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**SECTION 02510  
SANITARY SEWER FORCE MAINS**

**PART I: GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Sanitary sewer force mains.

**1.2 MEASUREMENT AND PAYMENT**

A. Unit Prices:

1. Payment for installation of sanitary sewer force main pipe by open-cut, augered with or without casing, or within limits of Potentially Petroleum Contaminated Area (PPCA) is on a linear foot basis. Measurement shall be taken along center line of pipe from end to end. Payment shall be made for each foot of sanitary sewer force main pipe installed, complete in place including pipe, excavation, bedding, backfill and special backfill, shoring, earthwork, connections to existing manholes, acceptance testing and pipe and accessories.
2. Payment for installation of sanitary sewer force main pipe crossing a stream or other body of water is on a lump sum basis.
3. The Unit Price item identifies line segments between stations as shown on the Drawings.
4. Refer to Section 01270 – Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):

1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

**1.3 REFERENCES**

A. ACI – American Concrete Institute.

1. ACI 318 – ACI Building Code and Commentary.

B. ASTM – American Society for Testing and Material.

1. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 C and 30 C with a Vitreous Silica Dilatometer.
2. ASTM D2310 – Standard Classification for Machine-Made “Fiberglass” (Glass-Fiber-Reinforced- Thermosetting-Resin) Pipe.
3. ASTM D2992 – Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber Reinforced Thermosetting-Resin) Pipe and Fittings.
4. ASTM D2996 – Standard Specification for Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

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- C. CFTS – City of Friendswood Technical Specifications.
- D. Uni-Bell UNI-B-3 Polyvinyl Chloride (PVC) Pressure Pipe (complying with AWWA C 900).

#### 1.4 SUBMITTALS

- A. Conform to requirements of Section 01330 – Submittal Procedures.
- B. Submit proposed methods, equipment, materials and sequence of operations for sanitary sewer force main construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.
- C. Sanitary sewer force mains twenty-four inches (24 In) in diameter and larger: Submit shop drawings and design calculations for joint restraint systems using reinforced concrete encasement of pressure pipe and fittings.
- D. Submit qualifications, proposed methods, equipment, materials and sequence for acceptance testing of sanitary sewer force main. Submit evidence of line proving by pigging for at least three (3) projects of equal or greater scope; project list shall include dates, size and length of pipe, location, owner name, contact person and telephone number. Provide certificate of training by manufacturer of pigging equipment being used.
- E. Submit test reports as specified in Part III of this Section.

## PART II: PRODUCTS

### 2.1 PIPE FITTING MATERIAL SCHEDULE

- A. Unless otherwise shown on the Drawings, use pipe materials that conform to requirements specified in one (1) or more of the following Sections:
  - 1. Section 02215 – Ductile Iron Pipe (DIP) and Fittings.
  - 2. Section 02220 – High Density Polyethylene Pipe (HDPE).
  - 3. Section 02235 – Polyvinyl Chloride Pipe (PVC).

### 2.2 THRUST RESTRAINT

- A. Unless otherwise shown on the Drawings, provide concrete thrust blocking for sanitary sewer force mains up to twelve inches (12 In) in diameter, to prevent movement of buried lines under pressure at bends, tees, caps, valves and hydrants. Blocking shall be Portland cement concrete, as specified in Section 03300 – Structural Concrete. Place concrete in accordance with details on the Drawings. Place thrust blocks between undisturbed ground and fittings. Anchor fittings to thrust blocks so that pipe and fitting joints are accessible for repairs. Concrete shall extend from six inches (6 In) below pipe or fitting to twelve inches (12 In) above.
- B. For sanitary sewer force mains larger than twelve inches (12 In) in diameter and where indicated on the Drawings, provide restrained joints conforming to requirements of sanitary sewer force main pipe material

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specifications. Install restrained joints for length of pipe on both sides of each bend or fitting for full length shown on the Drawings.

- C. Horizontal and vertical bends between zero degrees (0°) and ten degrees (10°) deflection angle shall not require thrust blocks or harnessed or restrained joints.
- D. Horizontal and vertical bends between ten degrees (10°) and ninety degrees (90°) deflection angle shall have thrust restraint as shown on the Drawings.
- E. Provide thrust restraint at tees, plugs, blowoff drains, valves and caps, or other locations as indicated on the Drawings.
- F. Reinforced concrete encasement of sanitary sewer force main pipe and fittings may be used in lieu of manufactured joint restraint systems. Alternate joint restraint systems using reinforced concrete encasement shall conform to following design requirements.
  - 1. Design calculations shall be performed and sealed by Professional Engineer licensed in the State of Texas.
  - 2. Base design calculations upon soil parameters quantified in geotechnical report for site where alternative thrust restraint system is to be installed. When data is not available for site, use parameters recommended by geotechnical engineer.
  - 3. The design system pressure shall be the specified test pressure.
  - 4. The following safety factors shall be used in sizing restraint system:
    - a. Apply factor of safety equal to one and one-half (1.5) for passive soil resistance.
    - b. Apply factor of safety equal to two (2.0) for soil friction.
  - 5. Encasement shall remain entirely within standard trench width and terminate on both ends at pipe bell or coupling.
  - 6. Concrete encasement reinforcement steel shall be designed for all loads, including internal pressure and longitudinal forces. Concrete design shall be in accordance with ACI 318.

**PART III: EXECUTION**

**3.1 PIPE INSTALLATION BY OPEN-CUT**

- A. Perform excavation, bedding and backfill in accordance with Section 02125 – Excavation and Backfill for Utilities.
- B. Wrap ductile iron pipe (DIP) and fittings with polyethylene wrap in accordance with requirements of Section 02260 – Polyethylene Wrap. Do not install polyethylene wrap on ductile iron pipe protected by cathodic protection system, or fusion bonded or polyurethane coated fittings.
- C. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.
- D. Install pipe only after excavation is completed, bottom of trench is fine graded, bedding material is installed and trench has been approved by

the Project Manager.

- E. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.
- F. Install pipe with spigot ends toward direction of flow. Form concentric joint with each section of adjoining pipe so as to prevent offsets.
- G. Keep interior of pipe clean as installation progresses. Where cleaning after laying pipe is difficult because of small pipe size, use suitable swab or drag in pipe and pull it forward past each joint immediately after joint has been completed. Remove foreign material and debris from pipe.
- H. Provide lubricant, place and drive home newly-laid pipe with come-along winches so as to eliminate damage to pipe. Install pipe to "home" mark where provided. Use of backhoes or similar powered equipment shall not be allowed unless protective measures are provided and approved in advance by the Project Manager.
- I. Keep excavations free of water during construction and until final inspection.
- J. When the Work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.
- K. Where sanitary sewer force main is to be installed under existing water line with separation distance of less than two feet (2 Ft), install one (1) full joint length of pipe, minimum eighteen foot (18 Ft) length, centered on water line and maintain minimum six inch (6 In) separation distance. Embed sanitary sewer force main in cement-stabilized sand for minimum distance of nine feet (9 Ft) on each side of crossing.

**3.2 PIPE INSTALLATION OTHER THAN OPEN-CUT**

- A. For installation of pipe by augering, jacking or tunneling, conform to requirements of specification section of augering or tunneling work.

**3.3 HYDROSTATIC TESTING**

- A. After pipe and appurtenance have been installed, test line and drain. Prevent damage to the Work or adjacent areas. Use clean water to perform tests.
- B. The Project Manager may direct tests of relatively short sections of completed lines to minimize traffic problems or potential public hazards.
- C. Test pipe in presence of the Project Manager.
- D. Test pipe at one hundred fifty pounds per square inch (150 psi) or one and one-half (1.5) times design pressure of pipe, whichever is greater. Design pressure of sanitary sewer force main shall be rated total dynamic head of lift station pump.
- E. Test pipe at required pressure for minimum of four hours (4 Hrs) according to requirements of UNI-B-3.
- F. Maximum allowable leakage shall be as calculated by following formula:

$$L = (S) (D) (P_{0.5}) / 133,200$$

Where: L = Leakage in gallons per hour.  
S = Length of pipe in feet.  
D = Inside diameter of pipe in inches.  
P = Pressure in pounds per square inch.

- G. Correct defects, cracks or leakage by replacement of defective items or by repairs as approved by the Project Manager.
- H. Plug openings in sanitary sewer force main after testing and flushing. Use cast iron plugs or blind flanges to prevent debris from entering tested pipeline.

### 3.4 PIGGING TEST

- A. After completion of hydrostatic testing and prior to final acceptance, test sanitary sewer force mains longer than two hundred feet (200 Ft) by pigging to ensure pipe is free of obstructions.
- B. Pigs: Provide proving pigs manufactured of open-cell polyurethane foam body, without coating or abrasives which would scratch or otherwise damage interior pipe wall surface or lining. Pigs shall be able to pass through reductions of up to sixty-five percent (65%) of nominal cross-sectional area of pipe. Pigs shall be able to pass through standard fittings such as forty-five degree (45°) and ninety degree (90°) elbows, crosses, tees, wyes, gate valves or plug valves, as applicable to sanitary sewer force main being tested.
- C. Test Execution: Conduct pigging test in presence of the Project Manager. Provide at least forty-eight hours (48 Hrs) notice of scheduled pigging of sanitary sewer force main prior to commencing test.

**END OF SECTION**