

SECTION 45

WASTEWATER FORCE MAINS

45.1 GENERAL

These specifications cover the pipe, fittings, and accessory items used for wastewater force main systems.

Pipe used in wastewater force main systems shall be either Polyvinyl Chloride (PVC), or Ductile Iron Pipe (DIP). Prestressed Concrete Cylinder Pipe (PCCP) may be allowed if prior approval is obtained from the CITY.

The CONTRACTOR shall be responsible for all materials furnished and storage of same, until the date of project completion. He shall replace at his expense all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by the CITY, furnish certificates, affidavits of compliance, test reports, or samples for check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

45.2 PIPE INSPECTION AND TEST

Requirements specified in Section 40.5 shall apply.

45.3 PVC PIPE

45.3.1 PVC PIPE

All PVC pipe of nominal diameter six (6) through twelve (12) inches shall be manufactured in accordance with AWWA standard C900. The PVC pipe shall have a minimum working pressure rating of 100 psi and shall have a dimension ratio (DR) of 25. Pipe shall be the same O.D. as ductile iron pipe. PVC pipe of nominal diameter four (4) inches may be AWWA Standard C900, DR 25 or PVC pipe with a Standard Dimension Ratio (SDR) of 21.

45.3.2 JOINTS

PVC pipe shall have integral bell push-on type joints conforming to ASTM D3139.

45.3.3 FITTINGS

Fittings used with PVC pipe shall conform to Section 45.4.

45.4 DUCTILE IRON PIPE AND FITTINGS

45. 4. 1 DUCTILE IRON PIPE

All ductile iron pipe of nominal diameter four (4) through fifty-four (54) inches shall conform to ANSI/AWWA A21.51/C151. A minimum of Class 50 pipe shall be supplied for all sizes of pipe unless a higher class pipe is specifically called out in the DRAWINGS, or required by the CITY.

45. 4. 2 FITTINGS

All fittings shall be mechanical joint ductile iron or gray iron conforming to ANSI/AWWA A21.10/C110, 250 psi minimum pressure rating, or ductile iron compact fittings four (4) through twelve (12) inches in accordance with ANSI/AWWA A21.53/C153.

45. 4. 3 JOINTS

Joints for ductile iron pipe and fittings shall be push-on or mechanical joints conforming to ANSI/AWWA A21.11/C111, unless otherwise called for on the DRAWINGS. Where called for on the Drawings, restrained or flanged joints shall be provided. Flanged joints shall conform to ANSI Standard B16.1-125 LB. Restrained joints shall conform to Sections 34.3 or 34.4

45. 4. 4 COATINGS AND LININGS

Where ductile iron pipe and fittings are to be below ground or installed in a casing pipe the coating shall be a minimum 1.0 mil thick in accordance with ANSI/AWWA A21.51/C151. Where ductile iron pipe and fittings are to be installed above ground, pipe, fittings and valves shall be thoroughly cleaned and given one field coat (minimum 1.5 mils dry thickness) of rust inhibitor primer. Intermediate and finished field coats of Alkyd shall also be applied by the CONTRACTOR (minimum 1.5 mils dry thickness each coat). Primer and field coats shall be compatible and shall be applied in accordance with the manufacturers recommendations. (See approved manufacturers' list in appendix.) Final field coat color shall be grey for raw wastewater and brown for treated wastewater.

All ductile iron pipe and fittings shall have an interior protective lining of coal tar epoxy or polyethylene with a minimum dry thickness of 30 mils applied by the pipe manufacturer. Polyethylene lining material shall comply with ASTM D-1248 and shall be fused to the interior of the pipe by heat forming a tightly bonded lining. (See approved manufacturers' list in appendix.)

45. 4. 5 POLYETHYLENE ENCASEMENT

The pipe shall be polyethylene encased (8 mil) where shown on the DRAWINGS or required by the CITY in accordance with ANSI/AWWA A21.51/C105.

45.5 PIPE HANDLING

Requirements specified in Section 51.2 shall apply.

45.6 AIR AND VACUUM RELEASE VALVES

45.6.1 GENERAL

Wastewater force mains shall be equipped with either air or air/vacuum release valves located as shown on the DRAWINGS. Valves shall be located in an enclosure as detailed on the STANDARD DRAWINGS.

The valves shall be as described below. (See approved manufacturers' list in appendix.)

45.6.2 WASTEWATER AIR/VACUUM VALVE

The valve body shall be of cast iron ASTM A126-B; the floats, float guide and stem shall be of stainless steel Type 304. The resilient seat shall be of Buna N. The valve shall be suitable for 150 psig working pressure. Valve shall have standard two (2) inch NPT inlets and outlet ports unless otherwise shown on the DRAWINGS. Provisions shall be made for back-flushing the valve with clean water.

45.6.3 WASTEWATER AIR RELEASE VALVE

The valve body and cover shall be cast iron construction, ASTM A126-B, and all internal working parts shall be of stainless steel Type 304. The venting orifice shall be three-eighths ($\frac{3}{8}$) inch in diameter and the seating material shall be of Viton.

The inlet opening shall be standard two (2) inch NPT screwed connection, unless otherwise shown on the Drawings. The valve shall include a flushout feature for periodic cleaning of the internal mechanism. The overall height of the valve body shall not exceed twenty-one (21) inches, unless otherwise shown on the Drawings.

45.7 NOTIFICATION AND CONNECTION TO EXISTING MAINS

Pressure connection to existing wastewater force mains shall comply with the requirements of Section 35.3.

45.8 PLUG VALVES

45. 8. 1 GENERAL

Only plug valves as specified below shall be used on wastewater force main systems. All plug valves shall be installed so that the direction of flow through the valve is in accordance with the manufacturer's recommendations. Valves shall be eccentric plug valve type. (See approved manufacturers list in appendix.)

45. 8. 2 VALVE CONSTRUCTION

Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall meet AWWA C111, Class B.

Valve bodies shall be of ASTM A126, Class B Semi-steel, 31,000 psi tensile strength minimum in compliance with AWWA C507 and C504. All exposed nuts, bolts, springs, washers, etc. shall be zinc or cadmium plated. Resilient plug facings shall be of Hycar or Neoprene.

Port areas for valves four (4) inches through twenty (20) inches shall be eighty (80) percent nominal pipe diameter. Valves twenty-four (24) inches and larger shall have a minimum port area of seventy (70) percent of nominal pipe diameter.

Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings. These bearings shall comply with AWWA C507 and C504.

Seats in four (4) inch and larger valves shall have a welded-in overlay of a high nickel content on all surfaces contacting the plug face which comply with AWWA C507 and C504.

Valve shaft seals shall be adjustable and comply with AWWA C507.

45. 8. 3 VALVE TESTING

Plug valves shall be tested in accordance with AWWA C504. Each valve shall meet the performance, leakage, and hydrostatic tests described in AWWA C504. The leakage test shall be applied to the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof of design testing as described in AWWA C504.

45. 8. 4 ACTUATORS

Manual valves shall have lever or gear actuators and tee wrenches, extension stems, floorstands, etc. as indicated on the plans. All valves six (6) inches and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided

on all shafts to prevent entry of dirt and water into the actuator. All actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be zinc or cadmium plated. Valve packing adjustment shall be accessible without disassembly of the actuator.

45.9 VALVE BOXES

Requirements specified in Section 52.5 shall apply, except that covers shall have "sewer" cast into the top.

45.10 SEPARATION OF FORCE MAINS AND WATER MAINS

Requirements specified in Section 51.3 shall apply.

45.11 FORCE MAIN CONSTRUCTION

Requirements specified in Section 51.4 shall apply.

45.12 HYDROSTATIC TESTS

Requirements specified in Section 51.5 shall apply except that all pipe sections to be tested shall be subjected to a hydrostatic pressure of 100 psi.

45.13 FINAL CLEANING

Prior to final inspection and acceptance of the force main by the CITY, CONTRACTOR shall remove debris from all parts of the system. Flushing and cleaning shall remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the downstream end.

Upon the CITY's final inspection of the pressure pipe systems, if any foreign matter is still present in the system, CONTRACTOR shall clean the sections and portions of the lines as required.

45.14 LOCATION AND IDENTIFICATION

All non-metallic force mains shall be installed with a continuous, magnetically detectable warning tape installed four (4) to six (6) inches below finished grade directly over the pipe and be continuously marked "Caution, Sewage Force Main Buried Below" for location purposes. See STANDARD DRAWINGS. In addition, all PVC force mains shall be either a solid green or white with green lettering. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.

All ductile iron force mains shall be marked with a continuous stripe located within the top ninety (90) degrees of the pipe. Said stripe shall be a minimum two (2) inches in

width and shall be green in color. Backfill shall not be placed for thirty (30) minutes following paint application.