SECTION 33 05 01.10
HIGH DENSITY POLYETHYLENE (HDPE)
PRESSURE PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Society of Mechanical Engineer’s (ASME):
   b. B18.2.2, Square and Hex Nuts (Inch Series).

2. American Water Works Association (AWWA): C906, Polyethylene (PE) Pressure Piping and Fittings, 4-In. through 63-In., for Water Distribution and Transmission.

3. ASTM International (ASTM):
   g. D2657, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
   h. D2774, Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Catalog information confirming pipe, fittings, and other materials conform to requirements of this section.
   b. Drawings of specific connection details.
   c. The Contractor shall submit shop drawings of pipe, fittings, flanges, appurtenances, special details, alignments and grade, and laying dimensions, in accordance with SARA Specification No. 1340, Shop Drawings, Product Data and Samples. Design calculations shall be signed and sealed by a Registered Professional Engineer.
   d. Contractor shall submit detail of connection between HDPE pipe and concrete manhole to Owner for review and approval.

2. Certifications: The Contractor shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications.
   a. Hydrostatic proof test reports.
   b. Sustained pressure test reports.
   c. Burst strength test reports.

B. Informational Submittals:

1. Manufacturer’s Certificate of Compliance, in accordance with this specification and the referenced standards, referencing Project name and location.

2. The person performing the fusing of HDPE pipe shall have a minimum of 2 years of successfully fusing pipe similar in chemical composition and using equipment similar to that which will be used in the Work. In addition, the person performing the fusing shall have received training in the fusing of HDPE pipe in accordance with the recommendations of the pipe manufacturer and the fusing equipment supplier. The person responsible for fusing the HDPE pipe shall be certified under 49 CFR 192.285.

3. Certification from pipe manufacturer that Contractor is qualified to join, lay, and handle pipe.

4. Certificates of qualification for persons to be fusing HDPE pipe.


6. Test report documentation.

7. All expenses incurred in making samples for certification of tests shall be borne by the Contractor.
1.03 QUALIFICATIONS

A. Pipe Manufacturer: Listed with Plastic Pipe Institute as meeting recipe and mixing requirements of resin manufacturer for resin used to manufacture pipe for this Project.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, and store pipe and fittings as recommended by manufacturer.

B. If new pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Owner’s Project Representative at the Contractor’s expense, before proceeding further. Deliver, store, and handle other materials as required to prevent damage.

C. Shipping: Do not cut, kink, or otherwise damage pipe during transportation.

D. Storage:

1. Limit stacking of pipe to a height that will not cause excessive deformation of bottom layers of pipes under anticipated temperature conditions.

2. Where necessary due to ground conditions, store pipe on wooden sleepers, spaced suitably and of such widths as not to allow deformation of pipe at point of contact with sleeper or between supports.

3. Care shall be taken to ensure that the pipe is stacked in straight rows. The expansion and contraction caused by uneven heating by the sunlight shall be prevented by restraining the racks.

4. Pipe laid directly on the ground shall be placed on an area free of loose stones or sharp objects. Scarring or gouging of the pipe shall be avoided.

5. Pipe shall be stored, if possible, at the Site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe shall be stored in such a way as to prevent sagging or bending and protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets shall be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

E. Handling:

1. Pipe, fittings, and accessories shall be carefully inspected before and after installation, and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in
position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings, or any other material be dropped or dumped into trenches.

2. The joints shall be handled near the middle with wide web slings and bars. Rope slings also work well with straight lengths. The use of chains, end hooks or cable slings that may scar the pipe are not permitted. The following procedures shall be observed when handling HDPE pipe:
   a. Always stack the heaviest series of pipe at the bottom.
   b. Protect the pipe from sharp edges when overhanging the bed of a truck or trailer by placing a smooth, rounded protecting strip on the edge of the bed.
   c. The load should be anchored securely to prevent slippage.
   d. Lengths of small-diameter, lightweight pipe can be unloaded manually.

3. Pipe applications shall normally be handled by:
   a. Unloading the pipe from the truck in a row along the side of the installation area and moving the fusion unit along the row of joints.
   b. Stacking the pipe beside the fusion unit and trailing the pipe out after fusion, then dragging the long length of pipe into place for installation. It is suggested that as the pipe is fused and moved through the fusion machine, additional joints of pipe should be placed in the moveable jaw side of the machine for each subsequent fusion. This prevents the hydraulic system of the machine from having to pull the previously fused long length.
   c. Dragging the pipe into place is permitted provided the pipe is not damaged from sharp rocks or excessive abrasion created by pulling the pipe great distances.

1.05 ENVIRONMENTAL CONDITIONS

A. Fusing Conditions: In accordance with manufacturer’s instructions.

1.06 QUALITY ASSURANCE

A. The pipe manufacturer shall be listed by the Plastic Pipe Institute as meeting the recipe and mixing requirements of resign manufacturer for resign used to manufacture pipe for this Project.

B. A single manufacturer shall be responsible for supplying all HDPE pipe and fittings for the Work.
C. Inspection: All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards as supplemented by the requirements herein. The Contractor shall notify the Engineer in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

D. During the manufacture of the pipe, the Engineer shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

E. Tests: Except as modified herein, materials used in the manufacture of the pipe shall be tested in accordance with the requirements of this Section of the Specifications, and as specified in the referenced standards, as applicable.

F. The Contractor shall perform said material tests in accordance with the requirements of the Contract Documents. The Engineer shall have the right to witness all testing conducted by the Contractor, provided that the Contractor’s schedule is not delayed for the convenience of the Engineer.

G. In addition to those tests specifically required, the Engineer may request additional samples of any material for testing by the Owner. The additional samples shall be furnished as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pipe and fittings specified in this section shall be products of:

   1. CP Chem Performance Pipe.
   2. JM-Manufacturing Co.
   3. ISCO.
   4. Approved equal.

2.02 SERVICE CONDITIONS

A. The pipe being supplied for this Project will transmit raw sewage and will be installed by horizontal directional drilling.

   1. Operating Condition: Gravity flow.
   2. Test Pressure: As described in SARA Specification No. 518, Air Testing.
   3. Operating Temperature: 100 degrees F.
   4. Buried Condition: As shown on Drawings.
   5. Pressure Rating: 150 psi, DR 11.0.
2.03 MATERIALS

A. Materials: The HDPE pipe and fittings shall be made from prime virgin resins exhibiting a cell classification of PE 345444C as defined in ASTM D3350 with an established hydrostatic-design basis of 1,600 psi for water at 73 degrees F. The resign shall be listed by the Plastic Pipe Institute in its pipe-grade registry Technical Report (TR) 4, Listing of Plastic Pipe Compounds.

B. Pipe and Fittings: Pipe OD sizes 4 inches to 24 inches shall be available in ductile iron pipe sizes (DIPS). All pipes shall be suitable for use as a fluid pressure conduit. The pressure rating shall be 150 psi, DR 11.0. Laying lengths shall be 40 feet standard. The pipe shall be joined by heat fusion, flanges, or other proven and accepted mechanical joint system for HDPE pipe as shown on the Drawings, and as specified herein. Solid wall pipe shall be produced with plain end construction for heat joining (butt-fusion) conforming to ASTM D2657. Utilize controlled temperatures and pressures for jointing to produce a fused leak-free joint. Provide pipe with an inside diameter equal to or greater than the nominal pipe size indicated on the Drawings. Both pipe and fittings shall be NSF-listed by the manufacturer and bear the “NSF-pw” logo or mark.

C. Pipe and Fittings:

1. Conform to requirements of AWWA C906.
2. Polyethylene resin shall meet or exceed requirements of ASTM D3350 for PE 3408 material with cell classification of 345444C, or better.
3. Maximum Allowable Hoop Stress: 800 psi at 73.4 degrees F.
4. Pipe sizes shall conform to ASTM F714.
5. Pipe and fittings shall have a pressure rating of 150 (nominal DR 11.0).
6. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects.
7. Provide pipe as uniform as commercially practical in color, capacity, density, and other physical properties.
8. All HDPE pipe shall be carbon black stabilized throughout the entire structural wall for ultraviolet protection.
9. All pipe shall be made of virgin material. No rework except that obtained from the manufacturer’s own production of the same formulation shall be used.

D. Pipe lengths, fittings, and flanged connections to be joined by thermal butt-fusion shall be of same type, grade, and class of polyethylene compound and supplied from same raw material supplier.

E. Fittings shall be molded for sizes 6 inches and smaller and shall be fabricated from polyethylene pipe; for sizes 8 inch and larger, by means of thermal butt-
fusion. Ends of fabricated fittings shall not be trimmed to match pipe section to which they are going to be joined. Polyethylene fittings shall have same or higher pressure rating as pipe when installed.

F. Special Markings: Pipe and fittings shall be marked as prescribed by AWWA C906 and NSF. Pipe markings shall include nominal size, OD base (i.e., 12-inch ductile iron pipe sizing, DIPS), dimension ratio, pressure class, AWWA C906, manufacturer’s name, manufacturer’s production code including day, month, year extruded, and manufacturer’s plant and extrusion line.

G. Testing: Each manufacturer shall have an approved in-house QA/QC program providing compliance to the testing specifications and requirements of AWWA Standard C906 for both pipe and fittings.

H. Flanges: ASTM A536, ductile iron, backing flanges with 250 pound, ASME B16.1 Standard drilling. Flanges shall be complete with one-piece, molded polyethylene stub ends. Flanged connections shall have same or greater pressure rating as pipe.

I. Gaskets: Gasket material, size, and thickness shall be as recommended by pipe or flange manufacturer.

J. Joints: Thermal butt-fusion, except where connecting to unions, valves, and equipment with threaded connections that may require future disassembly.

K. Bolts, Nuts, Washers: Type 316 stainless steel, ASTM A193, Grade B8 hex head bolts; and ASTM A194, Grade 8 hex head nuts. Bolts shall be fabricated in accordance with ASME B18.2.2 and provided with washers of same material as bolts.

L. Wall Anchor:

1. Material: Same as HDPE pipe.
2. Internal Diameter: Equal to adjacent pipe.
3. Outside Diameter: 5 inches greater than adjacent pipe.
4. Shear Strength: Equal to or greater than tensile strength of adjacent pipe.
5. Fabrication: Butt fusion. Extrusion bead welding is not allowed.
PART 3  EXECUTION

3.01  INSTALLATION

A.  General:

1.  Fabricate and install polyethylene pipe in strict conformance with ASTM D2774, and pipe manufacturer’s recommendations.
2.  Joining: Butt-fuse pipes and fittings in accordance with pipe manufacturer’s recommendations. Depending on Site conditions, perform butt-fusion joining in or outside of excavation.
3.  Special Precautions at Flanges: Support polyethylene pipe connected to heavy fittings, manholes, and rigid structures in such a manner that no subsequent relative movement between polyethylene pipe at flanged joint and rigid structures is possible.

B.  Horizontal Directional Drilling:

1.  In accordance with Section 33 05 23.13, Utility Horizontal Directional Drilling.
2.  Handle joined pipeline in such a manner that pipe is not damaged by dragging it over sharp and cutting objects.
3.  Position slings for handling pipeline away from butt-fused joints.
4.  Remove sections of damaged pipe and replace it with undamaged pipe. Damaged pipe is defined as pipe with kinks or gouges exceeding 10 percent of pipe wall thickness.
5.  Exercise care when lowering pipe into trench to prevent damage or twisting of pipe.
6.  At flanges, valves, and connections, excavate trench bottom out sufficiently to ensure clearance between undisturbed trench bottom and flange, valve, or connection.

3.02  TESTING AND INSPECTION


B.  Mandrel Testing:

1.  After leak testing, mandrel test pipeline.
2.  Mandrel Configuration: Rigid, with circular cross section of diameter not less than 95 percent of average inside diameter of pipeline and with length of circular portion equal to nominal diameter of pipeline.