SECTION 02265
POLYURETHANE COATINGS ON STEEL OR DUCTILE IRON PIPE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Two (2) component polyurethane coating system for use as external coating for steel or ductile iron pipe.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:
   1. No separate payment will be made for work performed under this Section. Include cost of polyurethane coatings in contract unit prices for steel pipe or ductile iron pipe.
   2. Refer to Section 01270 – Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum):
   1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES

A. ASTM – American Society for Testing and Materials.
   1. ASTM D522 – Standard Test Method for Mandrel Bend Test of Attached Organic Coatings.

B. AWWA – American Water Works Association.
   1. AWWA C210 – Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

C. CFTS – City of Friendswood Technical Specifications.

D. SSPC – Steel Structures Painting Council.
   1. SSPC PA2 – Measurement of Dry Paint Thickness with Magnetic Gauges.
   2. SSPC PA Guide 3 – A Guide to Safety in Paint Application.
   3. SSPC PS Guide 17.00 – Guide for Selecting Urethane Painting Systems.
   4. SSPC PS10 – Near-White Blast Cleaning.

1.4 SAFETY

A. Secure, from manufacturer, Material Safety Data Sheet (MSDS) for polyurethane coatings and repair materials listed in this Section.

B. Safety requirements stated in this specification and in related sections apply in addition to applicable federal, state and local rules and regulations. Comply with instructions of coating manufacturer and requirements of insurance underwriters.

C. Follow handling and application practices of SSPC PA Guide 3; SSPC PS Guide 17.00; Coating Manufacturer's Material Safety Data Sheet.

1.5 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.
B. Submit coating manufacturer's catalog sheets and technical information for approval, prior to delivery of pipe.
C. Obtain from coating manufacturer and submit coating "affidavit of compliance" to requirements of this Section stating that coatings were applied in factory and in accordance with manufacturer's minimum requirements.

1.6 DELIVERY, STORAGE and HANDLING

A. Use standard containers to prevent gelling, thickening deleteriously or forming of gas in closed containers within period of one year (1 Yr) from date of manufacture.
B. Label each container of separately packaged component clearly and durably to indicate date of manufacture, manufacturer's batch number, quantity, color, component identification and designated name or formula specification, number of coatings together with special instructions. Do not use coating components older than one year (1 Yr).
C. Deliver coating materials to pipe manufacturer in sealed containers showing designated name, batch number, color, date of manufacture and name of coating manufacturer.
D. Store material onsite in enclosures, out of direct sunlight in a warm, ventilated and dry area.
E. Prevent puncture, inappropriate opening or other action which may lead to product contamination.

1.7 QUALITY ASSURANCE

A. Provide manufacturer's affidavits that pipe was manufactured in compliance with standards referenced in this Section.

PART II: PRODUCTS

2.1 COATING MATERIAL

A. CORROPIPE II PW – TOUCHUP (two-component) or approved equal; mix in accordance with coating manufacturer's recommendations.
    1. For areas less than or equal to six inches (6 In) in diameter, brush apply.
    2. For areas greater than six inches (6 In) in diameter, spray apply.
B. Coating System: Use Type V system which is two (2) package polyisocyanate, polyol-cured urethane coating, mixed in one to one (1:1) ratio at time of application. Components shall be balanced viscosities in their liquid state and not require agitation during use.
C. Exterior Coating Material: CORROPIPE II-TX and Joint Coating Material CORROPIPE II-PW, manufactured by Madison Chemical Industries, Inc.
D. Internal Coating Material: Joint Coating Material CORROPIPE II-PW, manufactured by Madison Chemical Industries, Inc

E. Cured Coating Properties:
   1. Conversion to Solids by Volume: Ninety-seven percent (97%) plus or minus three percent (±3%).
   2. Temperature Resistance: Minus forty degrees Fahrenheit (-40° F) and plus one hundred degrees Fahrenheit (130° F).
   3. Minimum Adhesion: Five hundred pounds per square inch (500 psi), when applied without primer to ductile iron pipe which has been blasted to comply with SSPC SP10.
   4. Cure Time: For handling in one minute (1 Min) at one hundred twenty degrees Fahrenheit (120° F) and full cure within seven days (7 D) at seventy degrees Fahrenheit (70° F).
   5. Maximum Specific Gravities: Polyisocyanate resin, 1.20. Polyol resin, 1.15.
   6. Minimum Impact Resistance: eighty inch-pounds (80 in-lb) using one inch (1 In) diameter steel ball where coating is applied at thirty (30) mils to ductile iron pipe surface which has been blasted to SSPC No. 10 finish.
   7. Minimum Tensile Strength: Two thousand pounds per square inch (2000 psi).
   8. Hardness: Fifty-five (55) plus or minus five (±5) Shore D at seventy degrees Fahrenheit (70° F).
   9. Flexibility Resistance: ASTM D522 using one inch (1 In) mandrel. Allow coating to cure for seven days (7 D). Perform testing on test coupons held for fifteen minutes (15 Min) at temperature extremes specified in this Paragraph.

2.2 REPAIR AND TOUCHUP MATERIAL
A. CORROPIPE II PW [Two (2) component, brush applied or approved equal]. Mix in accordance with coating manufacturer's recommendations.

PART III: EXECUTION

3.1 SURFACE PREPARATION
A. Remove deposits of oil, grease or other organic contaminates before blast cleaning by using solvent wash as specified in SSPC PA Guide 3. Clean and dry surfaces making them completely dry, free of moisture, dust, grit, oil, grease or other deleterious substances prior to application of coating.
B. Exterior and Interior Surfaces: SSPC SP10, near-white metal blast cleaning. Blast with clean, hard, sharp cutting abrasives with no steel or cast iron shot in mix.
C. Ductile Iron Pipe: Prior to start of production blasting, prepare specimens for white metal blast and near-white metal blast using equipment and abrasives proposed for work. During preparation of specimens, Change blasting intensity and abrasive as necessary to provide degree of

cleaning required by SSPC SP10, except that color of blasted substrate is not expected to match color of blasted steel. After examination and concurrence by the Project Manager, production blasting may begin. Monitor and control production blasting so that production pipe surfaces match surface of approved blasting specimens.

3.2 THICKNESS

A. External Coatings: Minimum DFT of twenty-five (25) mils (0.025 inch).
B. Internal Coatings: Minimum DFT of thirty-five (35) mils.
C. Thickness Determinations: Use Type 1 magnetic thickness gauge as described in SSPC PA2 specification. Individual readings below ninety percent (90%) of specified minimum are not acceptable. Average individual spot readings [consisting of three (3) point measurements within three inches (3 In) of each other] less than ninety-five percent (95 %) of minimum are not acceptable. Average of all spot readings less than minimum thickness specified are not acceptable.

3.3 FACTORY APPLICATION OF POLYURETHANE COATING

A. Equipment: Two-component, one to one (1:1) mix ratio, heated airless spray unit.
B. Temperature: Minimum five degrees Fahrenheit (5° F) above dew point temperature. Temperature of surface shall not be less than sixty degrees Fahrenheit (60° F) during application.
C. Humidity: Heating of pipe surfaces may be required to meet requirements of Paragraph 2.1E, Cured Coating Properties, when relative humidity exceeds eighty percent (80%).
D. Do not thin or mix resins; use as received. Store resins at temperature above fifty-five degrees Fahrenheit (55° F) at all times.
E. Application: Conform to coating manufacturer's recommendations. Apply directly to substrate to achieve specified thickness. Multiple-pass, one (1) coat application process is permitted provided maximum allowable recoat time specified by coating manufacturer is not exceeded.
F. Recoat only when coating has cured less than maximum time specified by coating manufacturer. When coating has cured for more than recoat time, brush-blast or thoroughly sand coating surface. Blow-off cleaning using clean, dry, high pressure compressed air.
G. Cure at ambient temperature above zero degrees Fahrenheit (0° F). Do not handle pipe until coating has been allowed to cure as specified in TABLE 4.1 – MINIMUM CURE TIME in this Section.

3.4 JOINTS

A. Apply coating to unlined pipe surfaces including inside of bell socket and outside of spigot.
B. Coating thickness on sealing areas of spigot end of pipe exterior: Minimum eight (8) mils (0.008 inch), maximum of ten (10) mils (0.010 inch). Maximum ten (10) mils may be exceeded in spigot end provided

maximum spigot diameter as specified by pipe manufacturer is not exceeded.

3.5 INSPECTION

A. The Project Manager may inspect coatings at coating applicator's facilities.
B. Secure approval of surface preparation by coating manufacturer's representative prior to coating application.
C. Holiday Inspection: Conform to AWWA C210, Section 5.3.3.1. Follow coating manufacturer's recommendation. Conduct inspection any time after coating has reached initial cure. Repair in accordance with Paragraph 3.7, Repair and Field Touchup.

3.6 PIPE INSTALLATION

A. When required by the Project Manager, provide services of manufacturer's representative for period of not less than two weeks (2 Wks) at beginning of actual pipe laying operations to advise the Contractor regarding installation, including, but not limited to, handling and storing, cleaning and inspecting, coatings repairs and general construction methods as to how they may affect pipe coatings.
B. Use nylon straps, padded lifts and padded storage skids. Field cuts shall be kept to minimum. Repair damage to coating due to handling or construction practices. See Section 02215 – Ductile Iron Pipe (DIP) and Fittings and Section 02250 – Steel Pipe and Fittings for additional requirements.
C. Just before each section of pipe is to be placed into trench, conduct visual and holiday inspection. Repair defects in coating system before pipe is installed.

3.7 REPAIR AND FIELD TOUCHUP

A. Apply repair and touchup materials to holidays and other deficient coating in conformance with factory application of polyurethane coating requirements specified in this Section, excluding equipment requirements.
B. Repair Procedure – Holidays:
    1. Remove traces of oil, grease, dust, dirt and other deleterious materials.
    2. Roughen area to be patched by sanding with rough grade forty (40) grit sandpaper.
    3. Apply one (1) coat of repair material described above. Work repair material into scratched surface by brushing.
C. Repair Procedure – Field Cuts or Large Damage:
    1. Remove burrs from field cut ends or handling damage and smooth out edge of polyurethane coating.
    2. Remove traces of oil, grease, dust, dirt and other deleterious materials

3. Roughen area to be patched with rough grade forty (40) grit sandpaper. Feather edges and include overlap of one inch (1 In) to two inches (2 In) of roughened polyurethane in area to be patched.
4. Apply thick coat of repair material described above. Work repair material into scratched surface by brushing. Feather edges of repair material into prepared surface. Cover at least one inch (1 In) of roughened area surrounding damage or adjacent to field cut.

D. Repair Procedure – Thermite Brazed Connection Bonds:
1. Remove polyurethane coating with power wire brush from area on metal surface which is to receive thermite brazed connection.
2. Grind metal surface to shiny metal with power grinder and coarse grit grinding wheel.
3. Apply thermite-brazed connection using equipment, charge and procedure recommended by manufacturer of thermite equipment.
4. After welded surface has cooled to temperature below one hundred thirty degrees Fahrenheit (130° F), apply protective coating repair material to weld, exposed pipe surface and damaged areas of polyurethane coating.
5. Do not cover or backfill freshly repaired areas of coating at thermite-brazed connection until repair material has completely cured. Allow material to cure in conformance with manufacturer's recommendations.

PART VI: TABLES

4.1 – MINIMUM CURE TIME

Ambient Temperature	**Minimum Full Cure Time**
Over 70 degrees F	7 days
50 to 70 degrees F	9 days
0 to 50 degrees F	12 Days

END OF SECTION