

SECTION 02668

WATER MAINS – POLYETHYLENE ENCASEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies the requirements for furnishing and installing polyethylene encasement for water mains.
- B. Related Sections:
 - 1. Section 02660 Water Mains - General.
 - 2. Section 02661 Water Mains – Ductile Iron.

1.2 MEASUREMENT AND PAYMENT

- A. All costs for furnishing and installing the required polyethylene encasement shall be included in the unit price bid for water main installation.

1.3 REFERENCES

- A. Abbreviations and Acronyms
 - 1. ANSI – American National Standards Institute
 - 2. ASTM - American Society for Testing Materials
 - 3. AWWA – American Water Works Association
- B. Reference Standards
 - 1. ANSI/AWWA C105/A 21.5-10 – Polyethylene Encasement for Ductile Iron Pipe Systems.
 - 2. ASTM A674-10 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water.
 - 3. ASTM D149-09 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
 - 4. ASTM D882-12 – Standard test Method for Tensile Properties of Thin Plastic Sheeting
 - 5. ASTM D1709 – Standard Test Method for Impact Resistance of Plastic Film by the Free-Falling Dart Method
 - 6. ASTM D1922 – Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method
 - 7. ASTM D4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
- C. Reference standards and manuals addressed specifically by name shall be the current versions of said standards and manuals existing at the time of the award of the Contract.

1.4 SUBMITTALS

- A. Product Data: Submit product data, including manufacturer's product sheet, for specified products.

1. Material Safety Data Sheets.
 2. Preparation and installation procedures.
- B. Affidavit stating compliance with the requirements and practices of ANSI/AWWA Specification C105/A 21.

1.5 DELIVERY, STORAGE & HANDLING

- A. Natural Color Polyethylene Encasement shall not be stored with exposure to weather, including sunlight, for more than 48 hours.
- B. Black Polyethylene encasement may be stored exposed to weather and sunlight for longer than 48 hours, but in no case shall it exceed ten (10) days.

PART 2 PRODUCTS

2.1 POLYETHYLENE ENCASEMENT

- A. All ductile iron pipe and fittings shall be encased with polyethylene encasement in accordance with the requirements of ANSI/AWWA Specification C105/A 21.5-10.
- B. Polyethylene encasement materials shall be manufactured of three layers of co-extruded virgin linear low density polyethylene (LLDPE) fused into a single thickness possessing the following characteristics:
1. Raw material requirements in accordance with ASTM D4976.
 - a. Group: 2
 - b. Density: 0.910 to 0.935 g/cm³
 - c. Dielectric Strength: Volume resistivity = 10¹⁵ ohm-cm³, minimum
 2. Physical Properties of finished film
 - a. Tensile Strength: 3,600 psi for an 8-mil minimum thickness or 28.8 lbf/in width, minimum in machine and transverse directions (ASTM D882-12).
 - b. Elongation: 700 percent minimum in machine and transverse directions (ASTM D 882-12).
 - c. Dielectric Strength: 800 volts per mil thickness, minimum (ASTM D149-09)
 - d. Impact Resistance: 600 g, minimum (ASTM D1709, Method B)
 - e. Propagation tear resistance: 2,550 grams force, minimum in machine and transverse directions (ASTM D1922).
- C. Polyethylene tube material shall have a thickness of .008" (8-mils). Thickness tolerance shall not exceed 10% of the total tube thickness.
- D. Inside surface of polyethylene encasement to be in contact with the pipe exterior shall be infused with a blend of microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
- E. A suggested tube size for each pipe diameter is listed in Table 1.
1. For pipe sizes greater than 24", tube size may be determined by multiplying the nominal pipe diameter by 2.25 to obtain minimum flat tube width.
 2. Where bell circumferences are larger than the tube sizes shown, the bell areas should be carefully wrapped with cut film sections, effectively lapping

and securing cut edges as necessary; or, alternatively, sufficiently large tube sizes should be ordered to effectively cover these joints.

Table 1
Polyethylene Flat Tube Width (Inches)

Nominal Pipe Diameter (Inches)	D.I. Pipe, Bell & Spigot Joints	D.I. Pipe with Mechanical Joints
4	14	16
6	16	20
8	20	24
10	24	27
12	27	30
14	30	34
16	34	37
18	37	41
20	41	45
24	54	54

- F. Polyethylene film shall be clearly marked at a minimum of every two (2) feet along its length with print that does not contain hazardous material in accordance with ANSI/AWWA Specification C105/A 21.5-10.
- G. Adhesive tape shall be a general purpose adhesive tape 2" wide and approximately 10 mils thick, such as Scotchrap. no. 50, Polyken No. 900, or Tapecoat CT. Tape used for repair of damage to the polyethylene shall possess a life expectancy equal to that of the polyethylene.

PART 3 EXECUTION

3.1 OPEN CUT INSTALLATION

- A. General
 - 1. Install polyethylene encasement on pipe and fittings at locations specified on the construction drawings.
 - 2. Although not intended to be a completely air- and water-tight enclosure, provide a continuous barrier between the pipe and the surrounding backfill.
 - 3. Remove lumps of clay, mud, cinders, etc. on the pipe surface prior to installation of the polyethylene encasement.
 - 4. Soil or bedding material should not be trapped between the pipe and the polyethylene during installation.
 - 5. Fit the polyethylene film to the contour of the pipe creating a snug, but not tight, encasement with minimum space between the polyethylene and the pipe.
 - 6. Provide sufficient slack to prevent stretching and damage during backfilling operations.
 - 7. When installing polyethylene encasement below the water table;
 - a. seal both ends of the tube as thoroughly as possible with adhesive tape at the joint overlap
 - b. Place circumferential wraps of tape at 2-foot intervals along the barrel of the pipe.

- B. On Pipe
1. Cut polyethylene tube to a length approximately two feet longer than the length of the pipe section.
 2. Slip the polyethylene around the pipe, centering it to provide a one-foot overlay on each adjacent pipe section, and bunching it accordion fashion until it clears the pipe ends.
 3. Lower pipe into the trench and make up the pipe joint with the preceding section of pipe. Create a shallow bell hole at joints to facilitate installation of the polyethylene.
 4. Complete the joint and make the overlap.
 5. Pull the bunched-up polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure in place with one circumferential turn of tape plus enough new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Tape it in place. Take up the slack width to make a snug, but not tight, fit along the barrel of the pipe, securing the fold as necessary with adhesive tape at quarter points.
 6. Repair any rips, punctures, or other damage to the polyethylene with tape or with short length of polyethylene tube cut open, wrapped around the pipe, and secured with tape. Proceed with installation of the next section of pipe.
- C. On Pipe Alternate Method
1. Cut polyethylene tube to a length approximately one foot shorter than the length of the pipe section.
 2. Slip polyethylene around the pipe, centering it to provide six inches of bare pipe at each end.
 3. Make polyethylene snug, but not tight; tape down at quarter points and secure ends as described above.
 4. Before making up a joint, slip a three-foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion.
 5. After completing the joint, pull the three-foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot; make snug, tape down, and secure each end as described above.
 6. Repair any rips, punctures, or other damage to the polyethylene as described above. Proceed with installation of the next section of pipe in the same manner.
- D. Bends, Reducers, Offsets
1. Encase with polyethylene in the same manner as the pipe.
- E. Valves and Other Odd Shaped Pieces
1. Wrap with a flat sheet obtained by splitting open a length of polyethylene tube.
 2. Pass sheet under the valve and bring up around the body of the stem.
 3. Create seams by bringing the edges together, folding over twice, and tamping down.
 4. Handle slack width and overlaps at joints as described above.
 5. Tape polyethylene securely in place at valve stem and other penetrations.

- F. Openings for Service Taps
1. Wrap three layers of polyethylene adhesive tape completely around pipe and polyethylene encasement to cover the area where the tapping machine and chain will be mounted.
 2. Mount tapping machine on pipe area covered by the polyethylene adhesive tape.
 3. Make tap and install corporation stop directly through the tape and polyethylene.
 4. Inspect entire circumferential area for damage and make any necessary repairs.
 5. Wrap service tap extension with polyethylene a minimum clear distance of three (3) feet from the main.
- G. Openings for Branches, Blow-offs, Air Valves and Similar Appurtenances
1. Make an X-shaped cut in the polyethylene and temporarily fold back the film.
 2. Install appurtenance, replace the film and repair the cut, as well as other damaged areas in the polyethylene, with tape.
 3. Wrap branch lines of dissimilar material with polyethylene a minimum clear distance of three (3) feet from the main.
 4. Do not wrap branch pipe, blow-offs, air valves or similar appurtenances with polyethylene unless otherwise specified or shown on the Drawings.
- H. Junctions between Wrapped and Unwrapped Pipe
1. Where polyethylene wrapped pipe joins a pipe which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of three feet, unless shown on the Drawings. Secure the end with circumferential turns of tape

END OF SECTION