

SECTION 60

POLYVINYL CHLORIDE (PVC) WATER PRESSURE PIPE

PART 1 - GENERAL

1.01 SCOPE

- A. The work covered by this section includes furnishing all labor, equipment, and materials required to install and test polyvinyl chloride (PVC) pressure pipe, including valves, unions, fittings, couplings, adapters, and accessories, as shown on the Drawings and/or specified herein.
- B. The Contractor's attention is called to the fact that all PVC piping and accessories are not necessarily shown completely on the Drawings which are more or less schematic. However, the Contractor shall furnish and install all piping indicated or required for proper operation of the equipment or services requiring such piping.

1.02 QUALITY ASSURANCE

- A. The Contractor, at the Engineer's request, shall furnish a certificate from the manufacturer of the pipe and fittings that the manufacturer is fully competent and capable of manufacturing PVC pipe and fittings of uniform texture and strength that will fully comply with these specifications and have so manufactured this class of pipe in sufficient quantities to be certain that it will meet all normal field conditions of usage. The manufacturer must have adequate equipment and quality control facilities to be sure that each extrusion of pipe is uniform in texture, dimensions, and strength.
- B. All pipe shall be tested and inspected at the place of manufacture for all requirements of the latest ASTM and Commercial Standard tests.
- C. Each length of pipe and each fitting shall have the following data clearly marked on each piece:
 - 1. Nominal size
 - 2. Type and grade of material and ASTM standard
 - 3. SDR, class, or schedule rating
 - 4. Manufacturer
 - 5. National Sanitation Foundation's seal of approval

1.03 SHOP DRAWINGS AND MATERIAL SPECIFICATIONS

Complete shop drawings and material specifications shall be submitted to the Engineer upon receipt of bids.

1.04 STORAGE AND PROTECTION

- A. PVC pipe and fittings shall be stored under black plastic cover.
- B. All pipe and accessories shall be stored aboveground and fully supported so as not to bend or deflect excessively under its own weight. Height of stacked pipe shall not exceed 4 feet. Bundled pipe shall not be stacked more than two bundles high.
- C. Kinked, flattened, buckled, broken, or otherwise defective pipe and fittings shall not be used and shall be removed from the site.
- D. Pipe shall be handled using nylon slings. Wire rope slings or chains shall not be used.

1.05 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

1.06 RECORD DRAWINGS

Record drawings shall be prepared on reproducible mylars and given to Cleveland Utilities within thirty (30) calendar days of acceptance by C.U. of the completed project. The data to be included on the record drawings shall include as a minimum the following:

- 1. All changes and revisions to the original water plans;
- 2. Planview of the water lines and any revisions;
- 3. Location of all valves, fire hydrants, tees, blow offs, etc....
- 4. Length of the water line measured from beginning of job to end of job. This includes any extensions which may be added to original job.

PART 2 - PRODUCTS

2.01 PVC PIPE AND FITTINGS

- A. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density, and other physical properties.
- B. The manufacturer shall provide waterstops, acceptable to the Engineer, which shall be applied to the outside of plastic pipe when the pipe is to be enclosed in any structure where concrete or mortar is used which will prevent leakage along the outer wall of the barrel of the pipe.
- C. No single piece of pipe shall be laid on any project covered by this specification unless it is found to be generally straight. Such pipe shall have a maximum ordinate as measured from the concave side of the pipe not to exceed 1/16 inch per foot of length. If the deviation from straightness exceeds this requirement, then the particular piece of pipe shall be rejected for use until it can comply with this provision.
- D. Wyes, tees, bends, and adapters and any other fittings required or directed by the Engineer shall be constructed of ductile iron as directed in Section 50 of these Specifications. Engineering data for such fittings showing cross-sectional views with dimensions shall be provided and such data and fittings shall be approved by the Engineer prior to their use. The materials used in the manufacture of fittings shall conform with the requirements for the pipe with which they shall be used and any variation of such requirements shall be subject to the approval of the Engineer. Fittings shall have wall thicknesses equal to or greater than that of the pipe to which they are joined.

2.02 PIPE

- A. PVC pipe shown on the Drawings to be installed outside of structures or buried underground and used to convey water or wastewater shall have push-on joints unless otherwise noted on the Drawings. All pipe material shall be Grade 1, Type I, polyvinyl chloride (PVC) in accordance with ASTM D 1784, Class 12454-B. All pipe material shall be National Sanitation Foundation approved for use with potable water. Pipe in sizes 2 inches through 12 inches shall be either SDR 21 with 200 psi pressure rating in accordance with ASTM D 2241 or Class 200 in accordance with AWWA C 900, depending on which is called for on the Drawings or in the Bid Schedule. Maximum lengths of pipe shall not exceed 20 feet.

2.03 FITTINGS

- A. All fittings required in PVC piping systems conveying water shall be cast iron or ductile iron as specified in Section 50 of these Specifications. Engineering data for fittings showing cross-sectional views with dimensions shall be provided and such data and fittings shall be approved by the Engineer prior to their use. Connections between cast iron or ductile iron fittings and PVC pipe shall be made by use of special adapters similar to Mueller Transition Gland A-399 by Mueller Company, Transition Gasket F6340 by Clow Corporation or a similar transition which has been approved by the Engineer. The joint shall be mechanical joint for ductile iron or cast iron as described in Section 50 of these Specifications.

2.04 JOINTS

A. Push-On Joints

1. The joints shall be designed so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be single rubber gasket joint designed to be assembled by the positioning of a continuous, molded, rubber ring gasket in an annular recess in the pipe or fitting entering pipe into the socket thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the joint manufacturer's standard practice. The joints shall be designed so as to provide for the thermal expansion or contraction experienced with a total temperature change of at least 75⁰ F in each joint per length of pipe. The joint shall comply with ASTM F 477.
2. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to water. The lubricant containers shall be labeled with the manufacturer's name.
3. Gaskets shall meet all applicable requirements of ANSI A21.11. Gasket dimensions shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to effect a positive seal under all combinations of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark and year of manufacture shall be molded in the rubber on the back of the gaskets.

4. Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two hardnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material, and visible defects.
5. The gasket manufacturer shall set up such quality control procedures as will insure the gasket's meeting the requirements of this standard. He shall furnish a monthly report of representative quality control test results to the pipe manufacturer.
6. A sample push-on fitting shall be submitted to the Engineer for examination and approval prior to delivery of any pipe.

PART 3 - EXECUTION

3.01 LAYING PIPE

- A. All provisions with respect to trenching, backfilling, bedding, and pipe laying shall conform to the applicable requirements of the sections entitled "Earthwork" and "Ductile Iron Piping and Ductile Iron and Cast Iron Fittings" of these Specifications.
- B. All provisions with respect to connections and existing utilities shall comply with the applicable requirements of the section entitled "Ductile Iron Piping and Ductile Iron and Cast Iron Fittings" of these Specifications.
- C. When a joint consists of a PVC flange and a metal flange, the metal flange shall be flat faced and furnished with a full face resilient gasket.
- D. Where specifically shown or called for on the Drawings, service line taps into PVC pipe shall be made using tapping saddle constructed for use on PVC pipe. The saddle shall be constructed of bronze or brass, shall have all stainless steel bolts or screws, and have a resilient rubber gasket to provide a positive, watertight seal.
- E. PVC pipe laid underground shall have a minimum of 36 inches of cover in both traveled and non-traveled (open) areas. See construction detail drawing titled "Water Line Depth Requirements" for further details regarding the relationship of water pipe elevation to adjacent roadways, pipe bedding, etc. If this condition cannot be met, ductile iron pipe or concrete encasement must be used.
- F. After completing installation and bedding of water and service lines, backfill to the top of the pipe with suitable material. Install No. 12 or 14 gage cap wire directly over the water and service pipe. Then proceed to backfill to within 18

inches from finished ground elevation. Install a second layer of detection tape (2" WATER LINE) directly over the installed water and service pipe. Provide enough free end at each hydrant, valve, and meter to allow for the wire to be located and attached easily. The wire should be attached to each hydrant, valve and meter as directed by the Engineer. Type, width, color, and marking of wire must be approved by the Engineer.

3.02 FIELD TESTING

- A. After all piping has been placed and backfilled between the joints, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.
- B. All piping shall be subject to a hydrostatic gauge pressure equal to the rated pressure class of the pipe being tested. The allowable leakage shall be as shown in Table 1. The duration of the test shall be a minimum of 2 hours.
- C. The Contractor shall take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Delicate equipment shall be valved off, removed, or otherwise protected.
- D. All piping shall be securely anchored and restrained against movement prior to application of test pressures. Prior to the pressure test, pipe laid in trenches shall be partially backfilled adequately to secure the pipe during the test. All joints, fittings, and valves will be left open where possible. All exposed pipe, fittings, valves, and joints shall be carefully examined during the pressure test.
- E. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants, blow-offs, or air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.
- F. Any excessive leakage developing during the test shall be corrected at the Contractor's expense. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the specified leakage limits.
- G. After all tests on any section have been completed to the satisfaction of the Engineer, the Contractor shall carefully clean, blow out, and drain the line of all water to prevent the freezing of the same. The Contractor shall also demonstrate to the satisfaction of the Engineer that any and all lines are free from obstructions and foreign material.

- H. The Contractor shall bear the complete cost of the tests, including set-up, labor, temporary piping, blocking, gauges, bulkheads, water, air, soap solutions, and any other materials required to conduct the tests.

TABLE 1

ALLOWABLE LEAKAGE

U. S. Gallons per 100 Joints per Hour

Pipe Diameter (inches)	Test Pressure (psi)			
	<u>50</u>	<u>100</u>	<u>150</u>	<u>200</u>
4	0.35	0.50	0.60	0.75
6	0.53	0.75	0.90	1.10
8	0.70	1.00	1.20	1.40
10*	0.88	1.25	1.50	1.75
12*	1.05	1.50	1.80	2.10

*Single-gasket coupling is one joint. Twin-gasket coupling is two joints.

3.03 DISINFECTION

After installation and testing, all potable water piping shall be disinfected in accordance with the requirements of Section 130 entitled "Sterilization" of these Specifications.

** END OF SECTION **