

SECTION 15000 - PIPING COMPONENTS

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing fittings, hangers, supports, anchors, expansion joints, flexible connectors, insulation, lining and coating, testing, disinfection, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 02601 Preinsulated Pipe
2. Section 05500 Miscellaneous Metalwork
3. Section 09800 Protective Coating
4. Section 11000 Equipment General Provisions
5. Section 15010 Mill Piping - Exposed and Buried
6. Section 15020 Pipe Supports
7. Section 15025 Cathodic Protection
8. Section 15250 Pipe and Equipment Insulation

1.3 CODES

- A. The WORK of this Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:

1. Uniform Mechanical Code
2. Uniform Plumbing Code
3. Uniform Fire Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following applies to the WORK of this Section:

1. ANSI/ASME B1.20.1 Pipe Threads, General Purpose (inch)
2. ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
3. ANSI/ASME B31.1 Power Piping
4. ANSI/AWWA C111 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
5. ANSI/AWWA C150 Thickness Design for Ductile Iron Pipe

6. ANSI/AWWA C153 Ductile Iron Compact Fittings, 3 In through 24 In and 54 In Through 64 In for Water Service
7. ANSI/AWWA C207 Steel Pipe Flanges for Water Works Service, Sizes 4 in. Through 144 in.
8. ANSI/AWWA C213 Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
9. ANSI/AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 In Through 12 In for Water Distribution
10. ANSI/AWWA C905 Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In through 36 In
11. ANSI/AWS D10.9 Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing
12. ASTM A 123 Specification for Zinc Coatings on Iron and Steel Products
13. ASTM A 536 Ductile Iron Castings
14. ASTM D 792 Test Methods for Specific Gravity and Density of Plastics by Displacement
15. ASTM D 2000 Classification System for Rubber Products in Automotive Applications

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Shop drawings showing dimensions and details of pipe joints, fittings, fitting specials, valves and appurtenances.
2. Detailed layout, spool, or fabrication drawings showing pipe spools, spacers, adapters, connectors, fittings, and pipe supports.

1.6 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:

1. Manufacturer's product data.
2. Manufacturer's installation instructions.
3. Manufacturer's certification of compliance.
4. Statement from the pipe fabricator certifying that all pipe will be fabricated subject to a Quality Control Program.
5. Outline of Quality Control Program.

1.7 INSPECTION, TESTING AND WELDING

- A. **Inspection:** Products shall be inspected at the manufacturer's plant.
- B. **Tests:** Materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards.
- C. **Welding Requirements:** Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D10.9. Welding procedures shall be required for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- D. **Welder Qualifications:** Welding shall be performed by skilled operators who have had adequate experience in the methods and materials to be used and have been qualified under the provisions of ANSI/AWS D10.9 by an independent approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests.

1.8 FACTORY TESTING

- A. **Product Testing:** Products shall be tested at the factory for compliance with the indicated requirements.
- B. **Witnesses:** The OWNER and the CONSTRUCTION MANAGER (at the option of either) reserves the right to witness factory tests.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. **Storage:** Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. **Miscellaneous Small Pipes:** Miscellaneous small pipes and fittings shall comply with Section 15010.
- B. **Pipe Supports:** Pipes shall be properly supported in accordance with Section 15020.
- C. **Coating:** Pipes above ground or in structures shall be field-painted in accordance with Section 09800.
- D. **Pressure Rating:** Except as otherwise indicated, piping systems shall be designed for 150 percent of the maximum indicated pressure.

- E. **Grooved Piping Systems:** Grooved couplings on buried piping must be bonded. Grooved fittings, couplings, and valves shall be from the same manufacturer.

2.2 PIPE FLANGES

- A. **Flanges:** Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to either ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-lb class. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-lb class. Flanges shall be attached to the pipe in accordance with ANSI/AWWA C207.
- B. **Blind Flanges:** Blind flanges shall comply with ANSI/AWWA C207. Blind flanges for pipe sizes 12 inches and larger shall include lifting eyes in form of welded or screwed eye bolts.
- C. **Flange Coating:** Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- D. **Flange Bolts:** Bolts and nuts shall comply with Section 05500. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs may be used only on valve flange connections where space restrictions preclude the use of regular bolts.
- E. **Insulating Flanges:** Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.
- F. **Insulating Flange Sets:** Insulating flange sets shall be provided where indicated and shall consist of insulating gaskets, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall comply with ASTM A 325. Insulating gaskets shall be full-face.
- G. **Flange Gaskets:** Gaskets for flanged joints shall be full-face, 1/16-inch thick sheets of virgin graded teflon, suitable for temperatures to 550 degrees F, a pH of 0 to 14, and pressures to 1400 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

2.3 THREADED INSULATING CONNECTIONS

- A. **General:** Threaded insulating bushings, unions, and couplings shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are indicated.
- B. **Materials:** Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties suitable for the service and loading conditions indicated.

2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

- A. **General:** Cast mechanical-type couplings shall be provided where shown. Bolts and nuts shall conform to Section 05500. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized in accordance with the coupling manufacturer's recommendations. The wall thickness of all grooved piping shall conform with the coupling manufacturer's recommendations suitable for the highest pressure indicated.

2.5 SLEEVE-TYPE COUPLINGS

- A. **Construction:** Sleeve-type couplings shall be installed where indicated and shall include steel bolts, without pipe stop, and shall be sized to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold-expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to Section 05500. Buried sleeve-type couplings shall be epoxy-coated at the factory.
- B. **Pipe Preparation:** The ends of the pipe, where indicated, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.
- C. **Gaskets:** Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," grade 60, or equivalent suitable elastomer. The rubber in the gasket shall comply with the following:
1. Color - Jet Black
 2. Surface - Non-blooming
 3. Durometer Hardness - 74 ± 5
 4. Tensile Strength - 1000 psi Minimum
 5. Elongation - 175 percent Minimum

The gaskets shall resist deterioration caused by impurities normally found in water or wastewater. Gaskets shall comply with ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as otherwise indicated. Gaskets shall be compatible with the piping service and fluid utilized.

- D. **Insulating Couplings:** Where insulating couplings are indicated, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to insulate coupling metal parts from the pipe.
- E. **Restrained Joints**
1. Harnesses for flexible sleeve type couplings shall be in accordance with the requirements of the appropriate reference standards and standard practices.

2. Mechanical and Push-On Joints: Restraints shall be provided where shown and may be provided in lieu of concrete thrust blocks.
 - a. Mechanical joint restraint mechanisms shall consist of individually activated multiple gripping devices which incorporate breakoff actuating units and permanent nuts for future disassembly. Pressure ratings shall be:
 - (1) Ductile Iron Pipe
 - (a) 3 to 6 inch diameter: 350 psi (2:1 safety factor)
 - (b) 18 to 48 inch diameter: 250 psi (2:1 safety factor)
 - (2) PVC Pipe
 - (a) 3 to 36 inch diameter: full pressure rating or pressure class of pipe (2.5:1 safety factor)
 - b. Push-on joints for steel pipes shall be in accordance with the appropriate reference standards and standard practice.
 - c. Restrained push-on joints for all other pipe materials shall be comprised of two rings with connecting rods. The restraint ring shall be on the spigot, and a plain or slit bell ring shall be on the bell. Pressure ratings shall be:
 - (1) Ductile Iron Pipe
 - (a) 3 to 16 inch diameter: 350 psi (2:1 safety factor)
 - (b) 18 to 48 inch diameter: 250 psi (2:1 safety factor)
 - (2) PVC Pipe
 - (a) 3 to 10 inch diameter: 200 psi (4:1 safety factor)
 - (b) 12 inch diameter: 150 psi (4:1 safety factor)
 - (c) 14 to 16 inch diameter: 235 psi (2:1 safety factor)
 - (d) 18 to 30 inch diameter: 165 psi (2:1 safety factor)
 - (e) 36 inch diameter: 125 psi (2:1 safety factor)
 - (3) Dimensions of push-on bell restraints shall be compatible with ANSI/AWWA C150 and C900 or C905 for ductile iron or PVC pipe, respectively.
 - d. Restraint glands shall be of ductile iron conforming to ASTM A 536. Dimensions of the glands shall be compatible with standard mechanical joint bell and tee head bolts conforming to ANSI/AWWA C111 and C153, respectively.
 - (e) Bolts and nuts shall conform to Section 05500.

2.6 FLEXIBLE CONNECTORS

- A. Flexible connectors shall be provided in all piping connections to engines, blowers, compressors, vibrating equipment, and where indicated. Flexible connectors for service temperatures up to 180 degrees F shall be flanged reinforced neoprene or butyl rubber spools, rated for working pressures of 40 to 150 psi or reinforced flanged rubberized duck, as best suited for the application. For temperatures above 180 degrees F, flexible connectors shall be flanged braided Type 316 stainless steel spools with inner corrugated stainless steel hose rated for minimum 150 psi working pressure unless indicated otherwise. Connectors shall be minimum of 9 inches face to face between flanges. Material selection shall be proposed by the manufacturer based on the application.

2.7 EXPANSION JOINTS

- A. Linear Expansion Only: Use expansion loops, bellows-type expansion joints, or sliding type expansion joints of ductile iron, stainless steel, monel, or rubber.
- B. Linear, Angular, and Lateral Movement: Use flexible expansion joints consisting of expansion sleeve and ball-and-socket joints in a single unit. Each unit shall be capable of minimum 15 degrees angular motion in any direction, and the expansion sleeve shall be capable of minimum 4 inches of linear travel. Joints shall be suitable for the pressure and temperature application and be ductile iron conforming to ANSI/AWWA C153. All surfaces containing pressure and sealing surfaces shall be coated with minimum 15 mils of fusion bonded epoxy conforming to ANSI/AWWA C213.

2.8 PIPE THREADS

- A. Pipe threads shall comply with ANSI/ASME B1.20.

2.9 PIPE INSULATION

- A. Hot and cold liquid piping, flues, and engine exhaust piping shall be insulated where indicated, in accordance with Section 15250.

2.10 AIR AND GAS TRAPS

- A. Air and gas pipes shall be sloped to low points, provided with drip legs, strainers and traps. The traps shall be piped to the nearest drain. Air and gas traps shall be 150-lb iron body float type with copper or stainless steel float. Bracket, lever, and pins shall be of stainless steel.

2.11 STEAM TRAPS

- A. Steam traps shall be installed in all low points of steam piping, at minimum 300-foot intervals in mains, at steam appliances, heat exchangers, heaters, and control valves, and where indicated. Steam traps shall be preceded by drip legs, gate valves and strainers, and shall be connected to the condensate system. Steam traps shall be of the float and thermostatic type, the bucket type, or the disc type, with cast iron or steel body, stainless steel or monel trim, and threaded connections, with minimum rating of 150 psig.

2.12 GLASS LINING

- A. **General:** Ductile iron or steel pipe and fittings shall be glass-lined where indicated. The glass lining shall be suitable for handling sewage, primary sludge, digested sludge, and scum. It shall be smooth, continuous, and suitable for prevention of grease and foam build-up. The glass lining shall be capable of withstanding thermal shock of [350 degrees F] [430 degrees F to 800 degrees F] without crazing, blistering, or spalling.
- B. **Criteria:** The glass lining shall consist of a vitreous material selected to meet or exceed the following criteria:
1. Unaffected by scraping with a sharp knife, simulating the effects of rodding.
 2. Unaffected by the continuous application of live steam from a steam generator, immediately followed by a cold water quench.
 3. Unaffected by an 8 percent sulfuric acid solution at 148 degrees F for a ten-minute period.
 4. Minimum thickness: 10 mils by micro test.
 5. Spark tested: Surface must be free of pinholes.
 6. Hardness: 5-6 Mohs.
 7. Density: 2.5-3.0 g/cu cm, measured by ASTM D 792.
- C. **Application:** Cast or ductile iron pipes and fittings shall be bored or machined smooth to remove voids or protrusions. Steel pipe shall be seamless pipe, with all internal fitting welds ground smooth, slag holes ground out, re-welded, and ground smooth. Interior surfaces shall be grit blasted to white metal and lining fused to chemically clean metal at above 1400 degrees F. Welded flanges shall be factory-installed before lining. Threaded flanges of cast and ductile iron pipes shall be installed after lining and shall be sealed and tested prior to shipment.

2.13 MANUFACTURERS

- A. **Manufacturers:** Products of the type or model (if any) indicated shall be manufactured by one of the following (or equal):
1. Insulating Flanges:

JM Red Devil, Type E
Maloney Pipeline Products Co.
PSI Products, Inc.
 2. Flange Gaskets:

John Crane, Style 2160
Garlock, Style 3000
 3. Steel Pipe Couplings:

Gustin-Bacon (banded or grooved)
Victaulic Style 41 or 44 (banded)
Victaulic Style 77 or 07 (grooved)
 4. Ductile Iron Pipe Couplings:

Gustin-Bacon

Victaulic Style 31

5. Couplings for PVC Pipe:

Gustin-Bacon
Victaulic Style 775

6. Sleeve-Type Couplings:

Dresser, style 38
Ford Meter Box Co., Inc., Style FC1 or FC3
Smith-Blair, Style 411

7. Air and Gas Traps:

Armstrong Machine Works
Spirax Sarco, Inc.

8. Steam Traps:

Armstrong Machine Works
Dunham-Bush, Inc.
ITT Hoffman, Fluid Handling Division
Spirax Sarco, Inc.

9. Glass Lining:

The Pfaudler Co., Inc.
A.O. Smith Corp.
Waterworks, Inc.

PART 3 -- EXECUTION

GENERAL

A. Pipes, fittings, and appurtenances shall be installed in accordance with the manufacturer's installation instructions.

[B. Threaded pipe ends and joints shall be epoxy coated in compliance with Section 09800.]

**** END OF SECTION ****