SECTION 33 10 00
WATER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to existing potable water supply.

B. Definitions:

1. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout the site, as applicable, that provides water from the potable water supply source for the project, including irrigation system valves.

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):

A112.6.3-2016.....Floor and Trench Drains

B16.1-2010.....Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250

B16.18-2012.....Cast Copper Alloy Solder Joint Pressure Fittings

B16.26-2013.....Cast Copper Alloy Fittings for Flared Copper Tubes

B18.2.2-2015.....Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

B18.5.2.1M-2006 (R2011).Metric Round Head Short Square Neck Bolts

ASME Boiler and Pressure Vessel Code -

BPVC Section IX-2015....Welding, Brazing, and Fusing Qualifications

C. American Society of Safety Engineers (ASSE):

1003-2009 Water Pressure Reducing Valves

D. American Society for Testing and Materials (ASTM):

A36/A36M-2014.....Standard Specification for Carbon Structural Steel

A47/A47M-1999 (R2014)...Standard Specification for Ferritic Malleable Iron Castings

A48/A48M-2003 (R2012)...Standard Specification for Gray Iron Castings

A148/A148M-2015a.....Standard Specification for Steel Castings, High Strength, for Structural Purposes

A307-2014.....Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

A536-1984(R2014).....Standard Specification for Ductile Iron Castings

A563–2015.....Standard Specification for Carbon and Alloy Steel Nuts

B61-2015.....Standard Specification for Steam or Valve Bronze Castings

B62-2015.....Standard Specification for Composition Bronze or Ounce Metal Castings

B88-2014.....Standard Specification for Seamless Copper Water Tube

B117-2011.....Standard Practice for Operating Salt Spray (Fog) Apparatus

B633-2013.....Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

C443-2012.....Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

C857-2014.....Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

C858-2010e1.....Standard Specification for Underground Precast Concrete Utility Structures

D1785-2015.....Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

D2000-2012.....Standard Classification System for Rubber Products in Automotive Applications

D2464-2015.....Standard Specification for Threaded Poly(Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

D2467-2015.....Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D2672-2014.....Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement

D4101-2014.....Standard Specification for Polypropylene Injection and Extrusion Materials

F437-2015.....Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80

F439-2013.....Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80

F441/F441M-2015.....Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

F477-2014.....Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F593-2013a.....Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

E. American Water Works Association (AWWA):

B300-2010.....Hypochlorites

B301-2010.....Liquid Chlorine

C104-2013.....Cement-Mortar Lining for Ductile-Iron Pipe and Fittings

C105-2010.....Polyethylene Encasement for Ductile-Iron Pipe Systems

C110-2012.....Ductile-Iron and Gray-Iron Fittings

C111-2012.....Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

C115-2011.....Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

C150-2014.....Thickness Design of Ductile-Iron Pipe

C151-2009.....Ductile-Iron Pipe, Centrifugally Cast

C153-2011.....Ductile-Iron Compact Fittings

C502-2014.....Dry-Barrel Fire Hydrants

C504-10.....Rubber-Seated Butterfly Valves

C508-2009.....Swing-Check Valves for Waterworks Service, 50 mm thru 600 mm (2 inches through 24 inches) NPS

C509-2009.....Resilient-Seated Gate Valves for Water Supply Service

C510-2007.....Double Check Valve Backflow Prevention Assembly
C511-2007.....Reduced-Pressure Principle Backflow Prevention Assembly
C512-07.....Air Release, Air/Vacuum and Combination Air Valves
C550-2013.....Protective Interior Coatings for Valves and Hydrants
C600-2010.....Installation of Ductile Iron Water Mains and Their Appurtenances
C605-2013.....Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
C651-2014.....Disinfecting Water Mains
C700-2015.....Cold-Water Meters – Displacement Type, Metal Alloy Main Case
C701-2015.....Cold-Water Meters – Turbine Type, for Customer Service
C702-2015.....Cold-Water Meters – Compound Type
C706-2010(Withdrawn)....Direct-Reading, Remote-Registration Systems for Cold-Water Meters
C707-2010.....Encoder-Type Remote-Registration Systems for Cold-Water Meters
C800-2014.....Underground Service Line Valves and Fittings
C900-2007.....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 100 mm Through 300 mm (4 inches Through 12 inches), for Water Transmission and Distribution
C906-15.....Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 64 In. (1,600 mm), for Water Distribution and Transmission

F. American Welding Society (AWS):
A5.8/A5.8M-2011.....Specification for Filler Metals for Brazing and Braze Welding

G. Copper Development Association, Inc. (CDA):
A4015.....Copper Tube Handbook

H. National Fire Protection Association (NFPA):
24-2016.....Standard for the Installation of Private Fire Service Mains and Their Appurtenances

I. NSF International:
61-2014a.....Drinking Water System Components-Health Effects

J. University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC FCCCHR):
9th Edition.....Manual of Cross-Connection Control

1.3 SUBMITTALS

A. Make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements and will fit the space available.

B. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval by VA will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

C. Prior to submitting shop drawings for approval, certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

D. Manufacturers' Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity. Submit all items as one package. Ductile iron pipe and Polyvinyl Chloride (PVC) shall be in accordance with AWWA C600 and AWWA C605 respectively.
   1. Piping.
   2. Fittings
   3. Gaskets.
   4. Valves.
   5. Valve boxes.

E. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a compatible and efficient installation. Final review and approvals will be made only by groups.

F. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and

troubleshooting guide. Include complete list indicating all components of the systems.

1.4 QUALITY ASSURANCE

A. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply, and servicing of the specified products for at least 5 years.
2. All items furnished shall be free from defects that would adversely affect the performance, maintainability, and appearance of individual components and overall assembly.
3. The products and execution of work specified in Division 33 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the COR.
4. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be the product of one manufacturer.
5. Assembled Units: Ensure that manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
6. Nameplate: Nameplate bearing manufacturer's name or identifiable trademark securely affixed in a conspicuous place on equipment or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
7. Use of asbestos containing products, equipment, or materials is prohibited.

B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems.

C. Comply with all rules and regulations of Federal, State, and Local Department of Environmental Quality having jurisdiction over the design, construction, and operation of potable water systems.

D. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations

of the manufacturer of the material being installed, electronic copies of these recommendations shall be furnished to the COR prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

E. Execution (Installation, Construction) Quality:

1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the COR for resolution. Printed copies or electronic files of manufacturer’s installation instructions shall be provided to the COR at least 10 working days prior to commencing installation of any item.
2. Installer Qualifications: Installer shall be licensed and shall provide evidence of the successful completion of at least five projects of equal or greater size and complexity. Provide tradesmen skilled in the appropriate trade.
3. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or additional time to the Government.

F. Cleanliness of Piping and Equipment Systems:

1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading, and welding of piping shall be removed.
2. Piping systems shall be flushed, blown, or pigged as necessary to deliver clean systems.
3. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

G. All material surfaces in contact with potable water shall comply with NSF 61.

1.5 AS-BUILT DOCUMENTATION

A. Submit manufacturer’s literature and data updated to include submittal review comments and any equipment substitutions.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe, direct buried:

1. Provide ductile iron pipe conforming to the requirements of AWWA C151, Pressure Class 350 for Pipe 100 mm through 300 mm (4 inches

through 12 inches) in diameter with double thickness cement mortar lining interior, interior asphaltic seal coat, and exterior asphaltic coating, in accordance with AWWA and ANSI Standards.

2. Below Grade: Supply pipe in lengths not in excess of a nominal 6.1 m (20 feet) with rubber ring type push-on joints, mechanical joint, or approved restrained joint. Provide mechanical and restrained joint pipe with sufficient quantities of accessories as required for each joint.

B. Ductile Iron Pipe Above Grade or in Below Ground Concrete Pits:

1. Flanged ductile iron pipe, AWWA C115, with factory applied screwed long hub flanges except as otherwise specified hereinafter. Face and drill flanges after being screwed on the pipe, with flanges true to 90 degrees with the pipe axis and flush with end of pipe, ANSI B16.1, 861 kPa (125 psi) or 1724 kPa (250 psi) standard, for the purpose intended.
2. Wall Sleeve Castings: Size and types shown on the drawings and as herein specified in paragraph LINK/SLEEVE SEALS.
3. Pipe Thickness Class: Minimum of Class 53 as defined in AWWA C150 for all sizes of flanged pipe.
4. Rubber Ring Gaskets: Full face type, AWWA C111, 1.6 mm (1/16 inch) rubber ring gaskets and of approved composition suitable for the required service.
5. Bolts and Nuts on Flanged Fittings: Grade B, ASTM A307. Low alloy, high strength steel in accordance with AWWA C111. Assemble stainless steel bolts and nuts using anti-seize compound to prevent galling.

C. All Pipe Fittings: Ductile iron with a minimum pressure rating of 2413 kPa (350 psi). Fittings shall meet the requirements of ANSI and AWWA specifications as applicable. Rubber gasket joints shall conform to AWWA C111 for mechanical and push-on type joints. Ball joints shall conform to AWWA C151 with a separately cast ductile iron bell conforming to ASTM A148/A148M. Flanged fittings shall conform to AWWA C115 and be furnished flat faced and drilled to 861 kPa (125 psi) or 1724 kPa (250 psi) template in accordance with ANSI B16.1 with full faced gaskets.

D. Provide cement mortar lining and bituminous seal coat on the inside of the pipe and fittings in accordance with AWWA C104. Provide standard asphaltic coating on the exterior.

E. Provide a factory hydrostatic test of not less than 3.5 MPa (500 psi) for all pipe in accordance with AWWA C151.

2.2 MECHANICAL JOINT RETAINER GLANDS

A. Restraint devices for mechanical joint fittings and appurtenances conforming to either AWWA C111 or AWWA C153, shall conform to the following:

1. Restraint devices for nominal pipe sizes 75 mm (3 inch) through 900 mm (36 inch) shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of AWWA C110.
2. The devices shall have a working pressure rating equal to that of the pipe on which it is used. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.
3. Gland body, wedges, and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 Brinell Hardness Number (BHN).
4. An identification number consisting of year, day, plant, and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. All components shall be manufactured in the United States.
5. Mechanical Joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.
6. Mechanical joint restraints shall be listed by Underwriters Laboratories, and approved by Factory Mutual in the 75 mm (3 inch) through 300 mm (12 inch) sizes.
7. All 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 to provide corrosion, impact, and UV resistance.

2.3 VALVES

A. Gate:

1. Unless otherwise specified, valves shall conform to AWWA C515 with mechanical-joint ends. Valves shall be resilient seated, ductile iron body, non-rising stem type, turning counter-clockwise to open, with a working pressure of 250 psi (WOG). The resilient seat shall be fastened to the gate with stainless steel fasteners or vulcanizing methods. The interior and exterior shall be coated with thermo-setting or fusion epoxy coating in accordance with AWWA C550. Stuffing boxes shall have triple O-ring stem seals. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. Asbestos packing is prohibited.
2. Operator:
   a. Underground: Furnish valves with 50 mm (2 inch) nut for socket wrench operation.
3. Joints: Ends of valves shall accommodate, or be adapted to, pipe installed. The current valves are flanged.

2.4 VALVE BOX

A. Cast iron extension box with screw or slide-type adjustment and flared base. Minimum thickness of metal shall be 5 mm (3/16 inch). Box shall be adapted, without full extension, to depth of cover required over pipe at valve location. Cast the word "WATER" in cover. Provide two (2) "T" handle socket wrenches of 18 mm (5/8 inch) round stock long enough to extend 600 mm (2 feet) above top of deepest valve box. The least diameter of the shaft of the box shall be 135 mm (5-1/4 inches). Cast iron box shall have a heavy coat of bituminous paint. Valve box and cover shall be installed where indicated on the drawings to be utilized as access points for the tracer wire or detectable warning tape.

PART 3 - EXECUTION

3.1 INSTALLATION

A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 REGRADING

A. Raise or lower existing valve and curb stop boxes, or any other applicable water system facilities, to finish grade in areas being graded.

3.3 PIPE LAYING, GENERAL

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as recommended by the manufacturer in order to maintain the product performance as if it were undamaged.

B. All pipe and fittings shall be inspected just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost or time to the Government. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

C. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown.

D. Exercise extreme care when installing piping to shore up and protect from damage all existing utilities and structures.

E. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.

F. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.

G. Hold pipe securely in place while joint is being made.

H. Do not walk on pipes in trenches until covered by layers of earth compacted in place to a depth of at least 300 mm (12 inches) over pipe.

I. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.

J. Tees, plugs, caps, bends, and hydrants installed on underground pipe shall be anchored. See paragraph PIPE SUPPORTS.

K. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water, and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.

L. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.

M. Trench excavation and compaction of backfill shall comply with the requirements of Section 31 20 00, EARTH MOVING.

3.4 DUCTILE IRON PIPE

A. Jointing Ductile-Iron Pipe:

1. Mechanical Joints at Valves, Fittings: Install in strict accordance with AWWA C111. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gaskets with soapy water before tightening the bolts. Bolts shall be tightened to the specified torque. For new construction, all mechanical joints at valves and fittings shall be secured with an approved mechanical joint retainer glands suitable for the pipe.
2. Flanged joints shall be in accordance with AWWA C115. Flanged joints shall be fitted so that the contact faces bear uniformly on the gasket and then are made up with relatively uniform bolt stress.

3.5 SETTING OF VALVES AND BOXES

A. Provide a surface concrete pad 457 by 457 by 150 mm (18 by 18 by 6 inches) to protect valve box when valve is not located below pavement.

B. Clean valve and curb stops interior before installation.

C. Set valve and curb stop box cover flush with finished grade.

D. Set curb stop box and cover for access to identification wire and/or detectable warning tape with a 300 by 300 by 75 mm (12 by 12 by 3 inches) at approximately the depth of the warning tape and bring the tape and/or identification wire into the box and coil extra length sufficient to allow the tape or wire to be uncoiled and extended 1500 mm (5 feet) above finish grade at the location.

E. Valves shall be installed plumb and level and in accordance with manufacturer’s recommendations.

3.6 HYDROSTATIC TESTING

A. After new system is installed, except for connections to existing system and building, backfill at least 300 mm (12 inches) above pipe barrel, leaving joints exposed. The depth of the backfill shall be adequate to prevent the horizontal and vertical movement of the pipe during testing.

B. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.

C. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, provide and install

all required temporary thrust restraints required to safely conduct the test.

D. Install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.

E. Perform pressure and leakage tests for the new system for 2 hours to 1380 kPa (200 psi). Leakage shall not exceed the following requirements.

1. Ductile Iron Pipe: AWWA C600. Provide to COR office.

3.7 STARTUP AND TESTING

A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.

B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

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