SECTION 15061

STEEL PIPE SPECIFICATION – TRANSMISSION MAIN

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope of Work: Furnish and install steel pipe for water and sewer pipeline as specified herein.

B. Steel pipe shall be used in conditions only in conditions that are favorable for the use of steel pipe as approved by the Department and Engineer.

1.02 QUALITY ASSURANCE

ANSI/AWS D1.1: Structural Welding Code- Steel

ANSI/AWS B2.1: Specification for Welding Procedure and Performance Qualification

ANSI/AWWA C200: Steel Water Pipe – 6 In. (150 mm) and Larger

ANSI/AWWA C205: Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4 In. (100 mm) and Larger- Shop Applied

ANSI/AWWA C206: Field Welding of Steel Water Pipe

ANSI/AWWA C207: Steel Pipe Flanges for Waterworks Service – Sizes 4 In. through 144 In. (100 mm through 3,600 mm)

ANSI/AWWA C208: Dimensions for Fabricated Steel Water Pipe Fittings

ANSI/AWWA C209: Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipe

ANSI/AWWA C210: Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

ANSI/AWWA C214: Tape Coating Systems for the Exterior of Steel Water Pipelines

ANSI/AWWA C215: Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines

ANSI/AWWA C216: Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fitting

ANSI/AWWA C222: Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings

ASME Section IX International Boiler & Pressure Vessel Code: Welding and Brazing Qualifications

AWWA M11 Steel Water Pipe: A Guide for Design and Installation

A. Qualifications

1. Steel pipe manufacturer shall be pre-approved by the Miami-Dade Water and Sewer Department. Pipe manufacturer shall be pre-approved by the Department.

2. Pipe cylinders, coating, lining and fabrication of specials shall be the product of one manufacturer that has not less than 5 years successful experience manufacturing pipe of the particular type and size indicated. The Pipe Manufacturer must have a certified quality assurance program. This certified program shall be ISO 9001:2000 or other equivalent nationally recognized program as approved by the Engineer.

3. The Pipe Manufacturer shall be responsible for compiling the design calculations, details, and layout drawings for the steel pipe. The required submittals shall not be performed by a 3rd party but by direct staff of the Supplier. The submittal process must be overseen by a Professional Engineer (P.E.) employed by the Manufacturer.

4. Lining and coating shall be applied by the same company that is manufacturing the pipe.

5. All materials which may come into contact with potable water shall be NSF 61 certified.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 01340 and the following.

B. Submit materials list showing material of pipe and fittings with ASTM reference and grade. Submit certified original copies of mill test reports on each heat from which steel is rolled. Tests shall include physical and chemical properties.

C. Submit certified copies of mill test reports for flanges including details of stress relief used. Submit manufacturer's certification of compliance with these specifications including referenced standards.

D. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.

E. Shop Drawings

F. Drawings shall be submitted to the Engineer for approval and shall include the following:

1. Pipeline layout showing stations and elevations.

2. Details of standard pipe, joints, specials and fittings including lining, coating, cylinder thickness and tolerances.

3. Show weld sizes and dimensions of grooved-end collars, flanges, reinforcing collars, wrapper plates, and crotch plates.

G. Design

1. Calculations for pipe design and fittings reinforcement and/or test data.

2. Details of joint bonding and field welded joint restraint calculations.

1.04 VERIFICATION

A. Inspections

1. All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of AWWA C200 and AWWA coating and lining standard as supplemented by the requirements herein.

2. Personnel performing NDT (Non Destructive Testing) shall meet the requirements of AWWA C200, Section 5.

B. Tests

1. Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of AWWA C200 and AWWA coating and lining standards.

2. The Contractor shall perform required tests at no additional cost to the Owner. 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.

C. Welding Requirements

1. All welding procedures used to fabricate pipe shall be qualified under the provision of AWS D1.1 or ASME Section IX.

D. Welder Qualifications

1. Skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall maintain current qualifications under the provisions of AWS D1.1 or ASME Section IX. Machines and electrodes similar to those in the work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders.

1.05 HANDLING, STORAGE, AND SHIPPING

A. Pipe shall be stulled as required to maintain roundness of +/- 1% during shipping and handling.

B. Coated pipe shall be shipped on padded bunks with nylon belt tie-down straps or padded banding located approximately over stulling.

C. Coated pipe shall be stored on padded skids, sand or dirt berms, sand bags, old tires or other suitable means so that coating will not be damaged.

D. Coated pipe shall be handled with wide belt slings. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.

E. Prior to shipment, dielectrically coated pipe shall be visually inspected for damage to the coating by the following procedure:

1. When visual inspection shows a dielectric coating system has sustained physical damage, the area in question shall be subjected to an electrical holiday test in accordance with the appropriate AWWA coating standard.
2. When the area is tested and there are no holidays or no tearing of the material, (wrinkling or bruising of tape may be permitted) then the area shall be noted “OK” and shipped with no patching required.
3. When the damaged area does show damage going clear to the steel from either a visual inspection or a beep from a holiday detector, the area shall be repaired in accordance with Section 2.02 of these specifications and per manufacturer’s recommendations.

1.06 MARKINGS

A. The Contractor shall legibly mark all pipes and specials in accordance with the laying schedule and marking diagram. Each pipe shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. All special pipe sections and fittings shall be marked at each end with top field centerline. The word “top” or other suitable markings shall be painted or marked on the outside top spigot end of each mitered pipe section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe

1. Steel pipe shall conform to AWWA C200. Steel used in the manufacture and fabrication of steel pipe shall meet the requirements of AWWA C200. All longitudinal and girth seams, whether straight or spiral, shall be butt-welded using an approved electric-fusion-weld process.
2. Pipe shall be designed for 150 psi working pressure with an additional 75 psi allowance for surge. Pipe design shall be in accordance with AWWA M11.
3. Pipe shall be bedded and backfilled per the Plans and specifications utilizing an E’ value for design check per AWWA M11 Chapter 6.
4. Pipe is to be furnished in maximum 40 foot laying lengths with shorter lengths, field trim pieces and closure pieces as required by Plan and profile for location of elbows, tees, reducers and other in-line fittings or as required for construction. The pipe manufacturer shall prepare a pipe laying schedule showing the location of each piece by mark number with station and invert elevation at each bell end.

B. Fittings

1. Unless otherwise shown on the Plans, all specials and fittings shall conform to the dimensions of AWWA C208 and AWWA M11. Pipe material used in fittings shall be of the same material and pressure class as the adjoining pipe. The minimum radius of elbows shall be 2 ½ times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11 ¼-degrees (one cut elbow up to 22 ½-degrees). If elbow radius is less than 2 ½

times the pipe diameter, stresses shall be checked per AWWA M11 and the pressure class increased if necessary.

2. Fittings shall be equal in pressure class design as the adjoining pipe. Specials and fittings, unless otherwise shown on the Plans, shall be made of segmentally welded sections from hydrostatically tested pipe, with ends compatible with the type of joint or coupling specified for the pipe. All welds made after hydrostatic testing of the straight sections of pipe shall be tested per the requirements of AWWA C200 Section 5.2.2.1.

C. Joints

1. The standard joint shall be rubber gasketed, capable of sustaining a working pressure of 250 psi with a maximum joint pull of ¾".

2. The restrained joint (where pipe can be installed above ground or in a dry trench) shall be a field-welded lap joint, welded on either the inside or out, conforming to the requirements of ANSI/AWWA C206. The standard bell shall provide for a minimum lap of 1-inch or three times the thickness of the pipe, whichever is greater. The design maximum pull or offset shall be 1-inch. Where it is impractical to provide lap welded joints due to an inability to weld the joint, a mechanically restrained joint may be substituted.

3. The restrained joint shall be a mechanical type restraint joint where field welding is not deemed feasible. The mechanically restrained joint shall be American Pipe Lok-Ring or approved equal.

4. Couplings for buried service shall have all metal parts except bolts and nuts coated with epoxy paint conforming to ANSI/AWWA C210 or ANSI/AWWA C213.

5. Where tied joints are required, mechanical couplings shall be harnessed for the maximum pressure (test pressure or transient pressure) in accordance with AWWA M11 or shall be Victaulic Depend-O-Loc FxF couplings.

6. Pipe ends for mechanical couplings shall conform to ANSI/AWWA C200 and the associated ANSI/AWWA coupling standard. Harness lugs or rings and pipe ends shall be coated with one shop coat of epoxy conforming to ANSI/AWWA C210. The inside lining shall be continuous to the end of the pipe.

2.02 Linings and Coatings for Water

A. Cement-mortar Lining

1. Interior surface of all steel pipe, fittings and specials shall be lined in the shop with cement-mortar lining applied centrifugally and conforming with AWWA C205.

2. Holdbacks shall be left bare and be provided as shown on the approved shop drawings. Holdbacks shall be filled with cement mortar after joint completion per AWWA C205.

3. Defective linings as identified in AWWA C205 shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.
4. Fittings shall be cement-mortar lined per AWWA C205. Pipe and fittings too small to cement-mortar line may be lined with AWWA C210 epoxy or AWWA C222 polyurethane.
5. Cement-mortar lining shall be kept moist during storage and shipping. The Contractor shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

B. Exterior Polyethylene Coating

1. Straight pipe shall be coated with three layers of polyethylene tape, 80 mil system, conforming to ANSI/AWWA C214, or with polyurethane conforming to ANSI/AWWA C222 with a minimum of 25 mils DFT. Where machine applied tape is not practical, such as at fittings and special sections, the pipe shall receive one of the following protective coatings:

   a. Two layers of 60 mil polyethylene tape, conforming to ANSI/AWWA C209.

   b. Liquid epoxy, 16 mils minimum DFT, conforming to ANSI/AWWA C210.

   c. Polyurethane, 25 mils minimum DFT, conforming to ANSI/AWWA C222.

2. Coat the ends of plain-end buried pipe where flexible pipe couplings are to be installed with epoxy. Apply coating in shop.

   a. Surface Preparation: SSPC SP-10.

   b. Coating System: Apply the manufacturer's recommended number of coats to attain the specified minimum dry-film coating thickness. Products: Devoe Bar-Rust 233H, Tnemec 100, Scotchkote 323, Tnemec N140, Sherwin-Williams Tank Clad HS B62-80, Scotchkote 306, PPG AQUAPON® LT NSF Low Temperature Epoxy Coatings 95-172, Carboline Carboguard 891, PPG Amercoat 395FD, Carboline Plasite 7133 or 9133, Keysite 740, or equal; 16 mils total. Color of topcoat: white. Each coat shall be different color than the one preceding it.

3 The coating thickness on pipe ends having grooved-end joints (gasket seating surface and the entire groove) and on the coupling key, shoulder, gasket pocket, and bolt pad mating surfaces of the groove-end couplings shall be 8 to 10 mils.

   a. Coat exposed grooved-end couplings the same as the adjacent pipe.

   b. Coat the interior metal surfaces of blind flanges with epoxy.

2.03 Lining for Sewer

A. Polyurethane Lining

1. For service conditions where cement mortar is not appropriate, provide a polyurethane lining in accordance with ANSI/AWWA C222. Polyurethane linings shall be applied at 20 mils minimum dry film thickness (DFT) or as otherwise required by the Engineer for the specific application.

2. Polyurethane lining shall be applied in accordance with ANSI/AWWA C222 and the polyurethane manufacturer's recommendations. The lining shall be spray applied to the interior of the pipe after cleaning and blasting have been performed to achieve a properly prepared surface. Curing time and temperature are a function of the specific polyurethane type and formulation. After the lining has adequately cured, it is tested for conformance to the standard. These tests include verification of thickness, electrical holiday inspection to verify dielectric integrity, and pull-off testing to verify adhesion strength.

B. Epoxy lining

1. Epoxy lining meeting shall be used only with the approval of the Miami-Dade Water and Sewer Department. Any epoxy ling used shall be certified for use by the pipe manufacturer and provided with a history of successful installations in similar applications.

2. Provide detailed report for the mils thickness required in the sewer application.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall provide and install all required piping and accessories in accordance with the contract documents and manufacturer's recommendations. Pipe installation as specified in this section supplements AWWA M11 and AWWA C604.

B. Installing Buried Piping

1. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or roll pipe into trenches under any circumstances.
2. Inspect each pipe and fitting before lowering into the trench. Inspect the interior and exterior protective coatings. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
3. Grade the bottom of the trench and place a 4-inch minimum layer of select or scarified material under the pipe. Before laying each section the pipe, check the grade and correct any irregularities found. The trench bottom shall form a uniform bearing and support for the pipe.
4. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides to permit completion and visual inspection of the entire joint.
5. When the pipe laying is not in progress, including the noon hours, close the open ends of the pipe. Do not permit trench water, animals, or foreign objects to enter the pipe.

C. Joints Assembly

1. Rolled Groove Rubber Gasket Joint

   a. Clean exposed ends of joint surfaces.

   b. Thoroughly lubricate the gasket with material approved by the Pipe Manufacturer.

   c. Place gasket in grooved spigot and relieve tension by inserting a dull instrument under the gasket and completing at least two revolutions around the joint circumference.

   d. Upon completion of insertion of spigot (including any angular deflection as shown on the approved shop drawing) and prior to releasing from slings the entire placement of the gasket should be checked with a feeler gauge per manufacturer's recommendations. If gasket has disengaged or rolled, immediately pull the joint apart and reinstall the joint with a new gasket if required. Again verify proper placement of gasket with feeler gauge.

   e. It is recommended that bonding wires or clips be installed as supplied by the Pipe Manufacturer unless otherwise required in the Plans.

   f. Grout the interior of the joints with cement mortar per AWWA C205. Complete the exterior of the joints with heat-shrink sleeves per AWWA C216 and manufacturer's recommendations.

2. Lap Field Welded Joints

   a. Clean exposed end of joint surfaces.

   b. Provide a minimum overlap of 1-inch at any location around the joint circumference.

   c. Field welders and field weld procedures shall be certified in accordance with AWS D1.1.

   d. At the Contractor's option, provide a full fillet weld per AWWA C206 either on the inside or outside of the pipe. Inside welding may be performed after backfilling in accordance with manufacturer's recommendations.

   e. Testing of field welds shall be in accordance with AWWA C206.

   f. Grout the interior of the joints with cement mortar per AWWA C205. Complete the exterior of the joints with heat-shrink sleeve per AWWA C216 and manufacturer's recommendations.

3. Flanged Joints

   a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing; lubricate bolts with graphite or oil.

   b. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.

c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.

d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or re-tighten the bolts and nuts, and retest the joints.

3.02 FIELD QUALITY CONTROL

A. Perform hydrostatic pressure test in the presence of the Engineer in accordance with AWWA C604, “Installation of Steel Water Pipe-4 In. and Larger”. Field test pressure should not exceed 120% of the pipe’s rated pressure class as measured at the lowest elevation for the section being tested. Leakage allowance shall be per AWWA C604.

B. Provide all necessary piping between the reach being tested and the water supply, together with all required materials and equipment.

C. Provide dished heads, blind flange or bulkheads as necessary to isolate and test pipeline.

D. Methods and scheduling of tests to be approved by the Engineer.

E. Protect pipes and provide thrust restraint as required to complete test.

F. Provide for proper legal disposal of test water.

END OF SECTION