

## SECTION 33 05 31.16

### POLYVINYL CHLORIDE (PVC) PIPE

#### PART 1: GENERAL

##### 1.1 SECTION INCLUDES

PVC pipe and fabricated fittings in nominal sizes 4-inches through 12-inches with cast iron pipe equivalent outside diameters.

##### 1.2 SUBMITTALS

Submit manufacturer's product data, installation instructions and certification for all materials to be furnished in accordance with Specification Section 01 00 04. Submit classification and gradation test results for embedment and pipe backfill material.

#### PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Section assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation, the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify Owner immediately. Stop installing piping in the area of suspected contamination until Owner provides direction.

PVC Schedule 40 or 80 is not permitted for conveying wastewater or potable water within distribution or collection systems. However, it may be used in other applications, such as conveying chemicals or for drainage.

##### 2.1 GRAVITY SEWER PIPE

- A. PVC gravity sanitary sewer pipe shall be green in color and in accordance with provisions in following table except where specified differently on the Drawings:

B.

Type of service	Acceptable Materials
Gravity Mains with depth of cover $\leq$ 10 feet	PVC SDR 26
Gravity Mains with depth of cover 10-15 feet	PVC SDR 26
Gravity Mains with depth of cover > 15 feet	PVC SDR 21, Ductile Iron Pipe, or As shown on Drawings

- C. When solid wall PVC pipe 18-inches to 27-inches in diameter is required in SDR 26, provide pipe conforming to ASTM F679, except provide wall thickness as required for SDR 26 and pipe strength of 115 psi.
- D. 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 D2241 with suitable PVC adapter couplings.
- E. Joints: Spigot and integral wall section bell with solid cross section elastomeric or rubber ring gasket conforming to requirements of ASTM D3212 and ASTM F477, or ASTM D3139 and ASTM F477. Gaskets shall be factory-assembled and securely bonded in place to prevent displacement. Manufacturer shall test sample from each batch conforming to requirements ASTM D2444
- F. 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.
- G. Conditioning. Conditioning of samples prior to and during tests is subject to approval by Owner. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D618 at 73.4° F  $\pm$  3.6° 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.
- H. Pipe Stiffness. Determine pipe stiffness at 5 percent deflection in accordance with Test Method D 2412. Minimum pipe stiffness shall be 46 psi. For diameters 4-inches through 18-inches, test three specimens, each a minimum of 6-inches (150 mm) in length. For diameters 21-inch through 36-inch, test three specimens, each a minimum of 12-inch (300 mm) in length.

- I. 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.
- J. Joint Tightness. Test for joint tightness in accordance with ASTM D3212, except that joint shall remain watertight at minimum deflection of 5 percent. Manufacturer will be required to provide independent third party certification for joint testing each diameter of storm sewer pipe.
- K. 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.

## 2.2 SANITARY SEWER FORCE MAIN PIPE

- A. PVC sanitary sewer force main pipe shall be green in color. Provide approved PVC pressure pipe conforming to requirements for water service pipe, and conforming to minimum working pressure rating specified in Section 33 34 00 - Sanitary Sewer Force Mains.
- B. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting requirements of ASTM F477. In designated areas requiring restrained joint pipe and fittings, use approved joint restraint device conforming to UNI-B-13, for PVC pipe 12-inch diameter and less.
- C. Fittings: Provide ductile iron fittings as per Section - Ductile Iron Pipe and Fittings, except furnish fittings with one of following approved internal linings:
  - 1. Nominal 40 Mils (35 Mils minimum) virgin polyethylene complying with ASTM D 1248, heat fused to interior surface of fitting
  - 2. Nominal 40 Mils (35 Mils minimum) polyurethane
  - 3. Nominal 40 Mils (35 Mils minimum) ceramic epoxy
  - 4. Nominal 40 Mils (35 Mils minimum) fusion bonded epoxy
- D. Exterior Protection: Provide polyethylene wrapping of ductile-iron fittings as required by Section 33 06 00 - Polyethylene Wrap.
- E. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Specifications.

## 2.3 RECEIVING, HANDLING AND STORAGE

- A. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside and clearly mark defective, damaged or unsound material and hold material for inspection by Owner.
- B. Load and unload all materials in accordance with Manufacturer's recommendations and in such a manner as to prevent damage. Do not drop pipe and accessories or handle them in a rough manner.
- C. Provide safe storage for all materials. Cover stored pipe that will be exposed to sunlight for periods longer than 6 months. Cover with canvas or other opaque material with provision for adequate air circulation. PVC pipe shall not be stored close to heat sources, such as heaters, boilers, steam lines, or engine exhaust.

## PART 3: EXECUTION

### 3.1 INSTALLATION

Follow the provisions of Section 33 05 05 - Piping - General Provisions, and Sanitary Sewer Force Mains in addition to the following requirements:

- A. Remove all dirt and foreign matter from pipe before lowering it into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.
- B. Lay pipe with the bell end pointing in the direction of work progress. Do not roll, drop or dump pipe or appurtenances into the trench.
- C. Assemble push-on joints in accordance with the pipe manufacturer's recommendations. Assemble mechanical joints in accordance with the fitting Manufacturer's recommendations.
- D. Cut pipe with pipe saws, circular saws, handsaws, or similar equipment. Provide a smooth end at a right angle to the longitudinal axis of the pipe. Deburr, bevel, and re-mark insertion line on spigot ends. Match factory bevel length and angle for field bevels. When connecting to certain shallow depth bells, such as those on some cast iron fittings and valves, cut off the factory bevel and prepare a deburred, square cut end with a slight outer bevel.
- E. Clean the sealing surface of the spigot end, the pipe bell, the coupler or fitting, and the elastomeric gaskets immediately before assembly. Do not remove factory installed gaskets for cleaning. Keep the joint free of dirt, sand, grit, grease or any foreign material. Apply approved lubricant when assembling gasketed joints in accordance with the pipe manufacturer's requirements. The use of improper lubricants can damage gaskets. Excessive lubricant use can make disinfection more difficult and cause taste and odor problems when the line is placed in service.

- F. Good pipe alignment is essential for proper joint assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or “stab” the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion. Avoid metal to plastic contact with the pushing the pipe home (use wood or other material to cushion moving the pipe).
- G. Assemble pipe using the following types of joints:
  - 1. Gasketed bell joint – Integral with the pipe or fitting
  - 2. Gasketed coupling – A double gasketed coupling
  - 3. Mechanical joint – Any of the several joint designs that have gaskets and bolts manufactured in accordance with AWWA standards.
- H. Tracer Wire
  - 1. Place tracer wire in accordance with Section 33 05 97.16 – Markers for Utility Identifications.
  - 2. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack Model No. 054007-09053, or approved equal.
- I. All pressure and leakage testing shall be done in accordance with Specification Section 33 05 05.31 – Hydrostatic Testing Water.
- J. PVC pipe fittings shall employ ductile iron pipe fittings per Specifications 33 05 19.01. See detail drawings for transitions between different pipe materials.
- K. Gaskets - Gaskets shall be as provided or recommended by Manufacturer and satisfy AWWA standard C111 in all respects. Where ductile iron pipe and PVC pipe are directly connected, the appropriate gasket material for this purpose shall be employed. As noted in the products section of this specification, some gasket materials are prone to permeation of certain hydrocarbons which may exist in the soil (see Part 2). Under these conditions and at the discretion of Owner, the Contractor shall be required to provide FKM (Viton, Flourel) gasket material in areas of concern.

### 3.2 SERVICE CONNECTIONS

- A. Install service connections in accordance with AWWA Standard C605 and the manufacturer’s recommendations using the following methods:
  - 1. Tapping is only permitted through the use of service clamps or saddles.
  - 2. Using injection molded couplings with threaded outlets.

3. Tapping with large service connections through appropriately sized tapping sleeves and valves.

**END OF SECTION 33 05 31.16**