

Section 02506

POLYVINYL CHLORIDE PIPE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Polyvinyl chloride pressure pipe for water distribution, in nominal diameters 4 inches through 20 inches.
- B. Polyvinyl chloride sewer pipe for gravity sewers in nominal diameters 4 inches through 48 inches.
- C. Polyvinyl chloride pressure pipe for gravity sewers and force mains in nominal diameters 4 inches through 20 inches.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

- 1. No separate payment will be made for PVC pipe under this Section. Include cost in unit price for work included as specified in the following sections:

- a. Section 02511 - Water Lines
- b. Section 02531 - Gravity Sanitary Sewers

Section 02532 - Sanitary Sewer Force Mains

Section 02631 - Storm Sewers

- 2. Refer to Section 01270 - Measurement and Payment for unit price procedures.

- B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 REFERENCES

- A. ANSI A 21.16 (AWWA C 116) - Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey Iron Fittings for Water Supply Service.
- B. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
- C. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

- D. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- E. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- F. ASTM D 2444 - Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).
- G. ASTM D 2680 - Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- H. ASTM D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- I. ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- J. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- K. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- L. ASTM F 679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- M. ASTM F 794 - Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- N. ASTM F 949 - Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.
- O. AWWA C 110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches for Water.
- P. AWWA C 111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- Q. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches for Water Distribution.
- R. AWWA C 905 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. through 48 In., for Water Transmission and Distribution.

- S. AWWA C 909 - Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.
- T. PPI TR3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.
- U. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.

1.04 SUBMITTALS

- A. Conform to requirements of Section 01330 - Submittal Procedures.
- B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

1.05 QUALITY CONTROL

- A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this Section and AWWA C 900, AWWA C 909 and AWWA C 905 for pressure pipe applications, or appropriate ASTM standard specified for gravity sewer pipe.
- B. Submit manufacturer's certification that PVC pressure pipe for water lines and force mains has been hydrostatically tested at factory in accordance with AWWA C 900, AWWA C 909 and AWWA C 905, and this Section.
- C. When foreign manufactured material is proposed for use, have material tested for conformance to applicable ASTM requirements by certified independent testing laboratory located in United States. Certification from other source is not acceptable. Furnish copies of test reports to City Engineer for review. Cost of testing paid by Contractor.

PART 2 PRODUCTS

2.01 MATERIAL

- A. Use PVC compounds in manufacture of pipe that contain no ingredient in amount that has been demonstrated to migrate into water in quantities considered to be toxic.
- B. Furnish PVC pressure pipe manufactured from Class 12454-A or Class 12454-B virgin PVC compounds as defined in ASTM D 1784. Use compounds qualifying for rating of 4000 psi for water at 73.4 F per requirements of PPI TR3. Provide pipe, which is homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties. Deliver pipe with surfaces free from nicks and scratches with joining surfaces of spigots and joints free from gouges and imperfections, which could cause leakage.

- C. PVC Restrained Pipe: Must be listed on City's current Product Approval List.
 - 1. Pipe Material:
 - a. DR 18: For restrained joints where shown on Drawings.
 - b. DR 14: For alternate to offset pipe sections shown on Drawings. Do not use PVC for offset sections with depth of cover greater than 20 feet or less than 4 feet. Do not use PVC in potentially petroleum contaminated areas.
- D. Water Service.
 - 1. Provide self-extinguishing PVC pipe that bears Underwriters' Laboratories mark of approval and is acceptable without penalty to Texas State Fire Insurance Committee for use in fire protection lines.
 - 2. Bear National Sanitation Foundation Seal of Approval (NSF-PW).
- E. Gaskets:
 - 1. Gaskets shall meet requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.
 - 2. Flat Face Mating Flange: Full faces 1/8-inch thick ethylene propylene (EPR) rubber.
 - 3. Raised Face Mating Flange: Flat ring 1/8-inch ethylene propylene (EDR) rubber, with filler gasket between OD of raised face and flange OD to protect flange from bolting moment.
- F. Lubricant for rubber-gasketed joints: Water soluble, non-toxic, non-objectionable in taste and odor imparted to fluid, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets.
- G. Use single manufacturer to furnish PVC pipe. When approved PVC system is used as alternate to offset pipe section, a second manufacturer may be used.
- H. Do not use PVC in potentially or known contaminated areas.
- I. Do not use PVC in areas exposed to direct sunlight.

2.02 WATER SERVICE PIPE

- A. Pipe 4-inch through 12-inch: AWWA C 900, AWWA C 909, Class 150, DR 18; AWWA C 900, Class 200, DR 14 as alternate to offset pipe sections; nominal 20-foot lengths; cast-iron equivalent outside diameters.

- B. Pipe 14-inches through 20-inches: AWWA C 905; Class 235; DR 18; nominal 20-foot lengths; cast-iron equivalent outside diameter.
- C. Provide pipe manufactured by J-M Manufacturing Company, North American, Diamond Plastics Corporation, I-Pex, Certain Teed Corporation or Uponor ETI.
- D. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by City Engineer.
- E. Hydrostatic Test: AWWA C 900, AWWA C 905, AWWA C 909, ANSI A 21.10 (AWWA C 110); at point of manufacture; submit manufacturer's written certification.

2.03 GRAVITY SEWER PIPE

- A. PVC gravity sanitary sewer pipe and storm sewer pipe shall be in accordance with provisions in following table:

WALL CONSTRUCTION	MANUFACTURER	PRODUCT OPTIONS	ASTM DESIGNATION	SDR (MAX.)/ STIFFNESS (MIN.)	DIAMETER SIZE RANGE
Solid	J-M Pipe CertainTeed Can-Tex Carlton Diamond Uponor ETI North American	Approved	D3034	SDR 26 / PS 115	6" to 10"
		Approved	D3034	SDR 35 / PS 46	12" & 15"
		Approved	F679	SDR 35 / PS 46	18" to 27"
		Approved	AWWA C900	DR 18 / N/A	4" to 12"
		Approved	AWWA C909	DR 18 / N/A	4" to 12"
		Approved	AWWA C905	DR 18 / N/A	14" to 16"
Truss (Gasketed)	Contech	Preapproved	D2680	N/A /200 psi	8" to 15"
Profile	Contech A-2000	Preapproved	F949	N/A / 46 psi	12" to 36"
	Contech A-2026		F949	N/A / 115 psi	8" to 10"
	ETI, Ultra-Rib	Preapproved	F794	N/A / 46 psi	8" to 30"
	ETI, Ultra-Corr	Preapproved	F794	N/A / 46 psi	24" to 36"

- B. When solid wall PVC pipe 18 inches to 27 inches in diameter is required in SDR 26, provide pipe conforming to ASTM F 679, except provide wall thickness as required for SDR 26 and pipe strength of 115 psi.

- C. For sewers up to 12-inch-diameter crossing over water lines, or crossing under water lines with less than 2 feet separation, provide minimum 150 psi pressure-rated pipe conforming to ASTM D 2241 with suitable PVC adapter couplings.
- D. Joints: Spigot and integral wall section bell with solid cross section elastomeric or rubber ring gasket conforming to requirements of ASTM D 3212 and ASTM F 477, or ASTM D 3139 and ASTM F 477. Gaskets shall be factory-assembled and securely bonded in place to prevent displacement. Manufacturer shall test sample from each batch conforming to requirements ASTM D 2444.
- E. Fittings: Provide PVC gravity sewer sanitary bends, tee, or wye fittings for new sanitary sewer construction. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings are not acceptable.

16 Conditioning. Conditioning of samples prior to and during tests are subject to approval by City Engineer. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified.

17 Pipe Stiffness. Determine pipe stiffness at 5% deflection in accordance with Test Method D 2412. Minimum pipe stiffness shall be 46psi. For diameters 4 inches through 18 inches, test three specimens, each a minimum of 6 inches (152 mm) in length. For diameters 21 inches through 36 inches, test three specimens, each a minimum of 12 inches (305 mm) in length.

18 Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.04F, in suitable press until internal diameter has been reduced to 60 percent of original inside diameter of pipe. Rate of loading shall be uniform. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of pipe walls or bracing profiles. Perform the flattening test in conjunction with pipe stiffness test.

Joint Tightness. Test for joint tightness in accordance with ASTM D 3212, except that joint shall remain watertight at minimum deflection of 15%. Manufacturer will be required to provide independent third party certification for joint testing each diameter of storm sewer pipe.

J. Purpose of Tests. Flattening and pipe stiffness tests are intended to be routine quality control tests. Joint tightness test is intended to qualify pipe to specified level of performance.

2.04 SANITARY SEWER FORCE MAIN PIPE

- A. Provide PVC pressure pipe conforming to requirements for water service pipe, and conforming to minimum working pressure rating specified in Section 02532 - Sanitary Sewage Force Mains.

- B. Manufacturers: Approved manufacturers of pressure rated, solid wall PVC pipe for sanitary sewer force mains are:
1. J-M Manufacturing Company, Inc.
 2. CertainTeed Corporation
 3. Diamond Plastics Corporation
 4. Uponor ETI
- C. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting requirements of ASTM F 477. In designated areas requiring restrained joint pipe and fittings, use EBAA Iron Series 2000PV, JCM 600 Series, Uniflange Series 1350 restrainer, Certa-Lok or Yelomine with One Bolt, or equal joint restraint device conforming to UNI-B-13, for PVC pipe 12-inch diameter and less.
- D. Fittings: Provide ductile iron fittings as per Section 02501 - Ductile Iron Pipe and Fittings, Paragraph 2.04, except furnish fittings with one of following internal linings:
1. Nominal 40 mils (35 mils minimum) virgin polyethylene complying with ASTM D 1248, heat fused to interior surface of fitting, as manufactured by American Cast Iron Pipe "Polybond", or U.S. Pipe "Polyline".
 2. Nominal 40 mils (35 mils minimum) polyurethane, Corro-pipe II by Madison Chemicals, Inc.
 3. Nominal 40 mils (35 mils minimum) ceramic epoxy, Protecto 401 by Enduron Protective Coatings.
 4. Nominal 40 mils (35 mils minimum) fusion bonded epoxy, H. B. Fuller Company.
- E. Exterior Protection: Provide polyethylene wrapping of ductile-iron fittings as required by Section 02528 - Polyethylene Wrap.
- F. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Paragraph 2.02E.

2.05 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

- A. Bends and Fittings: ANSI A 21.10 or ANSI A 21.53, ductile iron; ANSI A 21.11 single rubber gasket push-on type joint; minimum 150 psi pressure rating. Certa-Lok PVC restrained joints, 250 psi, may be provided for up to 12 inches in diameter (water or sanitary).

- B. Fittings: JCM 610/620 Sur-Grip Fitting Restrainer by JCM Industries, Inc. or Series 500 Fitting Restrainer by Ebba Iron, Inc., One Bolt by One Bolt, Inc. or approved equal. Integral restrained joint fittings and pipe do not require secondary restraint.

PART 3 EXECUTION

3.01 PROTECTION

- A. Store pipe under cover out of direct sunlight and protect from excessive heat or harmful chemicals in accordance with manufacturer's recommendations.

3.02 INSTALLATION

- A. Conform to requirements of Section 02511 - Water Lines, Section 02531 - Gravity Sanitary Sewers, and Section 02532 - Sanitary Sewer Force Mains, as applicable.
- B. Install PVC pipe in accordance with Section 02317 - Excavation and Backfill for Utilities, ASTM D 2321 for Sewer Pipe, and manufacturer's recommendations.
- C. Install PVC water service pipe to clear utility lines and have minimum depth of cover below property line grade of street, unless otherwise required by Drawings:
 - 11 Water service pipe 12 inches in diameter and smaller 4 feet of cover.
 - 12 Water service pipe 16 inches in diameter and larger 5 feet of cover.
- D. Avoid imposing strains that will overstress or buckle pipe when lowering pipe into trench.
- E. Hand shovel pipe bedding under pipe haunches and along sides of pipe barrel and compact to eliminate voids and ensure side support.
- F. Store PVC pipe under cover out of direct sunlight. Protect pipe from excessive heat or harmful chemicals. Prevent damage by crushing or piercing.
- G. Allow PVC pipe to cool to ground temperature before backfilling when assembled out of trench to prevent pullout due to thermal contraction.

3.03 PVC RESTRAINED MECHANISM: CERTA-LOK OR YELOMINE

- A. Do not apply lubricant to spline or pipe or coupling spline grooves.
- B. Do not use excessive force while inserting the spline through coupling.
- C. Insert spline until it is fully seated around circumference of pipe.
- D. Field Cutting of Pipe Ends:

1. Perform by workers certified by manufacturer.
2. Use a PVC pipe cutter and provide square ends.
3. Use manufacturer approved power routing and grooving tool to field fabricate required pipe groove.

END OF SECTION