

Section 02505

HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes High density polyethylene (HDPE) pipe for nominal ID sizes 12 through 30-inches.

1.02 MEASUREMENT AND PAYMENT

- A. Unit Prices.
 - 1. No separate payment will be made for HDPE pipe under this Section. Include cost of the same in Contract bid price of which this is a component part.
 - 2. Refer to Section 01270 – “Measurement and Payment” for unit price procedures.
- B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 REFERENCES

- A. AASHTO Section 18 - Soil Thermoplastic Pipe Interaction Systems.
- B. AASHTO Section 30 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Flow Applications.
- C. ASTM D 618 - Standard Practice for Conditioning Plastics for Testing.
- D. ASTM D 2321 - Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Pipe.
- E. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- F. ASTM D 2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
- G. ASTM D 2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

- H. ASTM D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
- I. ASTM D 3261- Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- J. ASTM D 3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- K. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- L. ASTM F 714 - Standard Specification for Polyethylene Plastic (PE) Pipe (SDR-PR) Based on Outside Diameter.
- M. ASTM F 2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- N. AWWA C906 - Standard for Polyethylene Pressure Pipe and Fittings, 4-inch through 63-inch Diameter for Water Distribution.

1.04 SUBMITTALS

- A. Conform to requirements of Section 01300 – “Submittal Procedures”.
- B. Submit Shop Drawings showing design of pipe and fittings indicating alignment and grade, pipe length, laying dimensions, fabrication, fittings, flanges, gasket material, and special details.
- C. Submit detailed calculations for pipe design.
- D. Submit details of Pipe Joints and Jointing procedure for the HDPE pipe.
- E. Submit Affidavit of Compliance with (ANSI/ AWWA C906, Sec. 1.5) for the HDPE to be installed.
- F. Submit Special Quality Assurance Testing (ANSI/ AWWA C906, Sec. 4).
- G. Submit certification of trained personnel performing fusion joining.

1.05 RELATED REQUIREMENTS

- A. Section 01270 – “Measurement and Payment”
- B. Section 01330 – “Submittal Procedures”
- C. Section 02321 – “Cement Stabilized Sand”

- D. Section 02514 – “Disinfection of Water Lines”
- E. Section 02515 – “Hydrostatic Testing of Pipelines”

1.06 QUALITY ASSURANCE

- A. Provide manufacturer’s certificate of conformance to Specifications.
- B. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density, and other physical properties.
- C. Pipe manufacturer to provide services of experienced, competent, and authorized representative to visit site to advise and consult Contractor during jointing and installation of pipe.
- D. Qualifications
Manufacturer: Company specializing in manufacturing the products specified in this section with documented experience of minimum 5 years of pipe installations that have been in successful, continuous service for same type of service as proposed Work.

1.07 – 1.13 NOT USED

PART 2 PRODUCTS

2.01 MANUFACTURER(S) (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

- A. General
 - 1. Furnish solid wall pipe with plain end construction for heat joining (butt fusion) conforming to ASTM F 2620. Utilize controlled temperatures and pressures for joining to produce fused leak-free joint.
 - a. Material: PE4710
 - b. Minimum Dimension Ratio: DR13.5
 - c. IPS Pipe Size: To match or exceed nominal ID of pipe shown on Plans.
 - 2. Provide Independent Pipe Products, Performance Pipe, or approved substitution.

3. Fittings:
 - a. For bends less than or equal to $11\frac{1}{4}^{\circ}$, meet ANSI/AWWA C906; material designation (ASTM D3350) PE4710, and a minimum Pressure Class 150 of the appropriate size and class for the pipe/material it is being connected to. For Joints: ASTM D3261 thermal butt fusion joints.
 - b. For Stainless Steel Stiffening Rings, Type 231, AISI Type 304 S.S., as manufactured by JCM Industries or approved equal.
 4. Make curves by deflecting pipe, by use of beveled pipe ends, or by combination of two methods, unless otherwise indicated on Plans. Do not exceed manufacturers recommended deflections. Provide bends for localized deflections greater than 5 degrees, unless otherwise recommended by manufacturer and approved by Project Manager.
 5. Provide pipe according to manufacturers recommendations for installation in potentially or known contaminated areas.
 6. Piping shall be extruded from a polyethylene compound and shall conform to the following requirements:
 - a. The polyethylene resin shall meet or exceed the requirements of ASTM D3350 for PE 4710 material with a cell classification of 445574C or better.
 - b. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black, well dispersed by pre-compounding in a concentration of not less than 2 percent.
 - c. The maximum allowable hoop stress shall be 800 psi at 73.4 degrees F.
- B. A weather protection canopy shall be provided for the fusion machine that allows full machine motion of the heat plate, fusion assembly, and carriage.

2.03 FABRICATION

- A. Mark each standard and random length of pipe in compliance with these Specifications with following information:
 1. Nominal pipe size.
 2. Dimension ratio or standard dimension ratio.

3. AWWA pressure class.
4. AWWA standard designation number.
5. Extrusion production record code.
6. NSF-61 mark verifying suitability for potable water service.
7. Material designation code or cell classification.
8. Trademark or trade name.

B. Color

1. The pipe shall be blue in color or contain blue striping for potable water
2. The pipe shall be green in color or contain green striping for sewer applications
3. The pipe shall be purple in color or contain purple striping for reclaimed water.
4. SOURCE QUALITY CONTROL

C. Transportation and Storage

1. All of the pipe suppliers' guidelines shall be followed for transportation and storage of the pipe.
2. Care shall be taken during transportation of the pipe to ensure that it is not cut, kinked, or otherwise damaged.
3. Pipes shall be stored on level ground free of sharp objects which could damage the pipe
4. Stacking of the pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions
5. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports
6. Any pipe damage during transportation or storage shall be replaced by the Contractor at the Contractor's expense.

2.04 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.01 GENERAL / MANUFACTURER(S)

- A. Install pipe in accordance with the manufacturer's recommended installation procedures and the requirements of this section.
- B. Use only workmen trained in the installation of HDPE pipe.
- C. Bedding and Backfill:
 - 1. Direct bury sections: provide cement stabilized sand backfill a minimum of 12 inches around pipe on all sides per section 02321 – "Cement Stabilized Sand".

3.02 PREPARATION

- A. Handling of Pipe
 - 1. All of the pipe suppliers' guidelines shall be followed for handling the pipe.
 - 2. The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects.
 - 3. Ropes, fabric, or rubber protected slings and straps shall be used when handling pipes.
 - 4. Chains, cables, or hooks inserted into the pipe ends shall not be used.
 - 5. Two slings spread apart shall be used for lifting each length of pipe
 - 6. Pipe or fittings shall not be dropped onto rocky or unprepared ground.
 - 7. Slings for handling the pipeline shall not be positioned at butt-fused joints.
 - 8. Sections of the pipes with cuts and gouges or kinked sections shall be removed and the ends rejoined.
 - 9. Where possible, the pipe shall be raised and supported at a suitable distance back from the open end such that the open end will be below the level of the pipe at the point of support.

3.03 ERECTION/INSTALLATION APPLICATION AND/OR CONSTRUCTION

- A. Install pipe in accordance with the manufacturer's recommended installation procedures and ASTM D 2774. Do not install with less than 4 feet of cover unless otherwise shown in the Plans.

- B. Do not store pipe uncovered in direct sunlight. Allow pipe temperature to approach ground temperature before each individual pipe section is terminally connected.
- C. Cutting pipe: Comply with pipe manufacturer's recommendations. After cutting, leave end of pipe in accordance with manufacturer's recommendations.
- D. Joints
 - 1. Each length of pipe shall be inspected and cleaned as necessary to be free of debris immediately prior to joining.
 - 2. Join sections of HDPE pipe into continuous lengths above ground by thermal butt fusion method in accordance with AWWA C906 and pipe manufacturer's recommendations for the specified service.
 - 3. Fusion joints: meeting minimum requirements of manufacturer for cool down time and other fusing requirements.
 - 4. Pipe lengths to be joined by thermal butt-fusion shall be of the same type, grade, and class of compound and supplied from the same raw material supplier.
 - 5. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.
 - 6. Socket fusion and extrusion welding or hot gas welding will not be accepted.
- E. Restrained Joints: Designed by manufacturer and approved by Project Manager. Restrain sufficient distance from each side of bend, tee, plug, or other fitting to resist thrust developed at design pressure for pipe. Design pressure: 150 psi. When assembled outside of trench, allow pipe to cool in trench before backfilling.
- F. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipe line or pipe section.
 - 1. Waterproof nightcaps of approved design may be used but they shall also be so constructed that they will prevent the entrance of any type of natural precipitation into the pipe and shall be fastened to the pipe in such a manner that the wind cannot blow them loose.
 - 2. Stuffing cloth or paper in the open ends of the pipe is unacceptable

3.04 – 3.07 NOT USED

3.08 DEMONSTRATION / TESTING AND INSPECTION

A. Hydrostatic Testing

1. The pipe shall be hydrostatically tested after joining into continuous lengths prior to installation and again after installation. Pressure and temperature shall be monitored with certified instruments during the test. Erosion prevention procedures shall be used during removal and discharge of water.
2. Hydrostatic testing shall be performed in accordance with Section 02515 – “Hydrostatic Testing of Pipelines”, in accordance with the pipe manufacturer’s recommendations and this Specification.

Test pipe with a minimum pressure of 150 psi. The initial pressure test shall be applied and allowed to stand without makeup pressure for a sufficient time to allow for diametric expansion or pipe stretching to stabilize (minimum 4 hours). After this equilibrium period, the test section can be returned to the required testing pressure, the pump is turned off and a final test pressure held for 1 to 3 hours. All costs associated with acquiring water for testing shall be included in the established contract unit price bid prices.

B. Disinfection

Conform to Section 02514 – “Disinfection of Water Lines”.

3.09 – 3.10 NOT USED

END OF SECTION