WATER MATERIAL SPECIFICATIONS

GENERAL REQUIREMENTS

All materials shall be in accordance with these Material Specifications and shall, in no event, be less than that necessary to conform to the requirements of any applicable law, ordinances and codes. All materials or products that will be in contact with potable water shall be listed by the National Science Foundation (NSF-61 listed) or by an approved certifying agency as conforming to the requirements of ANSI/NSF-61.

Items designated to be “domestically manufactured” shall be manufactured, assembled and tested in their entirety within the United States of America or its territories. Items designated to be “domestically assembled” may be foreign-manufactured but shall be assembled and tested in their entirety within the United States of America or its territories. Items requiring a “domestic presence” may be foreign-manufactured and/or assembled and/or tested, but the manufacturer shall have a designated representative or agent located within the United States of America, and that representative or agent shall be available to provide on-site service if required by the City of Tampa Water Department (Department).

All materials shall be new, unused, and correctly designed. They shall be of standard first grade quality, produced by expert workmen, and intended for the use for which they are offered. Materials or equipment which, in the opinion of the Department, are inferior or are lower grade than indicated, specified or required, shall not be accepted. All materials used in this contract must be approved in advance by the Engineer. In conformance with section G-4.02 of these contract documents, any two items of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer. Unless approved in advance by the engineer, only one manufacturer may be used for each item under this contract.

POLYETHYLENE ENCASEMENT

1. GENERAL

Polyethylene encasement shall conform to the requirements of ANSI/AWWA C-105/A21.5 Method A and shall be 8-mil thick. Polyethylene encasement shall be installed on all buried ductile iron pipe, fittings, valves, and appurtenances where shown on the drawings or as directed by the Water Department as dictated by field conditions. It shall be blue in color.

2. PRODUCT

The raw material used to manufacture polyethylene encasement shall be Type 1, Class A Grade E-1 in accordance with ASTM D-1248

The polyethylene encasement shall meet the following test requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>1200 psi minimum</td>
</tr>
<tr>
<td>Elongation</td>
<td>300% minimum</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>800 V/Mil thickness, minimum</td>
</tr>
<tr>
<td>Thickness</td>
<td>0.008” (8-mils minimum nominal, with minus tolerance &lt; 10% of nominal)</td>
</tr>
<tr>
<td>Melt Index</td>
<td>0.4 maximum</td>
</tr>
</tbody>
</table>

3. QUALITY CONTROL AND TESTING

When submitting for approval polyethylene not listed in Section 4, manufacturer shall include drawings and brochures
that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the polyethylene may be rejected at the sole option of the City.

4. **MANUFACTURER**

All polyethylene encasement shall be domestically manufactured.

**TRANSITION COUPLING**

1. **GENERAL**

Transition coupling shall be used to connect two plain end pipes of equal or slightly different outside diameters. Transition coupling shall also be used to connect different types of pipe. The transition coupling shall operate by placing two plain ends of pipe inside a rigid sleeve, and drawing in two compression glands upon two un-cut full circle gaskets to produce a seal between the ends of the rigid sleeve and the adjacent outside wall of the existing pipe.

2. **PRODUCT**

a. Transition coupling shall be composed of three parts: rigid sleeve, compression glands, and gaskets.

b. The rigid sleeve shall be manufactured of ferrous material that is protected against corrosion by epoxy coating or approved method during the working life of the fitting. The rigid sleeve shall be the "long-body" type.

c. The compression gland shall be manufactured of ferrous material that is protected against corrosion during the working life of the fitting by epoxy coating or approved method. The glands shall be drawn in mechanically by bolts and nuts made of high-strength, low-alloy steel such as "Corten", "Usalloy", or "ACIPalloy".

d. The gasket shall be EPDM. The gasket shall be resistant to permanent set during the working life of the fitting.

e. Transition coupling for nominal size pipe, 3-inch and greater, shall be capable of joining standard ductile iron pipe to pit cast iron pipe Class C-D, Asbestos-Cement pipe, PVC sch 40, PVC sch 80, or PVC pressure rated pipe. Transition coupling shall join different diameter pipes by the following means:

1) by a coupling designed for stated diameters,

2) by a coupling designed with a variable range using a compressible gasket,

3) by a coupling with a variable range using different gaskets,

4) or a coupling using any combination of described designs.

3. **QUALITY CONTROL AND TESTING**

When submitting for approval transition coupling not listed in Section 4, manufacturer include drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the transition coupling may be rejected at the sole option of the City.

4. **MANUFACTURER**

Transition coupling for nominal size pipe 3-inches and greater shall be Baker 200/204/213, Ford FCI/2/3, Dresser
RESTRAINT DEVICES for DUCTILE IRON PIPE
(for Fittings and Valves)

1. GENERAL

Mechanical restraint devices shall be used to restrain plain ends of ductile iron pipe to joints, or fittings which meet ANSI/AWWA C-110/A21.10 and ANSI/AWWA C-111/A21.11, latest revisions.

Wedge action restraint for mechanical fittings shall be incorporated in the design of the follower gland and shall include a restraining mechanism (the lug) which, when activated, imparts multiple wedging actions against the pipe, thereby increasing its restraint on the pipe as the joint tries to separate. “Twist-off nuts” shall be used to ensure proper actuating of the restraining device.

2. PRODUCT

a. Mechanical Joint Restraint

The wedge action follower glands shall be manufactured of ductile iron conforming to ASTM A536-80. The Wedging lug and bolt shall be manufactured of ductile iron which has been heat-treated to a minimum hardness of 370 BHN. Wedge action glands shall be dimensioned such that they can be used with standard mechanical joints and have tee head bolts conforming to ANSI/AWWA C-111/A21.11 and ANSI/AWWA C-153/A21.53, latest revision.

b. Existing Pipe Joint Restraint

(1) Split-restraint fittings for mechanical joints on existing pipe installations shall be manufactured in accordance with these technical specifications; however, split-restraint fittings shall be segmented to allow restraint of existing ductile iron mechanical joints meeting AWWA C111.

(2) Split-restraint fittings for existing pipe bell-and-spigot joints shall consist of split restraint rings, one installed on the pipe barrel behind the bell. Restraint devices shall be ductile iron per ASTM A536, latest revision, min. Grade 60-42-12. Threaded rods shall be high strength low-alloy steel per AWWA C111, latest revision.

3. QUALITY CONTROL AND TESTING

a. Pipe restrained with mechanical restraint devices specified shall be capable of withstanding the following pressures:

   Mechanical Joint Pipe   -   4” - 16”   min. 350 psi

b. Burst pressure tests shall be performed as specified in ANSI/AWWA111/A21.11, latest revision.

c. When submitting for approval of restraint devices not listed, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the restraint fittings may be rejected at the sole option of the City.
4. **MANUFACTURER**

Wedge action restraint for mechanical joints shall be equal to or better than EBAA Iron “Megalug, Series 1100”, Tyler/Union TUF Grip TLD, Sigma One-Lok Model SLD (4” to 36”) or approved equal.

**DUCTILE IRON PIPE**

*(Push-On-, Mechanical-, Flexible-, and Manufactured Restrained Joint)*

1. **GENERAL**

Ductile iron pipe shall be domestically manufactured in accordance with the latest revision of ANSI/AWWA C-151/A21.51. Pipe shall be furnished in 18 or 20 foot laying lengths. Pipe shall be lined with a standard thickness cement mortar lining and seal coated in accordance with the latest revision of ANSI/AWWA C-104/A21.4 and NSF 61. Pipe outside coating shall be an asphaltic coating in accordance with ANSI/AWWA C-151/A21.51, latest revision. All pipe materials used in potable water systems shall comply with NSF Standard 61. Unrestrained joint pipe shall be either the rubber-ring compression-type push-on joint or mechanical joint.

2. **PRODUCTS**

**Push-on Joint Pipe**

Push-on joint pipe shall be supplied with all joint accessories. Accessories shall include gaskets and lubricant in sufficient quantity for the proper assembly of each joint. Gaskets for push-on joints shall be made of ethylene propylene diene monomer (EPDM) rubber, except: Acrylonitrile butadiene (NBR) gaskets shall be used for potable water mains that are located in soil that is contaminated with low molecular-weight petroleum products or non-chlorinated organic solvents or non-aromatic organic solvents. Fluorocarbon (FKM) gaskets shall be used for potable water mains that are located in soil that is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons. Fluorocarbon (FKM) gaskets shall be used for potable water mains if the soil is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons, and is also contaminated with low molecular-weight petroleum products or organic solvents. All plain ends shall be painted with a circular stripe on the pipe barrel to allow a visual means of checking proper assembly.

- All push-on joints shall be in accordance with ANSI/AWWA C-111/A21.11, latest revision.
- Pressure Class shall be as follows: 4” - 16” min. 350 psi

3. **QUALITY CONTROL AND TESTING**

a. All pipe shall meet or exceed all hydrostatic, performance and acceptance tests as set forth in ANSI/AWWA C-151/A21.51, latest revision.

b. When submitting for approval of ductile iron pipe not listed in Section 4, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, pressure class or thickness class, performance standards, etc. If this documentation is omitted, the ductile iron pipe may be rejected at the sole option of the City.

4. **MANUFACTURER**

a. All ductile iron pipe, unless specified below, shall be by U.S Pipe, American Cast Iron Pipe Company, McWane Cast Iron Pipe Company, Griffin Pipe Products Company, or approved equal.

b. All ductile iron pipe shall be domestically manufactured in the United States.
HDPE TUBING

1. GENERAL

All water service lines two (2) inches in diameter and smaller shall be constructed of high-density polyethylene (HDPE) tubing.

2. PRODUCT

a. Polyethylene extrusion compound from which the PE pipe and tubing are extruded shall comply with the applicable requirements for the Type III, color and U.V. code E, Class C, PE 4710, very high molecular weight polyethylene plastic material manufactured in accordance with AWWA C-901, latest revision, as specified in ASTM D1248. 2-inch and smaller HDPE pressure tubing shall have a color and ultraviolet code E and a minimum cell classification of PE 454474 E as specified in ASTM D3350.

b. The polyethylene extrusion compound shall be of virgin quality approved for potable water service by the National Sanitation Foundation. The polyethylene extrusion compound shall be manufactured with sufficient and proper ultra-violet color stabilizers.

c. Polyethylene tubing shall be SDR-9 200 psi.

d. The standard dimension ratio (SDR) shall be 9 for CTS tubing sizes. The average outside diameter, minimum wall thickness and respective tolerances for any cross-section shall be as specified in ASTM D2737. The average inside diameter, minimum wall thickness, and respective tolerances for any cross-section shall be as specified in ASTM D2239.

e. Polyethylene tubing shall be blue and have U.V. color stabilizers so that the pipe is not affected in color or flexibility for a minimum of four (4) years.

3. QUALITY CONTROL AND TESTING

a. Environmental stress cracking resistance testing shall be performed in accordance with ASTM D1693, Condition C, and shall have no failures after 5000 hours duration.

b. When submitting for approval of HDPE not listed in Section 4, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the HDPE may be rejected at the sole option of the City.

4. MANUFACTURER

All HDPE tubing shall be manufactured by Performance Pipes "DriscoPlex", Endot EndoPure", Vanguard "Bruiser", Charter Plastics "Blue Ice" or approved equal.
TAPPING VALVES, RESILIENT SEAT

1. GENERAL

All tapping valves shall conform to AWWA C-509 or AWWA C-515 and requirements contained herein.

2. PRODUCT

AWWA C-509 VALVES (Cast Iron or Ductile Iron) and AWWA C-515 (Ductile Iron)

a. General

1) Resilient Seat Gate Valves ("Valves") provided under this specification shall be suitable for installation on ductile iron or cast iron pipe. Valves shall be manufactured in accordance with AWWA C-509 or AWWA C-515, latest editions, as applicable, and as specified herein.

2) “Tapping valves” shall refer to resilient seat gate valves with one end mechanical joint, and one end flanged, meeting specifications stated herein.

3) Resilient seats for valves shall be made of EPDM rubber.

4) Mechanical joint gaskets shall be made of EPDM rubber.

b. Tapping Valves

1) Valves shall be of the non-rising stem type that shall open by turning a two-inch square AWWA operating nut clockwise (open right).

2) Valve stems shall be stainless steel and manufactured in accordance with AWWA C-509/C-515. Stems, stem-nuts and wedges shall act independently. Stems shall be sealed by at least two O-ring seals, one located both above and below the thrust collar. Stems shall be provided with low friction torque reducing thrust bearings. Thrust washers may be used to separate the thrust collar from iron surfaces.

3) Valve bodies and gates shall be cast iron or ductile iron manufactured in accordance with ASTM A126 or ASTM A536 respectively, and AWWA C-509 or AWWA C-515 as applicable, latest revisions. All internal and external exposed ferrous surfaces of the valve body and gate shall have an epoxy coating applied to a minimum of eight mils, in accordance with AWWA C-550 latest edition. Non-metallic resilient seats shall be bonded to the gate; mechanically attached seats will not be accepted. The method of bonding shall be approved by ASTM D429 A or B as specified in AWWA C-509/C-515. Hollow gates shall be provided with a drain in the bottom to flush the internal cavity of foreign material and stagnant water each time the valve is operated.

4) All bonnet bolts, gland bolts, nuts and other trim hardware exposed to the outside environment shall be stainless. Thrust collar tie-rod bolts shall be stainless steel.
5) Mechanical joints and accessories shall be manufactured in accordance with AWWA Standard C110 and C111, latest revision, with exceptions noted herein. Mechanical joint bolts and-nuts shall be manufactured of high-strength, low-alloy steel such as "Corten", "USalloy", or "ACIPalloy". Joints requiring a shorter bolt than called for in AWWA Standard C111 shall be supplied as required. Mechanical joint gaskets shall be made of EPDM rubber.

7) Tapping valve interior waterway shall be a full-opening and capable of passing a full-sized shell cutter through the valve. Tapping valve shall be provided with a tapping-flange and flanged joint accessories. Tapping-flanges shall conform to dimensions and drillings of ANSI B16.1, Class 125, ANSI/AWWA C110/A21.10 latest edition, and NAPF 200.

8) Tapping-flange shall have a raised face or lip designed to engage a corresponding recess in a tapping sleeve. Mechanical joint accessories shall be provided for mechanical joint end as stated above.

9) All tapping valves shall be interchangeable with multiple makes of tapping sleeves.

3. QUALITY CONTROL AND TESTING

a. Catalogs and maintenance data shall be provided as required by the Engineer. The catalogs and maintenance data shall contain sufficient detail to serve as a guide in the valve assembly, valve disassembly, the ordering of repair parts, complete valve lubrication and valve maintenance information.

b. Valves shall meet or exceed test specifications as set forth in AWWA C-509/C-515, latest editions, as applicable.

c. The Water Department may request samples of proposed valves. Samples shall be supplied and/or returned to the Contractor at the Contractor's expense.

d. Failure to submit samples within 10 calendar days after the date of a written request shall result in rejection of that item.

e. The resilient seat shall be bubble-tight against a 200-psi water working pressure and maintain zero leakage at all times.

4. MANUFACTURER

Tapping valves shall be domestically assembled and shall be equal to or better than Clow F-6114, U. S. Pipe Metroseal 250, Mueller Co. (2360 for 2”-12”, 2361 for 14”-24”), American Flow Control Series 500 or Series 2500, Kennedy KenSeal 7571, American AVK Series 25, or approved equal.

VALVE BOXES
(Class 35 Grey Iron)

1. GENERAL

Valve boxes provided under this specification shall be designed to provide access to an underground valve 2-inch operating nut at a depth of 2-feet or greater. Valve boxes shall be suitable for installation in areas subject to heavy vehicle traffic loading.
2. **PRODUCT**

Valve boxes shall include removable valve box cover with "WATER" label as shown on the Standard Dimension detail titled "Valve Box". All valve boxes shall be manufactured of Class 35 grey iron. All valve boxes shall consist of four parts: valve box covers, risers, top sections, and bottom sections. All valve boxes shall be the same dimension, within manufacturing tolerances, as shown in Standard Dimension Detail "Valve Box".

3. **QUALITY CONTROL AND TESTING**

When submitting for approval of valve boxes not listed, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the valve boxes may be rejected at the sole option of the City.

4. **MANUFACTURER**

Valve box manufacturers shall have a domestic presence. Valve boxes shall be equal to or better than those made by Union Foundry, Sunshine Foundry, or Pipeline Components, Inc.

**COMPACT ANCHOR FITTINGS - DUCTILE IRON**

1.0 **GENERAL**

Ductile Iron Compact Anchor Fittings ("Fittings") provided under this specification shall be manufactured in accordance with AWWA Standard C-153 and C-111, latest editions, and as specified herein. Joint accessories shall be provided with fittings.

2.0 **PRODUCT**

a. **Anchor Elbow and Anchor Coupling**

The Anchor x Anchor elbows and anchor couplings shall have for both ends anchoring "plain ends". These "plain ends" shall have integral or split follower glands, suitable for mechanical joint fittings meeting ANSI/AWWA C-111/A 21.11.

b. **Joint Accessories**

(1) All T-head bolts and nuts for joints shall be domestically manufactured high-strength, low-alloy steel such as "Corten", "Usalloy," or "ACIPalloy."

(2) All joint accessories shall be furnished with anchoring fittings.

(3) All gaskets shall be EPDM rubber.

c. **All anchoring fittings shall be furnished with either: i) a standard thickness cement mortar lining seal coated in accordance with AWWA Standard C-104, latest edition, and an exterior, asphalt coating which conforms to ANSI/AWWA C-151/A21.51; or, ii) have factory-applied fusion bonded epoxy coatings both inside and outside, in accordance with AWWA C550.**

d. **All fittings shall have a minimum pressure rating of 350 psi.**
3.0 QUALITY CONTROL AND TESTING

a. All anchor fittings shall meet or exceed acceptance, performance and hydrostatic testing in accordance with AWWA Standard C-153 and C-111, latest editions.

b. When submitting for approval of ductile iron compact anchor fittings not listed in Section 4, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the ductile iron compact anchor fittings may be rejected at the sole option of the City.

4.0 MANUFACTURER

Ductile iron compact anchor fittings shall be manufactured by U.S. Pipe and Foundry Company, Clow, American Ductile Iron Pipe, McWane, Pipeline Components, Inc. or approved equal.

COMPACT MECHANICAL JOINT FITTINGS-DUCTILE IRON

1. GENERAL

a. Ductile iron compact mechanical joint fittings shall be manufactured in accordance with ANSI/AWWA C-153/A21.53, latest revisions and the specifications stated herein. Fittings shall be listed by the National Sanitation Foundation (NSF) and shall conform to the requirements of NSF-61.

b. Whenever the word "fitting" is used in this specification, it shall mean "Compact Ductile Iron Mechanical Joint Fitting".

2. PRODUCT

a. The minimum working pressure for fittings shall be 350. The minimum wall thickness shall not be less than that of pressure class 350 ductile iron pipe.

b. Joints shall be Mechanical Joint in accordance with ANSI/AWWA C111/A21.11 and C153/A21.53, latest revision, with exceptions noted herein. Mechanical Joint bolts and nuts shall be domestically manufactured of high-strength, low-alloy steel such as "Corten", "Usalloy", or "ACIPalloy". Joints requiring a shorter bolt than called for in ANSI/AWWA C111/A21.11 shall be supplied as required. Gaskets for mechanical joints shall be made of ethylene propylene diene (EPDM) rubber.

c. Exterior Coating and Interior Lining

Mechanical Joint fittings furnished shall have either of the exterior coating and interior lining systems described below:

(1) Cement Mortar Lining: Fittings furnished shall have a standard thickness cement mortar lining and be seal coated in accordance with ANSI/AWWA C-104/A21.4, latest revision. Fittings shall be listed by an approved certifying agency as conforming to all requirements of ANSI/NSF 61 and shall have an asphalt exterior coating which conforms to ANSI/AWWA C-153/A21.53.

(2) Fusion-bonded Epoxy: Fittings shall be coated inside and out with fusion-bonded epoxy, and be in conformance with the requirements of ANSI/AWWA C-116/A21.16 and AWWA C-550, latest revisions. Fittings shall be listed by NSF or by an approved certifying agency as conforming to all requirements of ANSI/NSF 61.
3. **QUALITY CONTROL AND TESTING**

   a. All fittings specified herein shall meet or exceed all hydrostatic, performance, and acceptance tests in accordance with ANSI/AWWA C153/A21.53 latest revision.

   b. When submitting for approval ductile iron compact MJ fittings not listed in Section 4, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the ductile iron compact MJ fittings may be rejected at the sole option of the City.

4. **MANUFACTURER**

   All manufacturers of ductile iron compact MJ fittings specified herein shall have a domestic presence. The fittings shall be manufactured by U.S. Pipe, Clow, Tyler/Union Pipe, American Ductile Iron Pipe, McWane, Pipeline Components, Inc., Sigma, Star Pipe, or approved equal.

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**MECHANICAL JOINT BOLTS-AND-NUTS**

1. **GENERAL**

   All mechanical joint bolts and nuts shall be manufactured in accordance with ANSI/AWWA C-111/A21.11, latest revision, and shall also adhere to the following specification.

2. **PRODUCT**

   a. All mechanical joint bolts shall be a Tee-head design with hexagonal nuts. Dimensions shall be in accordance with ANSI/AWWA C-111/A21.11.

   b. All bolts and nuts shall be manufactured of high-strength, low alloy steel in conformance with ANSI/AWWA C-111/A21.11 and ASTM A242, latest revisions.

   c. All bolts shall be designed for internal and external threads to conform to ANSI/ASME B1.1 and B1.2. Thread form shall conform to the standards and dimensions of the coarse-thread series Unified Coarse (UNC); external threads shall be made in compliance with Class 2A limits, and internal threads shall be made in compliance with Class 2B limits. The Contractor is advised that various HDPE MJ adapters may require longer than standard bolts to complete the installation.

3. **QUALITY CONTROL AND TESTING**

   When submitting for approval of mechanical joint bolts and nuts not listed in Section 4, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the mechanical joint bolts and nuts may be rejected at the sole option of the City.

4. **MANUFACTURER**

   Mechanical joint bolts and nuts specified herein shall be domestically manufactured of Cor-Ten or approved equal by Birmingham Foundry, National Set Screw Corporation or approved equal.
SOLID SLEEVES
(Ductile Iron, Compact, MJ)

1. GENERAL
Solid sleeves shall be used to join two plain ends of pipe or repair a damaged pipe.

2. PRODUCT
a. Solid sleeve lengths shall be up to 24-inches. The solid sleeve shall be capable of having two plain ends of pipe inserted into opposite ends of the sleeve. The sleeve is then to be sealed to the pipe by a mechanical joint at each end of the sleeve.

b. All sleeves shall be manufactured of ductile iron. Solid sleeves shall be manufactured in accordance with ANSI/AWWA Standard C-153/A21.53, latest revision. All sleeves shall be rated for a minimum working pressure of 350 psi.

c. All solid sleeve sealing ends shall be mechanical joints in accordance with ANSI/AWWA C-111/A21.11, latest revision. All joint accessories shall be furnished with the fittings. All bolts and nuts shall be made of high-strength, low-alloy steel such as "Corten", "Usalloy", or "Acipalloy". The gasket shall be for a standard Mechanical Joint, in accordance with ANSI/AWWA C-111/A21.11, latest revisions, and be made of EPDM rubber. The follower gland shall be manufactured from ductile iron at least ASTM A536, Grade 70-50-05 in accordance with ANSI/AWWA C-111/ A21.11, latest revision

d. All ductile iron compact solid sleeves shall be furnished with a standard thickness cement mortar lining and seal coating in accordance with AWWA Standard C-104, latest revision.

e. Fittings shall have an exterior, asphaltic coating which conforms to ANSI/AWWA C-153/A21.53.

3. QUALITY CONTROL AND TESTING
a. All solid sleeves shall meet or exceed all testing requirements of ANSI/AWWA C-153/A21.53.

b. When submitting for approval of solid sleeves not listed in Section 4, include manufacturer drawings and brochures that clearly indicate size, dimensions, weights, performance standards, etc. If this documentation is omitted, the solid sleeves may be rejected at the sole option of the City.

4. MANUFACTURER
All ductile iron mechanical joint solid sleeves shall be manufactured by U.S Pipe, Sigma, Tyler/Union, American Cast Iron Company, Clow, or approved equal.