

SECTION 02623

HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS (PRESSURE PIPE)

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install high density polyethylene (HDPE) pipe and fittings complete as shown on the Drawings and as specified herein.

1.2 RELATED WORK

- A. Dewatering and drainage are included in Section 02140.
- B. Trenching, backfilling and compaction are included in Section 02200.
- C. Buried valves and appurtenances are included in Section 02640.
- D. Concrete for thrust blocks is included in Division 3.

1.3 SUBMITTALS

- A. Submit, in accordance with Section 01300, completely detailed working drawings and schedules of all high density polyethylene (HDPE) pipe and fittings required.
- B. Submit the name and address of pipe manufacturer.
- C. Submit complete description of method of pipe installation.
- D. Submit description of the method of testing the pipe and fittings including a complete drawing of mandrel with dimensions for each pipe size.
- F. Submit the manufacturer's recommendations for handling, storing and installing the pipe and fittings.
- G. Submit certification that the stress regression testing has been performed on the specific polyethylene resin being utilized in the manufacturing of the pipe for this contract in accordance with ASTM D2837.

- I. Prior to each shipment, submit certified test reports that the pipe and fittings for this contract were manufactured and tested in accordance with the ASTM and AWWA Standards specified herein.
- J. Submit the name and qualifications of the technician proposed to perform the heat fusion of the pipe joints.

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

- 1. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.
- 2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- 3. ASTM D2239 – Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- 4. ASTM D2774 – Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
- 5. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
- 6. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
- 7. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- 8. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
- 9. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

B. American Water Works Association (AWWA)

- 1. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.

- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 DELIVERY, STORAGE AND HANDLING

- A. The delivery, storage and handling of the pipe and fittings shall be done in accordance with the manufacturer's recommendations.
- B. Pipe shall be stored on clean, level ground to prevent any scratching or gouging of the pipe. The handling of the pipe shall be done in a manner to avoid dragging the pipe over any hard or sharp objects to avoid cutting of the pipe's exterior. Any cut or gouge deeper than 5 percent (5%) of the pipe's wall thickness shall be removed from the site.
- C. Handling of the pipe shall be done in a manner to avoid all undue stress in the pipe caused by bending of the pipe.
- D. The interior and exterior of the pipe shall be free of cuts, gouges and scratches.

1.6 QUALITY ASSURANCE

- A. All HDPE pipe and fittings shall be manufactured in strict accordance with ASTM F714 and shall be from a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the polyethylene pipe and fittings to be furnished. All HDPE pipe and fittings shall be supplied by a single distributor who is fully experienced, reputable, and qualified with the distribution of the pipe and fittings to be furnished. The pipe shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these specifications.
- B. All pipes under this contract shall be manufactured from a polyethylene resin that has been specifically stress regression tested to provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1,600 psi, as determined in accordance with ASTM D2837.
- C. Omitted.
- D. Inspection of the pipe may also be made by the ENGINEER or other representatives of the OWNER after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specified requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

1.7 WARRANTY

- A. The pipe manufacturer shall provide a warranty against manufacturing defects of material and workmanship for a period of ten (10) years after the final acceptance of the project by the OWNER. The manufacturer shall replace, at no additional cost to the OWNER, any defective pipe material within the warranty period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General

1. HDPE pipe is a flexible conduit and shall be designed to transfer imposed loads to the surrounding embedment medium. The pipe and fittings shall be free from all defects including indentations, delaminations, cracks, bubbles and pinholes, which due to their nature, degree, or extent, detrimentally affect the strength and serviceability of the pipe. Any pipe or fittings with such defects which, in the judgement of the ENGINEER, will affect the strength and serviceability shall be repaired or rejected.
2. HDPE pipe resins shall be high molecular weight, high density polyethylene with a cell classification number of 445574C cell classification in accordance with ASTM D3350.

B. Pipe and Fittings

1. The pipes shall have the nominal dimensions shown on the Drawings, and shall conform to the dimension requirements of the DIPS Sizing System (ANSI B16.1). Pipe shall meet the requirements of Dimension Ratio (DR) 11.
2. All polyethylene pipes shall meet the requirements of ASTM F714.
3. Pipe shall be furnished in standard laying lengths not exceeding 50 feet.
4. Joining system: The pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations and ASTM 2657. Where required, mechanical joint connections and butt connections using bolted mechanical couplers shall be provided from a polyethylene mechanical joint adaptor. Mechanical connections shall be provided from a polyethylene mechanical joint adaptor and restraining gland designed to resist pull out forces. Back-up flanges shall be primed and painted in a corrosion protected paint recommended and supplied by the manufacturer. All bolts, nuts and hardware shall be Type 316 stainless steel.

5. All mechanical joints and fittings shall be approved types designed specifically for HDPE pipe systems. They shall be supplied with all necessary couplings, rings, nuts, bolts, washers; rubber rings/sealing gaskets and restrainers/stiffeners.

2.2 PIPE IDENTIFICATION

- A. At 5 feet intervals along the pipe, the pipe shall be marked with the name of the manufacturer, size and class (pressure and DR), and manufacturing reference to ASTM F714.
- B. A color coded strip(s) shall be marked along the entire length of the pipe.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All pipe and fittings shall be installed in accordance with the manufacturer's instructions and Section 02610.
- B. The contractor performing the joining shall be a distributor of the pipe material supplied. All fusion joints shall be done by a factory qualified technician as designated by the manufacturer with a minimum of five years experience with the fusion equipment to be used.
- C. Joining of the pipe by heat fusion shall be done in accordance with ASTM F1962. Prior to the start of pipe installation, one test joint shall be made and tested. Test shall be done in accordance with CPChem Co. Bulletin No. 106. No joints shall be made until a successful test joint has been made.
- D. When cutting pipe is required, the cutting shall be done by machine specifically designed for the cutting of HDPE pipe. The cut shall leave a smooth cut at right angles to the axis of the pipe.
- E. Fittings shall be connected to HDPE pipe in accordance with manufacturer's recommendations.
- F. Flanged and mechanical connections shall consist of the following:
 1. A high density polyethylene flange adapter, made by the manufacturer from the same resin as the pipe, and fully pressure rated to match the pipe DR pressure rating, thermally butt-fused to the stub end of the pipe.

2. A ductile iron or steel back-up ring conforming to ANSI B16.1 fitted to the polyethylene flange adapter and shaped as necessary to suit the outside dimension of the pipe.
 3. A full face neoprene gasket, conforming to ANSI B16.21.
 4. Corrosion resistant bolts and nuts of Type 316 stainless steel as specified in ASTM A276 and ASTM A307. Bolts shall be tightened alternatively and evenly to the manufacturer's specified torques. After installation a bitumastic coating shall be applied to bolts and nuts.
- G. Gradual changes in direction of HDPE pipelines can be accommodated by pipe deflection but every effort should be made to keep the pipe as central as possible within the trench to enable adequate compaction of side-fill.
- H. If any defective pipe is discovered after it has been installed, it shall be replaced or repaired as directed by the ENGINEER at no additional cost to the OWNER. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when installed, shall conform to the lines and grades required.
- I. Butt-fusion of pipes shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. Fusion shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and /or fusing equipment. Depending on site conditions, butt-fusion joining shall be performed in or outside of excavation.

3.4 TESTING

- A. After installation, but prior to connection to existing distribution and transmission mains, the pipe shall be tested for compliance as specified herein. Furnish all necessary equipment and labor for the pressure test and leakage test on the pipelines.
- B. Submit detailed test procedures and method for ENGINEER's review. In general, testing shall be conducted in accordance with AWWA C600.
- C. Pressure pipelines shall be subjected to a hydrostatic pressure of 1.5 times the working pressure at the lowest point along the test segment or 150 psi, whichever is greater. This test pressure shall be maintained for a minimum of two (2) hours. The leakage rate shall not exceed those indicated in AWWA C600. Provide suitable restrained bulkheads as required to complete the hydrostatic testing specified.

- D. All valves and valve boxes shall be properly located and installed and operable prior to testing. Bulkheads shall be provided with a sufficient number of outlets for filling and draining the line and for venting air.
- E. Hydrostatic pressure and leakage tests shall conform with Section 4 of AWWA C600. Furnish gauges, meters, pressure pumps, and other equipment needed to fill the line slowly and perform the required hydrostatic pressure leakage tests.
- F. The line shall be slowly filled with water and the specified test pressure shall be maintained in the pipe for the entire test period by means of a pump furnished by the CONTRACTOR. Provide accurate means for measuring the quantity of water required to maintain this pressure. The amount of water required is a measure of the leakage.
- G. Duration of pressure test shall not be less than two (2) hours. The leakage test shall be a separate test following the pressure test and shall not be less than two (2) hours in duration. All leaks evident at the surface shall be repaired and leakage eliminated regardless of the total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced.
- H. Submit plan for testing to the ENGINEER for review at least ten (10) days before starting the test.

3.4 CLEANING

- A. The CONTRACTOR shall use a removable watertight plug to prevent any dirt or debris from entering the pipe during construction. At the conclusion of the work, the CONTRACTOR shall thoroughly clean the entire pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.

END OF SECTION