

SECTION 15125

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS FOR WATER AND WASTEWATER MAINS (Contractor Furnished)

PART 1: GENERAL

1.01 SECTION INCLUDES

Furnishing and installing 4 inch through 12 inch or other size as approved by Engineer high density polyethylene (HDPE) pipe and fittings for potable water mains and wastewater mains

1.02 REFERENCES

- A. ANSI/AWWA C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe.
- B. ANSI/AWWA C153 Ductile Iron Compact Fittings.
- C. ANSI/AWWA Standard C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) through 63 In. (1,575 mm), for Water Distribution and Transmission.
- D. ASTM D3350: Standard Specification for Polyethylene Plastic Pipe and Fitting Materials
- E. ASTM F2620: Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- F. CFR 49 Part 192.281 thru 192.287 Transportation of Natural and other Gas by Pipeline *Minimum Safety Requirements for Plastic Pipe*
- G. NSF/ANSI 61 Drinking Water System Components Health Effects.

1.03 SUBMITTALS

Submit manufacturer's product data, installation instructions and certification for all materials to be furnished in accordance with Specification Section 01300 Submittals. Submit classification and gradation test results for embedment and pipe backfill material.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Research has documented that certain pipe materials (such as polyethylene, polybutylene, polyvinyl chloride, and asbestos cement) and elastomers, such as used in jointing gaskets and packing glands, may be subject to permeation by lower molecular weight organic solvents or petroleum products. Products supplied under this Specification Section

assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until the Engineer provides direction.

- B. Pipe and fittings shall be made from the same resin meeting the requirements of the Plastic Pipe Institute (PPI) material designation PE 4710 with an ATSM D3350 minimum cell classification of PE 345464C.
- C. The material shall have a minimum Hydrostatic Design Basis (HDB) of 1,600 psi at 73 degrees F.
- D. All materials for potable water projects including lubricants, shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard 61.

2.02 PIPE

- A. All pipe and fittings shall be manufactured in ductile iron pipe sizes (DIPS) in accordance with ANSI/AWWA Standard C906 and shall meet the requirements of NSF/ANSI 61
- B. The pipe shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.
- C. Permanent identification of water piping service shall be provided by co-extruding longitudinal blue stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the outside surface shall not be acceptable.
- D. The nominal pipe diameter is specified on the Contract Drawings. The DR (dimension ratio) shall be DR 11 unless otherwise noted on the Contract Drawings.
- E. The minimum pressure rating is 200 psi for all HDPE pipe or as stated in the contract drawings and documents.
- F. HDPE may be deflected subject to approval by the Engineer. The following table shows maximum deflection based upon the allowable strain of the pipe wall. Potential flow restrictions, surge and other non-trench stability and pipe strain issues may reduce the values shown here per the Engineer's recommendations.

PE pipe Dimension Ratio (DR)	Allowable deflection (percent)
32.5	8.1
26.0	6.5
21.0	5.2
19.0	4.7
17.0	4.2
15.5	3.9
13.5	3.4
11.0	2.7

2.03 FITTINGS

- A) Plain end butt fused fittings shall be used when joining polyethylene materials. The minimum pressure rating is 200 psi for all HDPE fittings or as stated in the contract drawing s and documents.
- B) The fittings shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added. The fittings shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.
- C) All HDPE fittings shall comply with ANSI/AWWA C906 and meet the requirements of ANSI/NSF 61 and capable to meet CFR 49 Part 192.281 thru 192.287. Alternate option; when shown on the contract drawings or with written approval from the Owner's Engineer special fittings shall meet the requirements of Section 15131.2.04.B.
- D) Tapping Sleeves used with polyethylene pipe shall be Ductile Iron or Stainless Steel specifically designed for use with polyethylene pipe and meet the requirements of Specifications Section 15171 Tapping Sleeves, Saddles, and Valves.
- E) HDPE Mechanical Joint Adapter fittings shall be designed to mate with Ductile Iron Mechanical Joint fittings that meet the requirements of ANSI/AWWA C153 and mate with a mechanical joint gasket to produce a sealed joint that meets the requirements of ANSI/AWWA C111.
- F) All fittings designed for the HDPE pipe transition to Ductile Iron pipe shall be designed for butt fusion and preassembled by the manufacture. The Ductile Iron pipe that is utilized by the transition fitting manufacture shall be pressure class 350, with either epoxy or bituminous coating that meets the pipe material requirements of Specifications Section 15106 Ductile Iron Pipe and Fittings.

2.04 ACCEPTABLE MANUFACTURERS

- A. CPChem Performance Pipe
5085 West Park Blvd., Suite 500
P.O. Box 269006
Plano, Texas 75093
- B. KWH Pipe Ltd.
5225 Canyon Crest Drive
Building 300, Suite 353
Riverside, California 92507
- C. WL Plastics
3575 Lone Star Circle
Suite 300
Fort Worth, Texas 76177
- D. United Poly Systems
4707 E Keerney Street
Springfield, MO 65803

PART 3: EXECUTION

3.01 PACKAGING, HANDLING, AND STORAGE

- A. The manufacturer shall package the pipe in a manner designed to ensure that it arrives at the project neat, clean, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to assure that the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.
- B. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside defective, damaged or unsound material and hold material for inspection by the Engineer.
- C. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.
- D. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined by butt fusing.

3.03 PIPE INSTALLATION

- A. Refer to Specifications Section 15000 Piping-General Provisions and referenced drawings that are part of these Contract Documents. Trenching and embedment shall be performed in accordance with Specifications Section 02210 Trenching Backfilling and Compaction. The Contractor shall verify and follow all manufacture recommended procedures as well as any special manufacture recommendations for working in very cold or hot weather conditions including but not limited to providing temperature conditioning for the pipe fusion and installation processes.
- B. Remove all dirt and foreign matter from pipe before lowering into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.
- C. Maximum pipe bending radius shall be in conformance with the manufacturer's recommendation for the specific diameter and dimension ratio (DR) of the pipe. The Contractor shall verify the minimum bending radius with the manufacture and shall submit the manufacture recommended minimum bending radius to the Engineer prior to installation startup. Whenever possible, changes in direction shall be accomplished by bending the pipe in lieu of installing a fitting, except as approved by the Engineer.
- D. The Contractor shall furnish and install identification tracer wire in accordance with Specifications Section 02558 Identification Location Guide.
- E. Prevent flotation of sealed pipe during work stoppages.
- F. HDPE Directional Drilling Installation specifications are not incorporated into this Section. The HDPE Directional Drilling installation shall meet the HDPE Directional Drilling installation specifications provided by the Engineer. If the Engineer has not provide HDPE Directional Drilling installation specifications as part the contract documents then the Contractor shall submit a directional drilling design plan and specifications as part of the bid. After the Engineer's written approval, directional drilling installation shall meet the requirements of the approved submittal.
- G. The ends of the HDPE pipeline including a transition to another type of pipe shall be installed with restraint blocking and Ductile Iron pipe in accordance with the Specifications Drawing 0201-0601-SD04. Prior to installing restraint blocking or transition to another type of pipe the HDPE pipe shall go through a minimum of a 24 hour relaxation period.

3.04 PIPE AND FITTING JOINING

- A. Prior to fusion start up the Contractor shall submit a copy of satisfactory training records for each heat fusion technician that meet the requirements of the fusion equipment manufacture. Prior to fusion start up the Contractor shall do tensile tests that verify fusion joint quality control at the start of the fusion technician's work-shift and additional tests when the ambient temperature changes more than 20 ° F during the work shift. At a minimum tensile testing for each technician must be conducted at least once per week. Tensile testing shall meet the requirements of subpart 3.06.B Testing and Disinfection of this Section.
- B. The Contractor shall furnish and maintain protective shields, shelter equipment, heaters, blankets, fans, or other equipment as needed to condition the pipe temperature and protect the fusion process from dust, wind, extreme temperatures, forecasted weather conditions, and other adverse elements as required to maintain the manufacture's recommended temperature and atmospheric conditions of the fusion process. At minimum, a protective canopy shall be utilized during the fusion process.
- C. The fusion mating surfaces shall be maintained clean and dry before joining per the manufacture's recommendations. The Contractor shall maintain the mating surfaces and fusion equipment in accordance with manufacture recommendations. Each mating end of the fusion joint is required to be of the same DR pipe. The longitudinal alignment of the pipe at the fusion joint shall align with the longitudinal centerline of both pipe sections. Miter joints are not allowed. The pipe ends shall be cut square and align perpendicular to the longitudinal centerline. The pipe ends shall be rounded uniformly as much as practical not to exceed a maximum tolerance of 5% of the pipe wall thickness.
- D. The fusion process shall be performed in accordance to the HDPE pipe manufacture's recommended procedures utilizing the HDPE pipe manufacture's recommendations for device(s) and equipment. The fusion process shall also meet the HDPE fusion equipment manufacturer's recommended procedures. The procedures and equipment shall incorporate preparations of the mating surfaces and the application of heat to the mating surfaces. The heat source shall be aligned and held in place with the matting surfaces simultaneously to achieve uniform heating. After removing the heat source uniformly join the mating surfaces together and hold in place until the plastic hardens. The fusion process shall meet the requirements of CFR 49 192.281 thru 192.287. For additional information, see ASTM F2620.
- E. Fusion equipment shall be equipped with a Datalogger. Prior to work start up the Contractor shall submit a listing of the manufacture's recommended data logging parameters. Upon substantial completion, the Contractor shall submit records of each fusion joint appropriately identified in a report and provided to the Engineer. The data shall be kept updated at the work site and available to the Engineer for review at the

Engineer's request during the progress of the work. The data report shall provide a side-by-side comparison of the manufacture's recommended data parameters and the actual fusion data for each fusion joint.

- F. Electrofusion fittings are not permitted.
- G. The installation of mechanical compression type fittings for the joining of HDPE pipe is not permitted for pipes sizes 4" and larger diameters unless shown on the contract drawings or with written approval from the Owner's Engineer. Special fittings shall meet the requirements of Section 15131.2.04.B.
- H. HDPE Transition Fittings that join HDPE pipe to Ductile Iron pipe are permitted only if preassembled by the manufacture. The installation of the Ductile Iron portion of the transition fitting shall meet the requirements of Specifications Section 15106 Ductile Iron Pipe and Fittings and in accordance to Specifications Drawing 0201-0601-SD04. The installation of the HDPE portion of the transition fitting shall meet the requirements of CFR 49 Part 192.281 thru 192.287. Alternate option; when shown on the contract drawings or with written approval from the Owner's Engineer special fittings shall meet the requirements of Section 15131.2.04.B.
- J. HDPE Mechanical Joint Adapter fitting installation shall meet the requirements of CFR 49 Part 192.281 thru 192.287. The Mechanical Joint adapter portion of the fitting shall be installed to mate with a Ductile Iron fitting meeting the requirements of Specifications Section 15106 Ductile Iron Pipe and Fittings. When the fitting is used as part of a transition to Ductile Iron pipe the transition shall be in accordance with Specifications Drawing 0201-0601-SD04. Alternate option; when shown on the contract drawings or with written approval from the Owner's Engineer special fittings shall meet the requirements of Section 15131.2.04.B.

3.05 SERVICE CONNECTIONS

- A. Mechanical clamps or tapping saddles may be used provided they are designed for HDPE pipe and acceptable to the manufacturer of the pipe.
- B. The Contractor shall furnish and install service connections and materials that meet Section 01011 Specifications Special Conditions listing for each Missouri American Water District and shall meet the requirements of Specifications Section 15200 Service Lines.

3.06 TESTING AND DISINFECTION

- A. Pressure testing and disinfection shall be performed in accordance with the Specifications Section 15020 Disinfecting Pipeline and Specifications Section 15030 Pressure and Leakage Tests. HDPE pipe shall only be pressure tested when the temperature of the pipe is between 40° F and 85° F. When adhering to Specifications Section 15030 the maximum test pressure shall not be permitted to exceed the HPDE pipe and fittings

manufactures' recommended test pressure. The contractor shall verify the manufacture rated maximum test pressure.

- B Bend Strap tensile tests for fusion joint quality control shall be performed in accordance with the manufacture's recommendations. The sample pipe shall be fused from HDPE pipe stock or scrap HDPE pipe from the same material stock, diameter, and DR as that of which the technician will be installing during the technicians work-shift. Bend strap testing shall be done in accordance to the manufacture's recommended procedures. The Contractor shall submit a copy of the manufacture's recommended bend strap testing procedures to the Engineer prior to testing. A minimum of three straps per joint must be tested and found to be satisfactory. Samples shall be conditioned to 73° F prior to bending. Satisfactory test results shall meet the manufacture's recommended criteria. Testing results will be considered unacceptable if any disbondment, cracks, or voids are found during visual inspection. If a sample is found to be unsatisfactory, the Contractor supervisor shall be notified. Equipment repairs and/or modified procedures shall be utilized until a satisfactory bend strap test is performed. If one bend strap sample is found to be unsatisfactory, the fusion technician shall fuse another joint and start the testing over. Fused joint installation shall not proceed until satisfactory testing is completed. For 12-inch diameter HDPE pipe with wall thickness that exceeds 1-inch alternate tensile testing methods can be submitted to the Engineer for fusion joint quality control. The Contractor shall obtain written approval from the Engineer prior to implementing alternate tensile testing.

END OF SECTION