SECTION 02665

WATER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. **Section Includes:** Water systems piping for potable water service and fire protection service outside the building.

B. **Work Included:** This Section does include tapping of Sewerage and Water Board of New Orleans water main by Contractor and charged directly to Owner.

C. **Related Sections**: The following Sections contain requirements that relate to this Section:
1. Division 15 - Mechanical: Fire protection and water distribution systems inside building.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. **Minimum Working Pressure Ratings:** Except where otherwise indicated, the following are minimum pressure requirements for water system piping.
1. Underground Piping: 150 psig (1035 kPa).

1.3 SUBMITTALS

A. **General:** Submit the following according to Section 01300.

B. **Product data**, including pressure rating, rated capacity, and settings of selected models for the following:
1. Water meters.
2. Fire hydrants.
3. Identification materials and devices.

C. **Coordination drawings** showing pipe sizes and valves, meter and specialty locations and elevations. Include details of underground structures, connections, anchors, and thrust blocking. Show other piping in same trench and clearances from water system piping. Indicate interface and spatial relationship between piping and proximate structures. Locate tie-in in utility servitude.

D. **Record drawings** at Project closeout of installed water system piping and products according to Division 1 Section "Project Closeout."

E. **Test reports** specified in "Field Quality Control" Article in Part 3.

F. **Maintenance data** for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout." Include data for the following:
1. Fire hydrants.

1.4 QUALITY ASSURANCE

A. **Comply with requirements** of the Sewerage and Water Board of New Orleans, Louisiana, or any of its agencies supplying water. Include tie-in to water mains.

B. **Comply with standards** of authorities having jurisdiction for fire protection systems. Include materials, hose threads, installation, and testing.

C. **Comply with standards** of authorities having jurisdiction for potable water piping and plumbing systems. Include materials, installation, testing, and disinfection.

D. **Comply with** NFPA 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances" for materials, installations, tests, and flushing.

E. **Provide** listing/approval stamp, label, or other marking on equipment made to specified standards.

F. **Listing and Labeling**: Provide equipment and accessories that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

G. **Product Options**: Water systems specialties and accessories are based on specific types, manufacturers, and models indicated. Components by other manufacturers but having equal performance characteristics may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by Architect. The burden of proof of equality of products is on Contractor. Refer to Division 1 Section "Product Substitutions."

1.5 PROJECT CONDITIONS

A. **Perform** site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. **Verify** that water system piping may be installed in compliance with original design and referenced standards. Identify conflicts with other utilities and report to Architect prior to commencing work.

C. **Site Information**: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.6 SEQUENCING AND SCHEDULING

A. **Coordinate** connection to water main with Sewerage and Water Board of New Orleans.

B. **Coordinate** with pipe materials, sizes, entry locations, and pressure requirements of building fire protection systems piping.

C. **Coordinate** with pipe materials, sizes, entry locations, and pressure requirements of building water distribution systems piping.

D. **Coordinate** with other utility work.

E. **Coordinate** electrical requirements of actual equipment furnished with requirements specified in Division 16.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Manufacturers**: Subject to compliance with requirements, provide products by one of the following:

1. Drilling Machine Corporation Stops:
   a. Ford Meter Box Company, Inc.
   b. Hays Div., Romac Industries
   c. Mueller Company, Grinnell Corp.
2. Bronze Corporation Stops and Valves:
   a. Ford Meter Box Company, Inc.
   b. Hays Div., Romac Industries
   c. McDonald Mfg. Co.
   d. Mueller Company, Grinnell Corp.
3. Tapping Valves:
   a. Clow Valve Co. Div., McWane, Inc.
   b. East Jordan Iron Works, Inc.
   c. Kennedy Valve Div., McWane, Inc.
   d. Mueller Company, Grinnell Corp.
   e. Pipe and Foundry Co.
4. Gate Valves:
   a. American Darling Valve Div., American Cast Iron Pipe Co.
   b. Clow Valve Co. Div., McWane, Inc.
   c. East Jordan Iron Works, Inc.
   d. Gem Sprinkler Co. Div., Grinnell Corp.
   e. Hammond Valve Corp.
   f. Kennedy Valve Div., McWane, Inc.
   g. Milwaukee Valve Co., Inc.
   h. Mueller Co., Grinnell Corp.i. Nibco, Inc.
   i. Stockham Valves & Fittings, Inc.
   j. Pipe & Foundry Co.
   k. Waterous Co.
5. Indicator Posts and Indicator Gate Valves:
   a. American Darling Valve Div., American Cast Iron Pipe Co.
   b. Clow Valve Co. Div., McWane, Inc.
   c. Kennedy Valve Div., McWane, Inc.
   d. Mueller Co., Grinnell Corp.

e. Nibco, Inc.
f. Stockham Valves & Fittings, Inc.
g. Pipe & Foundry Co.
h. Waterous Co.

6. Wet-Barrel Fire Hydrants:
   a. Clow Valve Co. Div., McWane, Inc.
   b. Mueller Co., Grinnell Corp.
7. Water Meters:
   a. Provided by Louisiana Utilities.
8. Drains:
   a. Ancon, Inc.
   b. Jones Manufacturing Co., Inc.
   c. Josam Co.
   d. Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
   e. Wade Div., Tyler Pipe Subsid., Tyler Corp.
   f. Zurn Hydromechanics Div., Zurn Industries, Inc.
9. Detector Check Valves:
   a. Ames Co., Inc.
   b. Hersey Products, Inc., Grinnell Corp.
   c. Kennedy Valve Div., McWane, Inc.
   d. Viking Corp.
   e. Watts Regulator Co.
10. Backflow Preventers:
   a. Ames Co., Inc.
   b. Cla-Val Co. Div., Griswold Industries
   c. Conbraco Industries, Inc.
   d. Febco
   e. Hersey Products, Inc., Grinnell Corp.
   f. Watts Regulator Co.
   g. Wilkins Regulator Div., Zurn Industries, Inc.

2.2 PIPES AND TUBES

A. **Refer to** Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.

B. **Ductile-Iron Pipe**: AWWA C151, Classes 150, 200, and 250.
1. Lining: AWWA C104, cement mortar, seal coated.
2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
4. Mechanical-Joint-Type Pipe: AWWA C111, rubber gaskets, ductile- or cast-iron glands, and steel bolts and nuts.
5. Encasement: AWWA C105, polyethylene film tube.

C. **Polyvinyl Chloride (PVC) Pipe**: AWWA C900; Classes 150 and 200; with bell end and elastomeric gasket, with plain end for cast-iron or ductile-iron fittings, or with plain end for PVC elastomeric gasket fittings.

1. Pipe Marking: NSF 14, "NSF-pvc cto only."
2. Gaskets: ASTM F 477, elastomeric seal.

2.3 PIPE AND TUBE FITTINGS

A. **Refer** to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.

B. **Ductile-Iron and Cast-Iron Pipe Fittings**: AWWA C110, ductile-iron or cast-iron, 250-psig minimum pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psig pressure rating.
1. Lining: AWWA C104, cement mortar.
2. Gaskets: AWWA C111, rubber.

C. **Ductile-Iron, Flexible Expansion Joints**: Compound fitting with combination of flanged and mechanical-joint ends conforming to AWWA C110 or AWWA C153. Units have 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections, rated for 250-psig minimum working pressure and with FDA-approved epoxy interior coating, for offset and expansion indicated.

D. **Ductile-Iron Deflection Fittings**: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends conforming to AWWA C110 or AWWA C153. Units rated for 250-psig minimum working pressure, and with cement lining or FDA-approved epoxy interior coating, for up to 20 degrees deflection.

E. **Polyethylene Encasement**: AWWA C105, 8-mils (2 mm) minimum thickness, tube or sheet.

F. **Polyvinyl Chloride (PVC) Pipe Couplings and Fittings**: AWWA C900, with ASTM F 477 elastomeric seal gaskets.

2.4 JOINING MATERIALS

A. **Refer** to Part 3 Article "Piping Applications" for identification of systems where joining materials specified below are used.

B. **Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings**: The following materials apply:
1. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
2. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
    a. Gaskets: Rubber, flat face, 1/8 inch (3 mm) thick except where other thickness is indicated; and full-face or ring type except where other type is indicated.
    b. Flange Bolts and Nuts: ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL B18.2.1, carbon steel, except where other material is indicated.

C. **Plastic Pipe Flange Gasket, Bolts, and Nuts**: Type and material recommended by piping system manufacturer, except where other type or material is indicated.

2.5 VALVES

A. Nonrising Stem Gate Valves 3 Inches (80 mm) and Larger: AWWA C500, cast-iron double disc, bronze disc and seat rings, bronze stem, cast-iron or ductile-iron body and bonnet, stem nut, 200-psig working pressure, mechanical joint ends.

B. Valve Boxes: Cast-iron having top section and cover with lettering "WATER", bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide a steel tee-handle operating wrench with each valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

C. Indicator Posts: UL 789, FM-approved vertical type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

D. Curb Stops: Bronze body, ground key plug or ball, and wide tee head, with inlet and outlet to match service piping material.

E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover having lettering "WATER", and bottom section with base of size to fit over curb stop and barrel approximately 3 inches (75 mm) in diameter.

1. Provide steel tee-handle shutoff rod with each service box. Shutoff rod shall have tee handle with 1 pointed end, stem of length to operate curb stop, and slotted end fitting curb stop head.

F. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Use service clamp and stop compatible with drilling machine.

1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
2. Corporation Stops: Bronze body and ground key plug, with AWWA C800 threaded inlet and outlet matching service piping material.
3. Manifold: Copper with 2 to 4 inlets as required, with ends matching corporation stops and outlet matching service piping.

2.6 WATER METERS

A. Include a $40,000.00 allowance in the base bid price for the furnishing and installation of water meters and vault box.

B. General: Provide water meter with registration in gallons.

C. Meter Box: Cast-iron body, cast-iron cover having lettering "WATER METER," and base section of length to fit over service piping. Base section is open at bottom, slotted, and may be cast iron, polyvinyl chloride (PVC), or piece of clay or other pipe.

2.7 PITS

A. **Concrete:** Portland cement mix, 4000 psi.
1. Cement: ASTM C 150, Type 1.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. **Reinforcement:** Steel conforming to the following:
1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM C 615, Grade 60, deformed.

C. **Ladder:** ASTM A 36, polyethylene-encased steel steps.

D. **Manhole:** ASTM A 536-80, Grade 65-45-12, ductile iron, 24-inch minimum diameter traffic frame and cover, of size and weight indicated.

E. **Drain:** ASME A112.21.1M, cast-iron area drain, of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type blockwater valve.

2.8 DETECTOR CHECK VALVES

A. **Detector Check Valve:** UL 312, FM-approved double detector check, iron body, corrosion-resistant clapper ring and seat ring material, 175 psig working pressure, flanged ends, with connections for, and including, a bypass and installation of a water meter.

2.9 BACKFLOW PREVENTERS

A. **General:** ASSE Standard backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
1. Working Pressure: 150 psig minimum except where indicated otherwise.
2. 2 inches (50 mm) and Smaller: Bronze body with threaded ends.
3. 2-1/2 inches (65 mm) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
4. Interior Lining: FDA-approved epoxy coating for backflow preventers having cast-iron or steel body.
5. Interior Components: Corrosion-resistant materials.
6. Exterior Finish: Polished chrome plate when used in chrome-plated piping system.
7. Strainer on inlet where strainer is indicated.

B. **Reduced-Pressure Detector Assembly Backflow Preventers:** ASSE 1047, FM-approved or UL-listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves, test cocks, and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer, for continuous-pressure application.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.10 IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 SERVICE ENTRANCE PIPING

A. Extend water system piping and connect to water supply source and building water distribution and fire protection systems at outside face of the building wall in locations and pipe sizes indicated.
1. Terminate water system piping at building wall until building water systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water systems when those systems are installed.

B. Water distribution systems and fire protection systems are specified in Division 15 Sections. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

C. Install restrained joints for buried piping within 5 feet of building. Use restrained-joint pipe and fittings, thrust blocks, anchors, tie-rods and clamps, and other supports at vertical and horizontal offsets.

3.3 PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and inside building may be joined with flanges or couplings, instead of joints indicated, for grooved-end AWWA-size piping.

B. Use pipe, tube, fittings, and joining methods according to following applications.
1. 2-1/2 Inches to 3-1/2 Inches: Schedule 40 polyvinyl chloride (PVC) plastic pipe, Schedule 40 PVC fittings, and solvent-cemented joints.
2. 4 Inches to 8 Inches: AWWA C900, Class 150 polyvinyl chloride (PVC) plastic pipe, AWWA C110 or AWWA C153, Class 150 minimum, ductile-iron or gray-iron fittings, and mechanical or push-on joints.

3.4 JOINT CONSTRUCTION

A. **Flanged Joints**: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.

B. **Ductile-Iron, Grooved-End Pipe and Fitting Joints**: Cut-groove pipes. Assemble joints with grooved couplings, gaskets, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. **AWWA Polyvinyl Chloride (PVC) Piping Gasketed Joints**: Use AWWA C900 joining materials. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

D. **Polyvinyl Chloride (PVC) Piping Solvent-Cement Joints**: Construct joints according to ASTM D 2672 and ASTM D 2855.

1. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.

E. **Dissimilar Materials Piping Joints**: Construct joints using adapters that are compatible with both piping materials, outside diameters, and system working pressure. Refer to "Piping Systems - Common Requirements" Article for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. **General Locations and Arrangements**: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated except where deviations to layout are approved on coordination drawings.

B. **Install piping** at indicated water main elevation.

C. **Install components** having pressure rating equal to or greater than system operating pressure.

D. **Install piping** free of sags and bends.

E. **Locate groups** of pipes parallel to each other, spaced to permit valve servicing.

F. **Install** fittings for changes in direction and branch connections.

G. **Piping Connections**: Except as otherwise indicated, make piping connections as specified below.

1. Install flanges, in piping 2-1/2 inches (65 mm) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3.6 PIPING INSTALLATION

A. **Comply with** requirements of NFPA 24 for materials and installation.

B. **Install** AWWA polyvinyl chloride (PVC) plastic pipe according to AWWA M23.

C. **Install** ASTM, NPS polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.

D. **Bury** piping at minimum depth of 36 inches below finished grade and not less than 18 inches below average local frost depth.

E. **Tunneling**: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.7 ANCHORAGE INSTALLATION

A. **Anchorages:** Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Polyvinyl Chloride (PVC) Piping: According to AWWA M23.
2. Fire Service Piping: According to NFPA 24.

B. **Apply** full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. **General Application:** Use mechanical-joint-end valves for 3-inch and larger buried installation. Use threaded- and flanged-end valves for installation in pits and inside building. Use nonrising stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch (50 mm) and smaller installation.

B. **AWWA-Type Gate Valves:** Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.

C. **UL/FM-Type Gate Valves:** Comply with NFPA 24.
1. Install buried valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

D. **Bronze Corporation Stops and Curb Stops:** Comply with manufacturer's installation instructions. Install buried curb stops with head pointed up and with cast-iron curb box.

3.9 WATER METER INSTALLATION

A. **Install** water meters, piping, and specialties according to utility company's requirements.

B. **Water Meter:** Install detector-type water meters according to AWWA M6 in meter pit. Include shutoff valves on meter inlet and outlet and full size valved bypass around meter. Support meters, valves, and piping on piers as indicated.

3.10 ROUGHING-IN FOR WATER METERS

A. **Install** roughing-in piping and specialties for water meter installation according to utility company's instructions and requirements.

3.11 PIT CONSTRUCTION AND INSTALLATION

A. **Construct pits** of poured-in-place concrete or provide precast concrete pits of dimensions indicated, with manhole frame and cover, ladder, and drain. Include sleeves with waterproof mechanical sleeve seals for pipe entry and exit.

B. **Connect** area drain outlet to storm drain. Storm drainage is specified in Division 2 Section "Storm Sewerage".

3.12 DETECTOR CHECK VALVE INSTALLATION

A. **Install detector check valves** in pits for proper direction of flow. Install bypass with water meter, gate valves on each side of meter and check valve downstream from meter.

B. **Support** detector check valves, meters, shutoff valves, and piping on 4000-psi minimum, Portland Cement-mix concrete piers as indicated.

3.13 BACKFLOW PREVENTER INSTALLATION

A. **Install** backflow preventers of type, size, and capacity indicated on customer side of meter vault. Include valves and test cocks. Install according to plumbing and health department authorities having jurisdiction.

B. **Do not** install bypass around backflow preventer.

C. **Do not** install reduced-pressure-principle-type in pit.

D. **Support** backflow preventers, valves, and piping on 4000-psi minimum, Portland Cement-mix concrete piers as indicated.

3.14 IDENTIFICATION INSTALLATION

A. **Install** continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 inches to 8 inches below finished grade, directly over piping.

B. **Attach** nonmetallic piping label permanently to main electrical meter panel.

3.15 FIELD QUALITY CONTROL

A. **Piping Tests:** Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.

B. **Hydrostatic Tests:** Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

3.16 CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.
2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if method is not prescribed by that authority, use procedure described in AWWA C651 or as described below:
   a. Comply with NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
   b. Fill system or part of system with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) system or part thereof and allow to stand for 24 hours.
   c. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine; isolate and allow to stand for 3 hours.
   d. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
   e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by authority shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION