laser Beams: The use of laser beams for vertical control shall be required. Contractor shall also make available to the Inspector, when requested, a level and rod, of sufficient sensitivity, to accurately determine differences in elevation between points 300 feet apart with one instrument set-up. **Contractor shall provide a written summary to the Inspector of all elevations that all installed, repaired, or replaced sewer main enter and exit a manhole or structure.**

No pipe shall be installed in tunnels except as noted in the contract documents or by approval of the Engineer. If the Contractor finds it necessary to install pipe in tunnels not provided in the contract documents, he shall submit to the Engineer a detailed outline of procedures, methods, and use of materials depending on existing soil conditions. This information requires review and approval prior to the commencement of work.

No horizontal or vertical curves shall be permitted in conformance with appropriate regulatory agency requirements.

Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight fitting plug or closure. The interior of laid pipe shall be kept free from dirt, silt, gravel, or foreign material at all times. All pipes in place must be approved by the Inspector before backfilling.

When replacing an existing system in place, Contractor shall maintain screens to prevent the entrance of construction debris into the sewer system.

**848.5 MEASUREMENT:** All sewer pipes will be measured from center of manhole to
center of manhole or end of main. Measurement will be continuous through any fittings in the main, even though the fittings are pay items of the contract.

848.6 PAYMENT:

1. Sewer pipe will be paid for at the contract bid price per linear foot complete in place for the types, size and depth constructed. 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 other incidentals necessary to complete the work.

2. 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 (150 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.

3. Sewer pipe fittings, as part of the main line such as wyes and tees, are inclusive in the cost of Item No.854, (“Sanitary Sewer Laterals.”)

4. 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.

- End of Specification -
See Testing Mandrel Chart on DD-848-01 Sheet 2 of 2

1/2" Angle Iron (Min. 9 Req'd)

1/2" Typ.

1/4" Dia.

Typ.

Round off corners

1" Dia.

O.D.

SIDE OR TOP VIEW

Ring made from 12" Steel plate

40° Typ.

Trim ends of angles to fit

Weld together

Mark O.D.

END VIEW

Note:
All mandrels must be approved by SAWS Construction Inspections and stamped before use.
<table>
<thead>
<tr>
<th>SIZE</th>
<th>A</th>
<th>B*</th>
<th>PVC (SDR-26)</th>
<th>PVC (SDR-25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>4.0&quot;</td>
<td>4.5&quot;</td>
<td>6.50</td>
<td>4.79</td>
</tr>
<tr>
<td>8&quot;</td>
<td>5.5&quot;</td>
<td>5.0&quot;</td>
<td>7.37</td>
<td>6.68</td>
</tr>
<tr>
<td>10&quot;</td>
<td>7.0&quot;</td>
<td>7.5&quot;</td>
<td>9.21</td>
<td>8.50</td>
</tr>
<tr>
<td>12&quot;</td>
<td>8.0&quot;</td>
<td>9&quot;</td>
<td>10.96</td>
<td>10.25</td>
</tr>
<tr>
<td>16&quot;</td>
<td>10.0&quot;</td>
<td>11&quot;</td>
<td>13.42</td>
<td>12.71</td>
</tr>
<tr>
<td>18&quot;</td>
<td>12.0&quot;</td>
<td>13.5&quot;</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>21&quot;</td>
<td>14.0&quot;</td>
<td>16&quot;</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>24&quot;</td>
<td>16.0&quot;</td>
<td>18&quot;</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>27&quot;</td>
<td>18.0&quot;</td>
<td>20&quot;</td>
<td>——</td>
<td>——</td>
</tr>
</tbody>
</table>

* Minimum Length

**CHART**

Notes:
PVC pipes and fittings 6" to 15" in diameter shall conform to ASTM D-3034-08.
PVC pipes and fittings 18" to 27" in diameter shall conform to ASTM F-679-08.

This information is provided as a reference. All deflection testing shall be done in accordance with TCEQ Chapter 217.