SECTION 33 12 24

PIPE APPURTENANCES

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Work under this Section includes furnishing and installing all required appurtenances to the pipelines and valves as shown on the Contract Drawings and as specified in this Section.

1. Contractor shall furnish and install tapers, connections between the new and existing pipelines and branch piping, butt straps, thrust collars, and other special fittings as required.

2. Contractor shall furnish and install gate valves, air release valves, blow-off valves, dismantling joint and all required components, perform testing and all work as required to provide complete and functional valve installation.

1.02 RELATED WORK:

A. Section 01 11 00: Summary of Work

B. Section 01 35 55: Sanitary Work Practices, Disinfection, And Other Regulatory Requirements

C. Section 33 11 00: Water Utility Distribution Piping

D. Section 33 11 50: Installation of Steel Pipeline

E. Section 33 11 55: Fabrication of Steel Pipe

F. Section 33 11 56: Field Welding of Steel Pipeline

1.03 CITED REFERENCES:

A. ASTM A-27 – Standard Specification for Steel Castings, Carbon, for General Application

B. ASTM A-36 – Standard Specification for Structural Steel

C. ASTM A-105 – Standard Specification for Forgings, Carbon steel, for piping connections

D. ASTM A-120 – Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses

E. ASTM A-123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

F. ASTM A-139 – Standard Specification for Electric-Fusion (Arc) – Welded Steel Pipe (NPS 4 inches and Over)

G. ASTM A-153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

H. ASTM A-193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

I. ASTM A-194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

J. ASTM A-197 – Standard Specification for Cupola Malleable Iron

K. ASTM A-307 – Standard Specification for Carbon Steel Externally Threaded Standard Fasteners

L. AWWA C-207 – Standard for Steel Pipe Flanges for Waterworks Service – Sizes

M. AWWA M-11 – Steel Pipe – A guide for Design and Installation

N. California Department of Public Health - Waterworks Standards

1.04 SUBMITTALS

A. Information on all external connections, piping, tubing and wiring, etc.

B. Specification sheets and catalog cuts of all components and accessories.

C. Manufacturer's installation instructions.

D. Minimum and maximum applied torque values for gasket installation at bolted joints and other bolted connections.

E. The Contractor shall provide submittals with a manufacturer's suggested list of spare parts for the valves furnished under this section. Such list shall include all spare parts, which the manufacturer expects to be required for maintenance/replacement purposes during the first two years of equipment operation. The list shall include part numbers, part description and current pricing. Prices are to be valid for a period of one year following the date of system commissioning.

F. The Contractor shall submit four (4) copies of field-testing procedures for the valves furnished under this section. Submit for review and approval by the City Representative.

G. Submit Operation and Maintenance Manual data and contents per the requirements of Section 00 17 30 – Operation and Maintenance Data.

H. Submit certifications per Section 01 35 55 – Sanitary Work Practices and Disinfection.

1.05 QUALITY ASSURANCE

A. Similar items of equipment specified herein shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.

B. The valve manufacturers shall have a minimum of five (5) years verifiable experience in manufacturing the valves and available spare parts in warehouse in the vicinity within thirty miles from the City and County of San Francisco.

1.06 WARRANTY

A. The Contractor shall furnish a two (2) year warranty for all work covered by this Section per the requirements of Section 01 78 36 – Warranties.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Spot facing for bolts is required on all surfaces not otherwise machined. Backfacing of flanges will be permitted in lieu of spot facing. In either case, the minimum flange thickness, after facing, shall be not less than that indicated on the Drawings.

B. Comply with American Iron and Steel Requirements in accordance with Section 01 60 00 – Product Requirements.

C. All components and appurtenances in contact with the water supply are to be NSF 61 certified for safe use for potable water.

2.02 COMBINATION AIR VALVE (CAV)

A. Combination air valves shall be of the compact single chamber design with solid cylindrical HDPE control floats housed in a tubular 304L stainless steel body, flanged, secured by means of stainless steel 304 fasteners. Flanged ends for sizes 3"-8" shall be steel (BS4360 Grade 43 A), epoxy powder coated to 300 microns.

B. Combination air valves shall have a minimum pressure rating of 350 psi and shall be furnished completely assembled and pressure tested from the factory as a complete unit for installation on the pipeline. Combination air valves shall be manufactured to AWWA C-512.

C. Combination air valves shall be NSF/ANSI 61 Certified.

D. The valve shall have an integral 'Anti – Shock' Orifice mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure to 1.5 times the valve rated working pressure.

E. Contractor shall furnish and install flanged pipe spool/risers as necessary for the combination air valves to meet clearance required above grade as shown on the m-series drawings. Length of spool shall be determined based on the pipe and ground profiles and shall be field verified. Flange connection and gasket shall be manufactured to ASME B16.5 Class 300.

F. All pipe spools for the air vacuum shall be supported. Contractor shall furnish and install all pipe supports and accessories including clamps, plates, bolts, saddles, brackets as necessary to support the pipe with air and vacuum release valve and anchor it to the concrete riser walls as shown on the drawings. Supports shall be galvanized steel. Contractor shall submit signed and stamped drawings and calculations by a California licensed, professional civil engineer for anchorage and pipe support design.

G. Combination air valves shall be provided with above ground valve enclosures. Refer to section 2.04 for valve box assembles.

H. Manufacturers

1. VENT-O-MAT model RBX-4061

2. Or Approved Equal.

2.03 MANUAL AIR VALVES (MAV)

A. To be furnished by SFWD, installed by the Contractor. See standard detail CDD-LP-003.

2.04 VALVE BOX ASSEMBLIES

A. Valve that are to be installed above ground shall be protected with a valve enclosure.

B. Valves that are to be buried shall be provided with valve box assemblies as shown in the drawings. Valve box assemblies shall consist of the following:

1. Valve box with triangular cover.

2. Ductile Iron pipe of varying lengths welded to the valve box with triangular cover.

3. Steel Base Plate welded to the ductile iron pipe.

4. Cement Mortar Bed.

C. Refer to drawings for dimensions and details.

2.05 MECHANICAL JOINT RESTRAINTS

A. Restraint devices for pipe sizes 3 inch through 16 inch that use mechanical joints, and valves that use mechanical joint ends shall use multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure of 350 psi for 3 inch through 16 inch.

B. Material:

1. Gland body wedges and wedge actuating components shall be cast from grad 65-45-12 ductile iron material in accordance with ASTM A536.

2. Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (UL) specifications and ASTM A536.Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

C. Restraint devices shall be listed by Underwriters Laboratories 3 inch though 16 inch.

D. Refer to section 33 11 00 Water Utility Distribution Piping for Field-Lok gaskets requirements.

E. Mechanical Joint restraints shall be manufactured by EBAA, Megalug Series 1100TDM MEGALUG Mechanical Joint Restraint or approved equal.

2.06 DISMANTLING JOINTS

A. For 36" Welded Steel Pipe

B. Dismantling Joint shall be NSF 61 certified per Specification 01 35 55 – Sanitary Work Practices, Disinfection, And Other Regulatory Requirements and shall be restrained with a harness designed per AWWA M-11 and meets AWWA C219. Restraint rods shall be type 316 stainless steel. Contractor shall submit calculations stamped by a California licensed Professional Engineer for dimensions and design of harness and bolts, nuts, and lugs for maximum working pressure of 350 psi.

C. Sleeve shall be carbon steel per ASTM A283C or 30,000 psi minimum yield. Gaskets shall be EPDM. Bolts/nuts shall be type 316 stainless steel with

fluoropolymer coating. Restraint rod shall be installed to allow for the removal of the joint.

D. Flange and bolt drilling pattern shall be ASME B16.47 Class 300 Series A Raised Face Flange

E. Dismantling joint coating shall be Fusion-Bonded Epoxy Coating meeting requirements of AWWA C213.

F. Dismantling Joint shall be Romac model DJ400, or approved equal.

2.07 FLANGE ADAPTER SPOOL

A. To be used with 36" Dismantling Joint.

B. AWWA C207 Class E x ASME B16.47 Series A Class 300 Flange

C. 225 psi. The flange adapter spool will not be part of the calculation for the dismantling joint.

D. Adapter spool coating shall be Fusion-Bonded Epoxy Coating meeting requirements of AWWA C213

E. Adapter spool shall be NSF 61 certified

2.08 GATE VALVES

A. Used with air valve assembly, blow-off assembly and fire hydrant laterals. Size as indicated in the drawings.

B. Resilient wedge gate valve with non-rising stem.

C. 2" square wrench nut.

D. Valves shall have all internal and external ferrous surfaces coated with a fusion bonded thermosetting powder epoxy coating of 10 mils nominal thickness. The coating shall conform to AWWA C550.

E. Meets or exceeds all applicable requirements of ANSI/AWWA C515 Standard, UL 262 Listed, FM 1120/1130 Approved, and certified to ANSI/NSF 61 & 372.

F. Flanged end drilling complies with ASME/ANSI B16.1 Class 250.

G. 350 psi maximum working pressure, 700 psi static test pressure.

H. Per ANSI/AWWA C111, working pressure above 250psi requires the use of a special gasket rated for the higher pressure.

I. UL Listed, FM Approved.

J. Gate Valve shall be Mueller A-2362 Resilient Wedge Gate Valve Class 250 FLxFL or approved equal.

2.09 PRESSURE REDUCING VALVES

A. Not Used.

2.10 PICK-UP, LOADING AND HAULING OF MATERIALS

A. The Contractor, at his/her own expense, shall provide the necessary crew, hauling equipment, (e.g., forklift) transportation, etc., for loading and hauling the materials to the construction site.

B. The Contractor shall notify the City Representative at least 48-hours in advance (two (2) full business days) prior to scheduling an appointment for pick-up from the SFWD Pipe Yard for items that are furnished by the City.

1. Should an exchange of material be required, the fitting to be exchanged shall be returned to the SFWD Pipe Yard before an exchange can be made.

C. No materials shall be released without the list of approved materials.

PART 3 – EXECUTION

3.01 GENERAL

A. Bolt holes of flanged valves shall straddle the vertical centerline of the pipe run. Prior to installing flanged valves, flange faces shall be thoroughly cleaned. After cleaning, insert gasket and bolts, and tighten the nuts progressively and uniformly. If flanges leak under pressure, loosen or remove the nuts and bolts, reseat or replace the gasket, retighten and/or reinstall the nuts and bolts, and retest the joints. Joints shall be watertight at test pressures before acceptance.

B. Thoroughly clean threads of screwed joints by wire brushing, swabbing, or other approved methods apply approved join compound to threads prior to making joints. Joints shall be watertight at test pressures before acceptance.

C. Valves shall be backfilled after the pressure test have been accepted by the City Representative.

D. Refer to specification 33 11 00 Water Utility Distribution Piping for installation of steel pipe, trenching excavation, and backfilling.

3.02 SHIPPING, HANDLING, STORAGE AND DELIVERY

A. All valves and appurtenances shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. Keep valves and appurtenances wrapped in plastic or other protective material until immediately prior to installation. Care shall be taken during loading, transporting, and unloading to prevent injury to the materials. Under no circumstances shall materials be dropped. All materials shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the coatings or lining shall be repaired as directed by the City Representative. Handling and installing of materials shall be in accordance with the manufacturer's instructions, referenced standards and as herein specified.

Before making connections in the field, first remove dirt, grease, and foreign material.

B. If any defective material is discovered after it has been installed, it shall be removed and replaced with a sound material in kind, in a satisfactory manner by the Contractor, at his/her own expense. All materials shall be thoroughly cleaned before installation, shall be kept clean until used in the completed work, and when installed shall conform to the lines and dimensions shown.

3.03 INSPECTION OF FITTINGS

A. Not Used.

3.04 WELD QUALITY CONTROL

A. Welder Qualifications:

1. Qualify welding processes and welding operators in accordance with:
    a. AWS D1.1 – Structural Welding Code - Steel
    b. AWS D11.2 – Structural Welding Code - Cast Iron
    c. AWS A5.1 – Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
    d. AWS A5.5 – Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding
    e. AWS A5.20/A5.20M – Specification for Carbon Steel Electrodes for Flux Cored Arc Welding
    f. AWS A5.29/A5.29M – Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding
    g. AWS A5.15 - Specification for Welding Electrodes and Rods for Cast Iron

h. AWWA C206 – Field Welding of Steel Water Pipe

2. Certify that each welder has satisfactorily passed AWS qualification test for welding processes involved.

B. Review of Shop Drawings shall cover only the general scheme, design and character of details, but not the checking of dimensions; nor will such review relieve the Contractor from the responsibility for executing the work in accordance with the Contract Drawings.

C. Written Welding Procedure Specifications (WPSs) requirements for each different welded joint proposed for use whether prequalified or qualified by testing.

D. Procedure Qualification Record (PQR) in accordance with AWS for all procedures qualified by testing.

E. Electrode manufacturer's data.

F. Welders certification.

3.05 FLANGED JOINTS

A. Before installing gaskets in flanged joints, the faces of the flanges shall be cleaned to the satisfaction of the City Representative.

1. All welded flanges shall have joint surfaces machined after welding.

2. Bolts for flanged joints shall be of sufficient length to give a full nut engagement plus two full threads when the joint is made up.

3. When bolting up flanges, the bolts shall be tightened in such a way that the flanges in the completed joint will be parallel and free from unequal stresses.

4. Care shall be taken to prevent damage to the bolt heads, nuts and threads.

5. All damaged material shall be replaced.

6. Flanged joints showing leaks will not be acceptable.

7. Leaks shall be stopped by one or all of the following methods: cleaning flange face; replacement of gaskets; and adjustment of tension on bolts. No other method will be permitted.

8. Where, in the opinion of the City Representative, conditions prevent the use of hex head bolts, stud bolts of the proper size shall be substituted.

9. Bolt holes in relation to the pipe centerline shall be as indicated on the Drawings.

10. Contractor shall submit a Flange Torque Sequence Procedure. Included in the procedure will be a diagram showing the bolt tightening sequence and a Table of Torque Values for bold sizes. The procedure shall be followed by the contractor for all flange connections.

B. Insulated Flange Joints. Spacing and alignment of bolt holes in flanges shall be proper to allow installation of phenolic insulating sleeves without significant binding.

1. Matching bolt holes shall be reamed as required to allow proper installation of sleeves. All gaskets and sleeves shall be thoroughly cleaned prior to assembling into insulated joint.

2. After completion of the joint assembly and pipe installation including welding but before coating the flanges, the joint shall be tested by the Contractor in the presence of the City Representative to assure that no substantial continuity exists across the joint. The initial test shall establish that the resistance between each bolt and the flanges exceeds 50,000 ohms.

3. Insulated flanged joints approved by the City Representative shall be completely encapsulated with coal tar enamel coating.

3.06 GALVANIZING

A. Where galvanizing is indicated on the Drawings, the steel work shall be galvanized after completion of all cutting, drilling and fabrication. The zinc coating shall cover uniformly all parts of the surfaces of the metal including threads.

1. Metal work to be galvanized shall, after fabrication, be thoroughly cleaned and uniformly coated with zinc.

2. All fabricated parts to be galvanized shall have all joining surfaces seal welded prior to galvanizing.

3.07 MISCELLANEOUS METAL WORK

A. Contractor shall furnish and install miscellaneous metal work as indicated on the Drawings or as directed by the City Representative. Miscellaneous metal work shall include structural steel, steel and aluminum hatch covers, steel frames, ladders, railing, anchor bolts for main valves, bollards, steel straps, turnbuckles, bolts, U-bolts, valve stem extensions, screen vents, sleeves, 2-inch drain pipe, thrust plates for blow-off pipe, and other metal work as required or directed.

1. Ferrous metal, other than castings or forgings, furnished under miscellaneous metal work shall be galvanized.

3.08 CONNECTING PIPES

A. Contractor shall construct connecting piping as indicated between existing pipelines and new pipelines. Contractor shall verify dimensions and make all necessary field measurements before fabricating connecting pipes.

1. Work shall include fabricating and installing various sizes of steel pipes, tapers, tees, reinforcing collars, crotch plate, insulated joints, and butt straps required to construct connections including lining and coating appropriate to pipe connected. Excavating and backfilling for all pipes and constructing pipeline and specials will be paid for under separate bid items. Connections to the existing pipeline shall be made during pipeline shutdown scheduled according to pipeline shutdown plan and the construction sequence.

2. The City will de-water existing pipes to the extent that existing, accessible blow-offs will drain. The Contractor shall do all necessary pumping to remove water from valve leakage and water which cannot be drained by the blow-offs.

3. After the existing pipe is properly drained, the existing protective coating at the connection shall be removed, taking care to remove only that amount which is necessary by flame cutting or other methods approved by the City Representative. The cut shall be a neat even line. High and sharp edges of cut joint shall be ground off.

4. After the completion of welding and air testing of joints, the coating and lining around each joint shall be replaced in accordance with the requirements for field joints as specified in Section 09 97 72 – Coating and Lining of Metallic Structures.

B. Dismantling Joints: Prior to installation, must be free of oil, scale, rust and dirt from the pipe to provide a clean seat for the gasket. Care should be taken that the gaskets are wiped clean before they are installed. Install in accordance with the manufacturer's recommendations. Bolts shall be tightened progressively, drawing up bolt on opposite sides a little at a time until all bolts have a uniform tightness. Workers tightening bolts shall be equipped with torque- limiting wrenches or other favorably reviewed type. Anchor studs on restrained flanged coupling adapters shall be installed to lock into holes drilled through pipe wall in accordance with manufacturer's recommendation.

3.09 PRESSURE REDUCING VALVES

A. Not Used.

3.10 COMBINATION AIR VALVES

A. Redundant combination air valves shall be placed along the pipeline as shown in the drawing. Redundant valves are required per surge analysis conducted on the system.

3.11 MECHANICAL JOINT RESTRAINT

A. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.

B. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

3.12 FIELD TESTING AND CORRECTION OF DEFICIENCIES

A. Valve shall be tested at the same time that the adjacent pipeline is tested. Joints shall show no visible leakage under test. Repair and retest joints that show signs of leakage prior to final acceptance by the City. If there are any special parts of service operator that may be damaged by the pipeline test, they shall be properly protected. The Contractor will be held responsible for damage caused by the testing.

B. For equipment that requires flow, Contractor to provide equipment for testing including but not limited to, materials, flushing assembly for flowing water, supervision and incidentals required for the work.

C. If requested by the City Representative, the valve manufacturer shall furnish an affidavit stating the materials options furnished and that he/she has complied with these and other referenced specifications.

D. Testing of the pipe as specified shall be carried out after all appurtenances have been installed including hangers, supports and anchorage.

E. Testing of flanged joints and couplings shall be in accordance with AWWA C200. Testing of butt strap joints shall be in accordance with AWWA C206, Section 6. Any leakage shall be corrected at Contractor’s expense.

END OF SECTION