DIVISION IV
GRAVITY SEWERS, FORCE MAINS, AND PUMP STATIONS

SECTION 45

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).

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 the project site for installation is subject to random testing for compliance with the designated specifications.

45. 2 INSPECTION AND TESTING

Requirements specified in Section 40.5 shall apply.

45. 3 POLYVINYL CHLORIDE PIPE AND FITTINGS

45. 3. 1 PVC PIPE

All PVC pipe of nominal diameter six (6) inches and larger shall be manufactured in accordance with AWWA standard C900. The PVC pipe shall have a minimum working pressure rating of 100psi or higher and shall have a dimension ratio (DR) of 18, or 25 as based on the system's design requirements. Pipe shall be the same O.D. as ductile iron pipe.

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.

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45. 4 DUCTILE IRON PIPE AND FITTINGS

45. 4. 1 DUCTILE IRON PIPE

Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 and have a minimum 350psi pressure class rating.

45. 4. 2 FITTINGS

Fittings shall be ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153 and have a minimum 350 p.s.i. pressure class rating.

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 oil based paint 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 manufacturer's recommendations. See approved manufacturers' list in Appendix C. 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 C.

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 C.

45. 6. 2 WASTEWATER AIR/VACUUM VALVE

The valve body shall be of cast iron ASTM A126-B. The float guide, stem, and floats 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. All internal working parts shall be of stainless steel Type 304. The venting orifice shall be three-eights (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

All plug valves shall be installed so that the direction of flow through the valve is in accordance with the manufacturer's recommendations. See Appendix C.

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, unless otherwise approved by the DIRECTOR. 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, 31,000psi 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 4 inches through 20 inches shall be 80 percent nominal pipe diameter. Valves 24 inches and larger shall have a minimum port area of 70 percent of nominal pipe diameter. All exposed nuts, bolts, springs, washers, etc., shall be zinc or cadmium plated. Resilient plug facings shall be of Hycar or Neoprene.

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 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, tee wrenches, extension stems, floor stands, etc. as indicated on the plans. All valves 6-inch 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 the words "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 with the exception that the test pressure shall be 100 p.s.i.

45.13 FINAL CLEANING

Prior to final inspection and acceptance of the force main by the CITY, CONTRACTOR shall flush and clean all parts of the system. Flushing and cleaning

shall include the removal of 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 lettering shall be legible and colors correct for the intended use. See STANDARD DRAWINGS.