

02740 – LOW PRESSURE FORCE MAIN

(Revised 4/28/17)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General	HDPE Pipe	PVC Pipe
Part 2 – Products	Manholes	Service Connections
Part 3 – Execution	Metallic Locating Wire	Steel Encasement
Infiltration/Exfiltration Test	Pipe Laying	Warning Tape
HDPE Fittings	PVC Fittings	

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.
- B. Section 01000 – GENERAL REQUIREMENTS.
- C. Section 02220 – TRENCHING, BACKFILLING AND COMPACTION OF UTILITIES.
- D. Section 02730 – SANITARY SEWER.
- E. Section 02770 – SEWER FLOW CONTROL.

1.2 SUMMARY

This section includes low pressure force main piping and specialties for municipal force mains and services outside of building structures.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to the low pressure force main collection system that comes under the authority of the City of Lynchburg, Virginia as specified within this section and other sections of this manual.

- A. **Low Pressure Force Main:** Exterior pressure sewer system.
- B. **Sanitary Sewer:** Exterior gravity sanitary sewer system.
- C. **Sewer Service:** Exterior domestic sewer piping.

1.4 PERFORMANCE

Piping Pressure Rating: At least equal to system test pressure.

1.5 SUBMITTALS

- A. Submit product data and shop drawings for the following in accordance with Section 01000 – *General Requirements*:
 - 1) Pipe
 - 2) Fittings
 - 3) Piping Appurtenances
 - 4) Precast Concrete Manhole Castings
 - 5) Frame and Covers
- B. Product Certificates from manufacturer
- C. Field Quality Control Reports
- D. **Bypass Pumping:** Contractor shall provide submittals in accordance with Section 02770 – *Sewer Flow Control*.

1.6 QUALITY ASSURANCE

- A. Materials and operations shall comply with the latest revision of all applicable Codes and Standards including but not limited to DEQ regulations.
- B. Piping material shall be marked clearly and legibly.
 - 1) HDPE pipe shall be show identification marks, at intervals not to exceed 5 feet, as follows:
 - a. Nominal pipe diameter
 - b. Company, plant, shift, ASTM, SDR, and date designation
 - c. Service designation or legend.

1.7 STANDARD ABBREVIATIONS

ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
DEQ	Department of Environmental Quality
F	Fahrenheit
HDPE	High Density Polyethylene Pipe
PE	Polyethylene
PPI	Plastic Pipe Institute
SDR	Standard Dimension Ratio

V	Volt
VDH	Virginia Department of Health

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Pipe Condition/Pipe Examination

- 1) **New Pipe Inspection:** Inspect material thoroughly upon arrival. Examine materials for damage. Remove damaged or rejected material from site. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate ASTM Specifications. Check pipe closely for smoothness, roundness, chips, and cracks which may be a source of infiltration. Reject any pipe that will not provide watertight seal or is otherwise structurally deficient.
 - 2) **Pre-Installation Inspections:** Prior to being installed, each pipe shall be carefully examined for damage and conformity with these specifications. All pipe damaged or deemed not to conform to these specifications shall be rejected and removed from the site.
- B. Protect pipe coating during handling using methods recommended by the manufacturer. Use of bare cables, chains, hooks, metal bars, or narrow skids in contact with coated pipe is not permitted.
- C. Observe manufacturer's directions for delivery and storage of material and accessories.
- D. Protect stored piping from entry of water or dirt into pipe.
- E. Support pipe to prevent sagging or bending. Do not store plastic pipe, structures, and fittings in direct sunlight.
- F. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.9 PRODUCT CONDITIONS

1.9.1 SEPARATION OF WATER AND SANITARY AND/OR COMBINED SEWERS

Follow the VDH and DEQ standards for separation of water mains and sanitary sewer lines.

A. Parallel Installations

- 1) **Normal conditions** – Water lines shall be construction at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge-edge.

- 2) **Unusual Conditions** – When local conditions prevent a horizontal separation of at least 10 feet, the water line may be laid closer to a sewer or sanitary sewer manhole provided that:
 - a. The bottom (invert) of the water line is at least 18 inches above the top (crown) of the sewer.
 - b. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved Ductile Iron Pipe pressure tested in place without leakage prior to backfilling. The sewer manhole shall be of watertight construction and tested in place.

B. Crossing

- 1) **Normal conditions** – Water lines shall be construction at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge-edge.
- 2) **Unusual Conditions** – When local conditions prevent a horizontal separation of at least 10 feet, the water line may be laid closer to a sewer or sanitary sewer manhole provided that:
 - a. Sewers passing over or under water lines shall be constructed of the materials described in paragraph A, Parallel Installation, Unusual Conditions – subparagraph 2) b, above.
 - b. Water lines passing under sewers shall, in addition, be protected by providing:
 - i. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line.
 - ii. Adequate structural support the sewers to prevent excessive deflection of the joints, and the settling on and breaking of the water line.
 - iii. That the length of the water line be centered at the point of the crossing so that joints shall be equal distant and as far as possible from the sewer.

- C. **Sanitary and/or Combined Sewers or Manholes** - No water mains/pipes shall pass through or come in contact with any part of a sewer or sewer manhole.

1.9.2 PROTECTION OF WELLS

No sewer shall pass within 50 feet of a drinking water supply well, source, or structure unless special construction and pipe materials are used to obtain adequate protection.

1.10 COORDINATION

- A. Coordinate tie-ins to municipal sewer mains with the City of Lynchburg Water Resources Engineer.
- B. See Section 02770- *Sewer Flow Control* for bypass pumping requirements and procedures.

PART 2 – PRODUCTS

2.1 PIPE AND FITTINGS

2.1.1 HDPE PIPE

A. HDPE Pipe: Less than 4 inches in diameter

- 1) Pipe shall be manufactured from a PE 3408 high density resin compound meeting the specifications of ASTM D3350 with a cell classification of PE:345434C and meeting Type III, Class C, Category 5, Grade P34 per ASTM D1238.
- 2) HDPE pipe shall comply with AWWA Specifications C901.
- 3) The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
- 4) Pipe and accessories shall be 160 psi at 73.4 F degrees meeting requirements of Standard Dimension Ratio (SDR) 11 as a minimum strength.

B. HDPE Pipe: Greater than 4 inches in diameter

- 1) Pipe shall be manufactured from a PE 3408 high density resin compound meeting the specifications of ASTM D3350 with a cell classification of PE:345434C and meeting Type III, Class C, Category 5, Grade P34 per ASTM D1238.
- 2) HDPE pipe shall comply with AWWA Specifications C906.
- 3) The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
- 4) Pipe and accessories shall be 160 psi at 73.4 degrees F meeting requirements of Standard Dimension Ration (SDR) 17 as a minimum strength.

C. Fittings

- 1) All fittings shall be fully pressure rated to match the pipe SDR pressure rating to which they are made. All fittings shall be molded or fabricated by the manufacturer. No contractor fabricated fittings are allowed.
- 2) The HDPE pipe manufacturer shall supply all HDPE fittings, accessories, adapters, and/or special components required to perform the work.

2.2 METALLIC LOCATING WIRE: See Section 02220, *Trenching, Backfilling, and Compaction of Utilities*.

2.3 VALVE BOX

Valve Boxes shall meet the following requirements:

- A. Constructed of non-corrosive materials, rigid plastic meeting ASTM D-1788.
- A. Box shall be tubular in shape with an adjustable length with telescoping section.
- B. Lid shall be cast iron or ductile iron with aluminum locking bolt. Locking mechanism shall have a pentagon-shaped head bolt.
- C. Box shall be easily detected when buried by 4 inches of material.
- D. Box shall be manufactured by Copperhead Industries or approved equal.

2.4 WARNING TAPE: See Section 02220, *Trenching, Backfilling, and Compaction of Utilities*.

2.5 SANITARY MANHOLES & COVERS

- A. All sanitary manholes and manhole frames and covers shall be in accordance with Section 02730 – *Sanitary Sewer*.
- B. All manholes with force main connections shall have protective coating of Sewer Shield 100 or approved equal.

2.6 ROAD AND STREAM CROSSINGS: See Section 02730, *Sanitary Sewer*, paragraph regarding Steel Pipe.

PART 3 – EXECUTION

3.1 PIPE INSTALLATION – GENERAL

3.1.1 Construction – All Pipe

- A. Systems shall be installed as shown on the drawings and in a neat and workmanlike manner using only new materials.
- B. Trench width: per **Standard Detail 27.25**.
- C. Pipe Laying Direction: Place pipe beginning at low point and progress uphill. Install on grade with horizontal and vertical alignment as indicated on construction plans. Install all pipe and fittings per manufacturer's installation requirements.
- D. Materials shall be cleaned and inspected prior to installation. No cracked, broken or defective material shall be used in the work.
- E. The interior surfaces of all piping and equipment shall be cleaned and free of all dirt, loose scale, rust and other foreign material before installation.
- F. Pipe ends shall be reamed to remove all burrs and pipe sections shall be cleaned inside to remove all chips and foreign material prior to making up joints. Pipe lines shall be installed with as few joints as possible and short lengths of pipe coupled together shall not be used.
- G. When the trench is left of the night or if pipe laying is suspended, the upper end of the pipe shall be plugged to keep out dirt, water animals and other foreign matter or substances. This plug shall be kept in the end of the pipe line at all times when laying is not in actual progress.
- H. Cleanouts: Install per **Standard Details 27.28, 27.30, and 27.31**. Cleanouts shall be placed at all pipe junctions and at a maximum of 1500 linear feet on straight length sections.
- I. Air Release Valve: Install per **Standard Detail 27.27**. An air release valve shall be installed at peaks of 25 feet or more and/or at intervals of 2000 to 2500 feet.
- J. Isolation Valves: Install as shown under cleanouts (H). Install isolation valves at all branch connections.
- K. Lateral Connections: Install per **Standard Detail 27.33**.

3.1.2 HDPE Pipe

- A. All pipe shall have a minimum bury of 36 inches.

- B. Ropes, fabric or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used.
- C. HDPE pipe shall be installed in accordance with the instruction of the manufacturer. A qualified joining technician as specified by the manufacturer shall perform all heat fusion joints.
- D. All fittings shall be butt fused, electrofused, or flanged.
 - 1) Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.
 - 2) Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
 - 3) Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D-3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

3.1.3 Testing

- A. All pipe shall be field tested. Contractor shall supply all labor, equipment, materials required for testing including but not limited to pumps, meters, gauges, etc. Pipe shall be tested prior to installation of final roadway surfacing.
- B. Pressure testing shall be in accordance with manufacturer's specifications. All pipe shall be tested at 150 psi in accordance with ASTM F2164, "Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure", unless otherwise approved by the Engineer. A test will be considered a failure if the pressure drops by more than 5 psi in 2 hours or exceeds allowable leakage.
- C. Pressure testing procedure
 - 1) Fill line slowly with water.
 - 2) Expel air from system during filling and before applying test pressure.

- 3) Apply test pressure and allow system to stand without makeup pressure for 2 to 3 hours for expansion of pipe.
- 4) Apply specified test pressure for 2 hours.
- 5) Pressure test shall be witnessed by a City of Lynchburg representative.

D. Allowable Leakage

- 1) HDPE Pipe – Chart 6, Allowance for Expansion Under Test Pressure, Technical Report TR31/9-79 published by the Plastic Pipe Institute (PPI).

3.2 METALLIC LOCATING WIRE

Metallic locating wire shall be installed with all plastic pipe and installation shall meet the following specifications, including those in Section 02220, *Trenching, Backfilling, and Compaction of Utilities*.

- A. A continuous wire shall be installed between locating boxes.
- B. Tracer shall connect to a brass screw in cover.

3.3 WARNING TAPE: See Section 02220, *Trenching, Backfilling, and Compaction of Utilities*.

3.4 SANITARY MANHOLES AND COVERS

- A. The installation of all sanitary manholes and manhole frames and covers shall meet Section 02730 – *Sanitary Sewer*.
- B. All manhole protective coatings shall be installed in accordance with manufacturer instructions.

3.5 ROAD AND STREAM CROSSINGS: See Section 02730, *Sanitary Sewer*, paragraph regarding Steel Pipe.

END OF SECTION 02740

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