STANDARD SPECIFICATION FOR DUCTILE IRON PIPE
V-BIO® POLYETHYLENE ENCASEMENT

V-Bio®

ENHANCED POLYETHYLENE ENCASEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. V-Bio® enhanced polyethylene encasement incorporating a Volatile Corrosion Inhibitor and anti-microbial additives is part of the corrosion protection system as indicated in Summary of Work.

B. Specifications for materials and installation of V-Bio® polyethylene encasement for pipe, valves, fittings, and other appurtenances in ductile or cast iron systems.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices. No separate payment will be made for the V-Bio® polyethylene encasement. Include cost of polyethylene encasement in unit price for pipes and fittings to be encased.

B. Stipulated Price (Lump Sum). For a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.03 REFERENCES

A. ASTM D 149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.

B. ASTM D 882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

C. ASTM D 1709 – Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

D. ASTM D 1922 – Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.

E. ASTM D 4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

F. ANSI/AWWA C600 – Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

G. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

1.04 SUBMITTALS

A. Product Data: Submit product data for polyethylene film and tape or plastic tie straps for approval. Film to be used in accordance with this standard specification shall be manufactured from virgin polyethylene, shall not be recycled and shall be purchased new for the project, clean, sound and without defects. The product shall be DIPRA approved V-Bio® enhanced polyethylene encasement manufactured by Crayex or First Films, or engineer approved equal. Submittals from companies requesting to be considered as equal must include documentation of suitable proof-of-design testing comprising no less than eight years proofing data obtained by burial of encased pipe specimens in a Severely Corrosive Environment as defined in Appendix A of ANSI/AWWA C105/A21.5.

B. Samples: Submit samples of polyethylene tube and/or sheet for approval. Provide one sample of tube for each pipe diameter and one sample of each sheet material to be used. Samples shall be a minimum of 40 square feet of standard production material.

C. Quality Assurance Plan: Submit quality assurance plans for film manufacturing and field application.

   a. Film Manufacturing: The manufacturer of polyethylene film for corrosion protection encasement of ductile iron pipe shall have a verifiable quality control system to assure that film is produced from only virgin polyethylene and that it complies with all requirements of this specification. Documentation of Quality Control procedures and test results shall be submitted and shall be made available for inspection for at least one year. A current ISO certificate may be used in lieu of other quality control documentation.

   b. Field Application: The contractor shall develop and submit for approval a comprehensive Quality Assurance Plan for installation of polyethylene encasement. Address all aspects of material and pipe handling, bedding, preparation of pipe surface, film installation and anchoring, service taps and backfill. Include written procedures to be used by installers.

D. Manufacturer’s Certification: Submit polyethylene film manufacturer's certification of compliance with this Section. The polyethylene film manufacturer shall provide a notarized statement from an officer of the company that the film meets the inspection and all applicable material specifications of this specification. The manufacturer’s statement of compliance must be verifiable. Statements from distributors or contractors shall not be accepted in lieu of a statement from the original manufacturer of the polyethylene film.

E. Installer Qualifications: Polyethylene encasement shall only be installed by qualified persons who have been trained in the proper procedures described in Part 3 of these specifications.

F. Qualified Persons: Qualified persons shall be those that have had training and experience in the installation of polyethylene encasement for corrosion protection of ductile iron pipe.

Such persons may be qualified by the Ductile Iron Pipe Research Association, ductile iron pipe manufacturers or engineering/inspection firms who offer training courses in the proper method(s) of installation. Proof of qualifications shall be submitted with the shop drawings and shall be provided to project inspectors upon request.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polyethylene Film: Tubular or sheet form without tears, breaks or defects, conforming to the following requirements.

1. Linear Low-Density, Polyethylene: Co-extruded linear low-density polyethylene film manufactured from virgin polyethylene material, containing biocide for controlling microbiologically influenced corrosion (MIC) and a volatile corrosion inhibitor (VCI) for controlling general corrosion, and conforming to the following:

   a. Extrusion: The polyethylene film is to consist of three layers of co-extruded, polyethylene. The innermost layer is to be a nominal 1.5 mils (0.0015 inches) in thickness, containing a biocide and VCI. The outer layer is to be a nominal 1.5 mils thick Linear Low Density Polyethylene. The core (center) layer will consist of a nominal 5 mils of Linear Low Density Polyethylene for a total minimum film thickness of 8 mils.

   b. Physical Properties: Physical properties of finished film to be as follows:

      1. Tensile Strength: 3,600 psi. minimum in machine and transverse direction (ASTM D 882)

      2. Elongation: 700 percent minimum in machine and transverse direction (ASTM D 882) as measured using rubber lined grips.

      3. Dielectric Strength: 800 volts/mil thickness minimum (ASTM D 149)

      4. Impact Resistance: 600 grams minimum (ASTM D 1709 Method B)

      5. Propagation Tear Resistance: 2,550 grams force minimum in machine and transverse direction (ASTM D1922)

   c. Thickness: Linear low-density polyethylene film shall have a minimum thickness of 8 mils.

   d. Color: Polyethylene film shall have a white exterior and shall contain a nominal 2 percent of a hindered-amine ultraviolet inhibitor.

2. Marking: The polyethylene film shall be clearly marked every two feet with, at a minimum, the following information:

   a. Manufacturer's name or trademark
   b. Year of manufacture
   c. ANSI/AWWA C105/A21.5
   d. Minimum film thickness and material type (LLDPE)
   e. Applicable range of nominal pipe diameter size(s)
   f. Warning – Corrosion Protection – Repair Any Damage

   Letters and numerals used for marking items "a" through "e" shall not be less than 1 inch in height and item "f" shall not be less than 1-1/2 inches in height.

B. Tape: Provide 1-½-inch wide, non-biodegradable plastic-backed, adhesive tape for fitting and anchoring the encasement. If the film is wet due to weather or groundwater conditions, a marine grade adhesive tape shall be used.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove lumps of clay, mud, and cinders from pipe surface prior to installation of polyethylene encasement. Prevent soil or embedment material from becoming trapped between pipe and polyethylene.

B. Fabric slings and padded forks shall be used for lifting and handling of wrapped pipe. Chains or cables shall not be used. Do not handle the encased pipe is a way that results in damage the polyethylene encasement.

C. For installations below water table or in areas subject to tidal actions the tube form polyethylene encasement shall be used. Completely seal both ends of the polyethylene tube with adhesive tape at joint overlap. Circumferentially wrap with tape or plastic tie straps every two feet along the barrel.

3.02 INSTALLATION

A. **Modified Method A.** The pipe shall be installed in accordance with Modified Method A as describes in ANSI/AWWA C105/A21.5

1. Cut a length of V-Bio® enhanced polyethylene tube approximately 1-ft. (300 mm) longer than the pipe section. Remove all lumps of clay, mud, cinders, or other material that might have accumulated on the pipe surface during storage. Slip the polyethylene tube around the pipe, starting at the spigot end. Bunch the tube accordion fashion on

the end of the pipe. Pull back the overhanging end of the tube and circumferentially tape it to the barrel of the pipe behind the insertion line. After assembly of the joint, the tape should be as close to the face of the bell as possible but not so close to the spigot end that it interferes with the gasket during assembly.

2. Take up the slack in the tube along the barrel of the pipe to make a snug, but not tight, fit. Fold excess polyethylene back over the top of the pipe and use pieces of tape across the fold to securely hold it in place. This step is extremely important to avoid the sagging of the film at the bottom of the pipe.

3. Dig a shallow bell hole in the trench bottom at the joint location to facilitate installation of the polyethylene tube. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe.

4. Move the sling (no chains or metal, use non-abrasive sling material) to the bell end of the pipe and lift the pipe slightly to provide enough clearance to easily slide the tube over the remaining barrel of the pipe. Snugly fold over the excess wrap using tape to hold it in place. Note: Make sure that no dirt or other bedding material becomes trapped between the wrap and the pipe.

5. Secure the polyethylene in place behind the preceding bell by using a circumferential wrap of tape. Make the overlap of the polyethylene tube by pulling back the bunched polyethylene from the preceding length of pipe and ensure there is at least a 12-inch overlap.

6. Place another circumferential wrap of tape on the overlapping polyethylene, securing it to the spigot side of the joint.

7. Carefully backfill the trench according to the procedures in ANSI/AWWA C600 Standard. To prevent damage during backfilling, allow adequate slack in the tube at the joint. Backfill should be free of cinders, rocks, boulders, nails, sticks, or other materials that might damage the polyethylene. Avoid damaging the polyethylene when using tamping devices.

8. Cuts, tears, punctures, or other damage to the polyethylene shall be repaired as described in Sec. 4.4.6. of ANSI/AWWA C105/A21.5. Proceed with the installation of the next section of pipe in the same manner.

B. **Modified Method A in Wet Trench Conditions**

In installations where the water table may intrude into the pipe zone, either constantly or intermittently, it is important circumferential wraps of tape shall be applied at 2-foot (600 mm) intervals along the barrel of the pipe. Also, tape shall be used instead of tie straps to secure the ends of the film.

C. Pipe-shaped Appurtenances: Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in same manner as pipe.

D. Odd-shaped Appurtenances: When it is not practical to wrap valves, tees, crosses, and other odd-shaped pieces in tube, wrap with flat sheet or split length of polyethylene tube by passing sheet around appurtenance and encasing it. Make seams by bringing edges together, folding over twice, and taping down. At valve stems and other penetrations, secure polyethylene film with tape.

E. Openings in Encasement: Create openings for branches, saddles, service taps, blowoffs, air valves, and similar appurtenances by making an X-shaped cut in polyethylene and temporarily folding back film. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene, with tape.

F. Hydrant Drain Relief: For hydrant relief holes and similar orifices, apply 3 wraps of tape completely around the polyethylene encased pipe, then, with a utility knife, cut a hole in the tape and polyethylene that is 1-inch larger in diameter than the orifice/opening.

G. Direct Service Taps: For direct service taps, apply 3 wraps of tape completely around the polyethylene encased pipe to cover the area where the tapping machine and chain will be mounted. After the tapping machine is mounted, install the corporation stop directly through the tape and polyethylene. After the direct tap is completed, the entire circumferential area shall be closely inspected and repaired as needed.

H. Service Connections: Wrap service lines of copper and other dissimilar metals with polyethylene or suitable dielectric tape for a minimum clear distance of 3 feet away from the cast or ductile iron pipe. Surface preparation and method of application shall follow tape manufacturer's written instructions.

I. Junctions between Wrapped and Unwrapped Pipe: Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for at least 3 feet. Secure end with circumferential turns of tape.

J. Installation of Pipe through Casings: Polyethylene encasement shall be used for pipe through casings. Use a single layer of polyethylene film. Casing spacers (insulated type) and casing end seals shall be installed. Do not damage the polyethylene film where these devices are attached to the pipe, over the encasement.

3.03 REPAIRS

Repair any cuts, tears, punctures, or damage to polyethylene with adhesive polyethylene tape or a short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area, and secured in place.

3.04 BACKFILL

Prevent damage to the polyethylene wrap when placing backfll. Assure backfill material is free from cinders, refuse, boulders, rocks, stones, or other material that could damage the polyethylene. Follow ANSI/AWWA C600 for backfilling.

3.05 QUALITY ASSURANCE

A. Freedom from Defects: All polyethylene film shall be clean, sound and free from defects.

B. Inspection: All parts of this Section are subject to inspection by the owner or its designated representative.

C. Non-Compliance: The Contractor will correct any deficiencies in materials or installation at his expense, including excavating the pipe subsequent to backfilling and re-installing the polyethylene wrap.

END OF SECTION