

SECTION 33 10 00

WATER UTILITY PIPING MATERIALS

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Work under this Section includes furnishing restrained push-on joint ductile iron pipe, flanged joint ductile iron pipe, pipe fittings, gate valves, gaskets, nuts, washers, bolts and all necessary components complete in place to provide functional installation of a potable water distribution system, in accordance with all the requirements as specified herein and as shown in the Drawings, including, but not limited to the following:
1. 4-, 6-, 8-, 12- and 16-inch ductile iron pipe and fittings with zinc exterior coating.
 2. Push-on, mechanical joint and flanged gate valves.
 3. Push-on, mechanical joint and flange gaskets.
 4. Mechanical joint restraint glands.
 5. Tapping valves, bronze fittings, copper pipe & fittings, corporation stops.
 6. Flexible couplings and restraint devices, including tie rods.
 7. Stainless steel nuts and bolts.
 8. 2-inch air/blow-off valves and 4-inch blow-off assemblies.
 9. Valve boxes and valve box covers
 10. Flushing assembly for disinfection

1.02 REFERENCES

- A. ANSI/ASME B 18.2.1 – Square and Hex Bolts and Screws; and Hex Cap Screws and lag Screws
- B. ANSI/ASME B 18.2.2 – Square and Hex Bolts (Inch Series)
- C. ANSI/ASME B 1.1 – Unified Inch Screw Threads
- D. ANSI/NSF-61 – Drinking Water System Components

- E. ASTM A193 or A194 Type 304 or 316
- F. ASTM A536 – Standard Specification for Ductile Iron Castings
- G. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
- H. AWWA C110 – Ductile-Iron and Gray-Iron Fittings
- I. AWWA C111– Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- J. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- K. AWWA C150 – Thickness Design of Ductile-Iron Pipe
- L. AWWA C151 – Ductile Iron Pipe, Centrifugally Cast, for Water
- M. AWWA C153 – Ductile-Iron Compact Fittings
- N. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
- O. SFDPW Standard Specifications (latest version)
- P. SFPUC – CDD Standard Plans for Installation of Ductile Iron Water Mains 16-inch and Smaller
- Q. California Code of Regulations, Title 22, CA DPH
- R. International Standard ISO 8179-1 and ISO 8179-2, Ductile Iron Pipes – External Zinc-based Coating

1.03 SUBMITTALS

- A. Catalog cut sheets of all materials.
- B. Manufacturer’s approved installation/assembly instruction, including field cut joint assembly procedures.

1.04 QUALITY ASSURANCE

- A. Factory Hydrostatic Test: All pipe shall be subject to a factory hydrostatic test of at least 500 psi for a period not less than 10 seconds per AWWA C151. Certified test results shall be furnished in duplicate to the City Representative prior to time of shipment.
- B. All materials furnished by the Contractor shall be new, of the best commercial quality, and as specified herein. All piping materials shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standard, as supplemented by the requirements herein. Inspection of pipe and

fittings will also be made by the City Representative after delivery. The piping materials shall be subject to rejection at any time on account of failure to meet any of the specified requirements. Piping materials rejected after delivery shall be marked for identification and shall be removed from the jobsite.

- C. All pipe and fittings shall be permanently marked with the following information:
 - 1. Manufacturer, date.
 - 2. Size, type, class or wall thickness
 - 3. Standard produced to AWWA, ASTM, etc.

PART 2 – PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

- A. The ductile iron pipe materials shall include, but are not limited to restrained push-on joint ductile iron piping and their gaskets, flanged ductile iron piping and their gaskets, flexible couplings, gate valves, stainless steel washers, nuts and bolts, and all necessary components as shown on the Drawings or as specified by the City Representative.
- B. Ductile iron pipe shall be Special Thickness Class 53 as shown in Table 15 of ANSI/AWWA C150/A21.50. All ductile iron shall be manufactured in accordance with the requirements of ANSE/AWWA C151/A21.51. Pipes shall be “gauged” all along the length and identified as such on each pipe.
- C. 4-, 6-, and 8-inch ductile iron pipes shall be provided with TYTON® joint and FIELD LOK® gaskets. 12-inch and 16-inch ductile iron pipes shall be provided with TR FLEX® Joints with TYTON® gaskets, American Ductile Iron Flex-Ring® joints with Fastite® gaskets, or approved equal in accordance with ANSI/AWWA C111/A21.11 unless otherwise specified herein. End caps shall be fastened to the pipe by use of stainless steel tie rods and lugs or restrainers.
- D. TR FLEX® or Flex-Ring® joint fittings furnished under these specifications shall conform to all applicable requirements and the latest revision of ANSI/AWWA C110/A21.10, AWWA C153/A21.53 or AWWA C606. Fittings shall be rated for 350 psi working pressure and shall be double the standard thickness.
- E. Ductile iron flanged pipe thread-fabrication shall be Special Thickness Class 53 and shall be in accordance with AWWA C115/A21.15. (Bolt circle and bolt holes shall match those of ANSI B16.1 class 125 and ANSI B16.5 class 150 flanges). The flanges shall be rated for at least 250 psi working pressure. The threaded flanges shall be individually fitted and machine tightened on the pipe ends at the factory. Flange facing shall be smooth or with shallow serration per AWWA C115.

- F. All water system materials that will eventually come into direct contact with drinking water shall be certified as meeting the specifications of National Sanitary Foundation (NSF) 61. This includes, but is not limited to pipes, fittings, valves, hydrants, coatings, linings, solvent cements, sealing materials, welding materials, gaskets, lubricating oils, etc.
- G. Manufacturers
 - 1. U.S. Pipe and Foundry Company, Inc. (TYTON® joint pipe and fittings and TR FLEX® joint pipe and TR FLEX® joint fittings).
 - 2. American Cast Iron Pipe Company (Flex-Ring® joint pipe and Flex-Ring® joint fittings).
- H. Coating and Lining of Ductile Iron Pipe and Fittings
 - 1. Cement mortar lining with seal coat for pipe shall be furnished double thickness and shall be in accordance with ANSI/AWWA C104/A21.4. The pipe exterior shall be coated with a layer of air-applied zinc coating per ISO8179-1 “Ductile Iron Pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer”. The mass of zinc applied shall be 200g/m² of pipe exterior surface area. A finishing layer standard asphalt topcoat shall be applied to the zinc.
 - 2. Fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10 or ANSI/AWA C153/A21.53 and shall be double the standard thickness. The coating materials for ductile iron fittings shall be a zinc-rich paint per ISO8179-2 “Ductile Iron Pipes – External zinc coating – Part 2: Zinc rich paint with finishing layer” with inorganic binder and a zinc content of at least 85% by weight in the dry film and bituminous topcoat paint compatible with the zinc rich paint. The zinc rich paint coating shall be applied to a dry film thickness (DFT) of between 203 to 3.5 mils (.0020” to 0.0035”)

2.02 DUCTILE IRON PIPE RESTRAINTS

Safety Factor: Ductile iron pipe restraints must have a minimum safety factor of 2.0.

- I. Coating: Unless specified otherwise, coating for restraints shall consist of the following:
 - 1. Wedge Assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat.

2. Casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder.
 3. Nuts and bolts shall be made of stainless steel.
- J. Traceability: Identification number consisting of year, day, plant designation and shift number shall be cast into each gland body.
- K. Materials: The following restraints shall be provided:
1. Restraints for Push-On Bells with Ears

Restraint for push on bells supplied with restraint ears shall consist of the following:
 - a. A split, serrated ring in conjunction with a sufficient number of bolts connecting the serrated restraint portion to the joint.
 - b. A minimum pressure rating of 250 psi.
 2. Restraints for Mechanical Joints

Restraint for Mechanical Joints shall consist of the following:
 - a. Wedge action gland body with torque limiting twist-off nuts.
 - b. The gland body shall have individually actuated wedges that increase their resistance to pull-out as pressure or external forces increases.
 - c. All necessary gaskets, bolts and nuts to install the restraint.
 - d. Rods shall be made of 304 Stainless Steel
 - e. Listed by Underwriters Laboratories (4-inch through 16-inch sizes) and approved by Factory Mutual (3-inch through 12-inch sizes)
 - f. A minimum pressure rating of 350 psi.
 3. Bell Restraint Harness with Split Wedge Action Spigot Restraint Rings

Bell Restraint Harness with Split Serrated Spigot Ring shall consist of the following:
 - a. Two split, serrated rings – one for the bell end and one for the spigot end in conjunction with a sufficient number of bolts connecting the serrated restraint portion to the pipe.
 - b. A minimum pressure rating of 250 psi.
 4. Bell Restraint Harness with Wedge Action Spigot Restraint Ring

Restraint Harness with Wedge Action Spigot Restraint Ring shall consist of the following:

- a. A restraint for mechanical joints (as specified above) to be installed on the spigot end.
- b. A non-serrated split ring to be installed behind the bell end.
- c. Rods shall be made of 304 Stainless Steel.
- d. A minimum pressure rating of 350 psi.

5. Restrained Flange Adapter

Restrained Flange Adapter shall consist of the following:

- a. Restrained flange adaptors are to be used in lieu of threaded or welded flanged spool pieces.
- b. Restrained flange adapter shall consist of a restraint ring and a gasket ring.
- c. Restraint ring shall have flange bolt circles that conform to all referenced standards and shall have a 125#/Class 150 Bolt Pattern.
- d. Restraint ring shall grip plain end ductile iron pipe with gripping wedges and torque limiting twist-off nuts.
- e. All internal surfaces of the gasket ring considered wetted parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213.
- f. Exterior surfaces of the gasket ring shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.
- g. Sealing gaskets shall be constructed of EPDM and meet ANSI/NSF-61.
- h. Flange adapter shall allow a minimum of a 0.6-inch gap between the end of the pipe and the mating flange.
- i. Listed by Underwriters Laboratories (4-inch through 12-inch sizes) and Factory Mutual approved (4-inch through 12-inch sizes).
- j. Minimum allowable joint deflection of 5.0 degrees.
- k. A minimum pressure rating of 350 psi.

2.03 DUCTILE IRON COUPLINGS

A. Materials: The following flex couplings shall be provided:

1. Unrestrained Cast Transition Couplings

Unrestrained straight transition couplings shall be used to join plain end pipes with the same or different O.D.s and shall be a stab-on type coupling. Due to variable site conditions, unrestrained couplings shall come equipped with either two-bolt or multi-bolt features. Couplings shall fit pipes with the overall and shall consist of the following:

a. Two-Bolt Couplings

- 1) Meets or exceeds AWWA C-219, NSF 61, NSF 372 Standards
- 2) End rings shall conform to ASTM A283/A283M Grade C Steel
- 3) Center rings shall conform to ASTM A53 Grade A Steel for sizes up to 12-inch and ASTM A283/A283M Grade C Steel for sizes up to 16"
- 4) Gaskets shall be constructed of EPDM and meet ANSI/NSF-61.
- 5) Bridge shall conform to AISI 304 stainless steel and the spherical spacers shall conform to AISI 304L stainless steel
- 6) Shall be fusion bonded epoxy coated per AWWA C213 and nominal thickness shall be 14 mils.
- 7) Nuts and bolts shall conform to AISI 304 stainless steel and have anti-galling coating.
- 8) Shall have a minimum allowable dynamic deflection of 4 degrees per side
- 9) A minimum rated pressure of 390 psi.
- 10) Vacuum test rating of 12 psi
- 11) Shall be equipped with a removable inner gasket and a hydraulically assisted outer gasket.
- 12) Couplings shall have only two top-facing bolts for sizes 12-inches and smaller. 16-inch couplings shall have no more than 4 bolts.
- 13) Couplings shall fit pipes with overall ranges listed below:

Two-Bolt Couplings	
Nominal Diameter (inch)	Overall Range (inch)
4"	4.25 – 5.63
6"	6.42 – 7.68
8"	8.54 – 9.84
12"	12.4 – 14.41
16"	17.1 – 19.2

- 14) All two-bolt couplings shall be of the same manufacturer and may be different than the manufacturer of the regular short body couplings.

b. Regular Short Body Couplings

- 1) Sleeves and follower flanges shall conform to ductile iron ASTM A536 and ends shall have smooth inside taper for uniform gasket seating
- 2) Gaskets shall be constructed of EPDM and meet ANSI/NSF-61.
- 3) Gaskets and flanges shall be permanently marked with a part number and range
- 4) Nuts and bolts shall be zinc coated and made of stainless steel
- 5) Shall be fusion bonded epoxy coated per AWWA C213 and nominal thickness shall be a minimum of 12 mils.
- 6) A minimum rated pressure of 250 psi.
- 7) Couplings shall have no more than 10 bolts for sizes 16-inches and smaller.
- 8) Couplings shall fit pipes with overall ranges listed below:

Regular Short Body Couplings	
Nominal Diameter (inch)	Overall Range (inch)
4"	4.0 – 5.45
6"	6.0 – 7.65
8"	8 – 9.85
12"	12 – 14.4
16"	17.4 – 19.2

- 9) All regular short body couplings shall be of the same manufacturer and may be different than the manufacturer of the two-bolt couplings.

2. Regular Long Body Couplings

Long body straight transition couplings shall be used to join plain end pipes with a wider gap between the pipes or when there is an uncertainty regarding the gap between the pipes. They shall conform to the same requirements as a regular short body coupling listed above, but come with a longer center body for extra size flexibility.

3. Restrained Couplings

Restrained straight transition couplings shall be used to join plain end pipes with the same or different O.D.s and shall be a stab-on type coupling. They shall have a radial gripping system which will provide circular restraint around the pipe and shall consist of the following:

- a. Meets or exceeds AWWA C-219, NSF 61, NSF 372 Standards
- b. Equipped with top-facing two-bolts
- c. End rings shall be made of ductile iron casting and conform to ASTM A536 Grade 60-40-18
- d. Center rings shall be made of ductile iron casting and conform to ASTM A536 Grade 65-45-12
- e. Gaskets shall be constructed of EPDM and meet ANSI/NSF-61.
- f. Grip chain shall consist of gripping teeth and conform to AISI 420 2B
- g. Bridge shall conform to AISI 304 stainless steel and the spherical spacers shall conform to AISI 304L stainless steel
- h. Shall be fusion bonded epoxy coated per AWWA C213 and nominal thickness shall be 14 mils.
- i. Nuts and bolts shall conform to AISI 304 stainless steel and have anti-galling coating.
- j. Shall have a minimum allowable dynamic deflection of 4 degrees per side
- k. A minimum rated pressure of 350 psi.
- l. Vacuum test rating of 12 psi
- m. Couplings shall fit pipes with overall ranges listed below:

Restrained Couplings	
Nominal Diameter (inch)	Overall Range (inch)
4"	4.40 – 5.10
6"	6.50 – 7.20
8"	8.50 – 9.40
12"	12.68 – 13.39

- n. All restrained couplings shall be of the same manufacturer.

4. Stainless Steel Couplings

Stainless steel couplings shall consist of the following:

- a. Meets or exceeds AWWA C-219, AWWA C-227, NSF-61 and NSF-372 Standards
- b. Body and gasket bridge shall comply with AISI 304 Stainless Steel
- c. Gaskets shall be constructed of EPDM and meet ANSI/NSF-61.
- d. Inner plate shall comply with AISI 304 Stainless Steel connected with reinforced insulated bolts made of Ultern resin 1000 with insert socket set crew AISI 316.
- e. Compression beam shall comply with AISI 304 Casting and ASTM-A351-CF8
- f. Lugs shall be of polycarbonate for regular pressure or comply with AISI 304 Casting (ASTIM A-351-CF8) for some high pressure pipes
- g. Nuts and Bolts shall be rolled thread and anti-galling coating and comply with AISI 304 Stainless Steel
- h. Shall have a dynamic deflection of up to 3 degrees per side
- i. Shall have a transition capability of up to 0.4"
- j. Shall have a working pressure of up to 232 psi for couplings up to 4" and up to 175 psi for couplings up to 16". Couplings rated for higher pressures shall have a working pressure of up to 232 psi for couplings up to 16".
- k. Rated pressure shall be 1.5 times the working pressure

2.04 GATE VALVES

- A. NSF 61 certified gate valves with a design working pressure of 250 psi shall be used for pipe sizes 4 inches and larger. 12-inch and smaller gate valves shall conform to ANSI/AWWA C509. 16-inch gate valves shall conform to ANSI/AWWA C515. All gate valves shall have a non-rising stem and be resilient seated, right turn open, nut (painted red) operated, and fusion-bonded epoxy coated identical to the approved make and model per the current City Purchasing Contract for gate valves. Water main gate valves 12-inches and smaller shall have push-on by push-on (TYTON® joint by TYTON® joint) ends that accommodate FIELD LOK® gaskets. 16-inch water main gate valves shall be mechanical joint ends restrained with EBAA MEGALUG® mechanical joint glands. Flanged end gate valves shall be full-face flange by flange manufactured in accordance with ASA B16.1, 125 lb. Class or ASA B16.2, 250 lb. Class.

2.05 AIR RELEASE AND BLOW-OFF VALVES

- A. 2-inch air-release and blow-off valves shall be manual type and the assembly shall be per Standard Plan CDD-LP-003, latest revision.

- B. Parts for air valve and blow-off valve assemblies shall be by GL Industries, JONES, AY McDonald, Merit Brass, and Mueller.

2.06 CORPORATION STOPS

- A. Corporation stops shall be used for service laterals 2-inch and smaller and tap into the main as shown in the Standard Plans CDD-LP-201B and CDD-LP-202B.

2.07 WATER METER BOXES, VAULTS, AND COVERS

- A. Meter boxes and covers for standard 1- and 2-inch (domestic) services shall be made of polyethylene and polymer concrete. Meter vaults for services larger than 2-inch shall be fiberglass vaults with torsion assisted frame and cover.

Sizes of meter boxes shall be as shown hereinafter:

<u>Meter Size</u>	<u>Nominal Size of Meter Box, Standard Plan(s)</u>	
1"	15" x 20" x 12"	CDD-LP-213, CDD-LP-208
2"	17" x 30" x 12"	CDD-LP-212, CDD-LP-210

<u>Meter Size</u>	<u>Nominal Size of Meter Vault, Standard Plan</u>	
3" & 4"	36" x 60" x 30"	CDD-LP-214
6"	48" x 72" x 30"	CDD-LP-215

2.08 HYDRANT, HYDRANT BURY, BREAK AWAY

- A. Hydrant should be Long Beach Iron Works Model 621, with valve assembly specified in SFFD specifications for low pressure hydrants. Hydrants shall be painted as required by SFFD. Hydrant and Hydrant Lateral shall be assembled per Standard Plan CDD-LP-004.

2.09 FLANGE GASKETS, NUTS, BOLTS AND WASHERS

- A. Flange gaskets
- a. All flange gaskets shall be new, type "E", 1/8 inch thick, and in compliance with ANSI/NSF-61 requirements. Sealing element placement shall accommodate flat faced flanges. The quad-ring seals shall be pressure energized. The G-10 retainer shall have a 550 volts/mil dielectric strength and a minimum 50,000 psi compressive strength. The flange gasket shall be one of the following:
- 1) Quad-seal, pyrox G-10 material, as manufactured by Advance Products & System, Inc., Part number GETQG10F.

- 2) One full faced isolating and sealing gasket, Linebacker G-10 retainer containing precision tapered grooves to accommodate the controlled compression of EPDM quad-ring sealing elements. Four grooves per gasket.
 - 3) Garlock Multi-Swell 3760U.
- b. Outside/inside diameter of the gasket shall be equal to the outside/inside diameter of the flange. Before installation, all gaskets shall require inspection for adherence to the specifications by the City Representative.
- B. Nuts, bolts and washers for ductile iron flanges: bolts and nuts for flanged joints shall be stainless steel Type 304 or 316.

2.10 VALVE COVERS AND VALVE BOX

- A. Valve covers, valve boxes, steel base plates, ductile iron riser pipes, and miscellaneous metals as required for valve box assemblies shall be as specified in Standard Plan CDD-LP-250, latest revision.

2.11 BACKFLOW PREVENTER

- A. All backflow prevention assemblies must have a maximum working pressure of 175 pounds per square inch (psi) and must be on the “Approved Backflow Prevention Assemblies” list developed by the University of Southern California (USC) Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR).
- B. All backflow prevention assemblies and associated pipe, fittings, solder and flux must be “lead-free” as defined in the California Health and Safety Code, Section 116875.
- C. Any modification of an assembly—such as relocation of valves, bypass arrangements, and jumper connections, whether temporary or permanent—invalidates the foundation’s approval and is not permitted. Likewise, an assembly that has been installed in an orientation for which it was not designed or approved is also not permitted.
- D. Backflow prevention assemblies must be inspected per the requirements of the SFPUC Cross Connection Control program prior to connection service connection into the SFPUC water distribution system.

END OF SECTION