SECTION 02660

WATER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. A complete underground domestic/fire water supply system, with all necessary accessories indicated on drawings or specified in this section.
2. System shall start from an existing water main located either inside or outside the property line, having sufficient capacity, and extended to within 5 feet from the new building services or as indicated in the drawings and connection to lines furnished under other sections of specifications.
3. The system's total installation cost shall include the costs imposed by the utility, municipality, and federal agencies having jurisdiction. System's costs include, but are not limited to:

    a. Furnishing and installing the water meters.
    b. Tapping to the existing lines as shown on the drawings and the services extension to the point of use.
    c. Installation and permit fee.
    d. Meter and tapping fees.
    e. Reduced pressure backflow preventers for domestic water, full sized, aboveground, complete with concrete pad and fencing.
    f. Fire line, full sized, aboveground, double check valve backflow preventer, complete with OS&Y valves, concrete pad, chains, and tamper switches, with installation and applicable items Underwriters Laboratories (UL) listed and Factory Mutual (FM) approved.
    g. Piping, pipe coatings, valves, backflow preventers, valve boxes, meter box or vault, and any other item or accessory required for a complete water supply system installation from the point of connection to the point of use shall be either provided by the Contractor directly, or paid for by the Contractor.
    h. Site restoration inside and outside the property line including road restoration.

4. The Board will only pay the meter deposits.

B. Related Sections:

1. 02221 - Excavating, Backfilling and Compacting for Utilities.
2. 03300 - Cast-In-Place Concrete.
3. 09900 - Painting.
4. Division 15 - Mechanical Work.

1.02 REFERENCES

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

1.	A53-96	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2.	B88-96	Specification for Seamless Copper Water Tube.
3.	D2241-96a	Specification PVC Pressure Rated Pipe.
4.	D1785-96a	Specification PVC Plastic Pipe, Schedules 40, 80, and 120.
5.	D3139-96a	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

B. American National Standards Institute (ANSI):

1.	A21.4	Cement-mortar Lining for Cast-iron and Ductile Iron Pipe and Fittings for Water.
2.	A21.6	Cast-iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids.
3.	A21.8	Cast-iron Pipe Centrifugally Cast in Sand-lined Molds, for Water or Other Liquids.
4.	A21.11	Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.
5.	A21.51	Ductile-iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids.
6.	B16.22	Wrought Copper and Bronze Solder Joint Pressure Fittings for Piping under 3 Inches in Diameter.
7.	B16.3	Malleable Iron Threaded Fittings, 150 and 300 Lbs.

C. American Water Works Association (AWWA):

1. B300 Hypochlorites.
2. B301 Liquid Chlorine.
3. C203.66 Coal Tar Enamel Protective Coating for Steel Water Pipe.
4. C5OO Gate Valves - 3" through 48" for Water and Other Liquids.
5. C601 Disinfecting Water Mains.
6. C800 Threads for Underground Service Line Fittings.
7. C900 Polyvinyl Chloride Pressure Pipe.

1.03 SUBMITTALS

A. Submit manufacturer's literature on the following items before starting work.

1. Pipe and fittings, complete with gaskets and lubricants.
2. Valves.
3. Solder and flux.
4. Chemical solvents.
5. Sterilizing chemicals.
6. Test reports and certificates.
7. Backflow preventers.
8. Fire hydrants.
9. Detector check valve.

B. Certification: Submit certification that solder used for copper tubing joints is lead free and complies with specifications.

1.04 QUALITY ASSURANCE

A. Provide manufacturer's certificate of compliance or certified analysis with each shipment of materials used.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cast Iron Pipe:

1. ANSI S21.6 or A21.8, cement mortar lined, working pressure minimum 150 psi.
2. Standard thickness cement mortar lining shall comply

with ANSI A21.4.
3. For all water and fire mains inside the property line, for sizes 3 inches and above.

B. Ductile Iron Pipe:

1. ANSI A21.51, cement mortar lined, working pressure minimum 150 psi.
2. Standard thickness cement mortar lining shall comply with ANSI A21.4.
3. For all water and fire mains inside and outside the property line, for sizes 3 inches and above. Pipe also allowed where required by Miami-Dade County Public Works Manual for use in backflow preventer installations.

C. Polyvinyl Chloride Pipe:

1. AWWA C-900, DR 18, 150 psi minimum working pressure.
2. For all water and fire mains inside and outside the property line, for sizes 4 inches and above.

D. Polyvinyl Chloride Pipe:

1. ASTM D2241, SDR 26, 160 psi minimum working pressure.
2. For non-fireline use inside the property line, sized 3 inches and above.

E. PVC Pipe:

1. ASTM D1785, Schedules 40, and 80.
2. For sizes below 3 inches.

F. Copper Tubing:

1. ASTM B88, Type "K" or "L".
2. For sizes below 3 inches.

G. Galvanized Steel Pipe:

1. ASTM A120.
2. For sizes below 3 inches.
3. Allowed only where mandated by Miami-Dade County Public Works Manual for use in backflow preventer installations.

H. Joints:

1. ASTM D3139, PVC push-on joints.

    a. For 3 inches diameter and above:
    b. Rubber gaskets and lubricants: ASTM D3139.

2. Schedule 40 PVC piping below 3 inches diameter:

    a. Solvent welded according to manufacturer's written recommendations.
    b. Do not thread schedule 40 pipe.

3. Copper Water Tubing Joints:

    a. Sweat solder joints using tin-antimony solder and flux according to manufacturer's recommendations without using lead compounds.

4. Cast Iron and Ductile Iron Pipe:

    a. Push-on Joints: ANSI A21.11
    b. Rubber Gaskets and Lubricants: Applicable requirements of ANSI A21.11.

5. Galvanized Steel Pipe:

    a. AWWA C800.
    b. Joints shall be threaded.

6. Dissimilar Metal Joints: Consist of a sandwich-type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts (for installation between non-threaded ferrous and non-ferrous metallic pipe).

    a. Make gaskets full faced with outside diameter equal to the flange outside diameter.
    b. Provide full length bolt insulating sleeves.
    c. Make units of a shape to prevent metal-to-metal contact between dissimilar metallic piping elements.

I. Fittings and Special Items:

1. For PVC Piping:

    a. Fittings: ASTM D2466 and D3139.

b. Solvent welding: Comply with manufacturers written recommendations.

2. For Copper Tubing:

a. Sweat solder type red bronze or wrought copper complying with ANSI B16.22.
b. Solder: 95-5 tin-antimony solder. Solder containing lead is not acceptable.

3. For Cast Iron and Ductile Iron Pipe:

a. Suitable for 150 psi pressure rating.
b. Pipe, fittings, and special items shall have standard thickness cement mortar lining complying with ANSI A21.4.
c. Fittings and Special Items for Use with Push-on Joints Pipe: ANSI/AWWA C110 and A21.1 1.

4. For Galvanized Steel Piping less than 3 inches.

a. Steel fittings shall be galvanized malleable iron.
b. Screwed fittings: ANSI Bl 6.3.
c. Dresser-type fittings shall not be used.

J. Gate Valves Not in Fire Service.

1. Design gate valves for a WOG working pressure of 150 psi minimum.

a. Connect valves as required for the piping in which they are installed.
b. Valves smaller than 3 inches shall be rising stem.
c. Provide a clear waterway equal to the full nominal diameter of the valve. Valve shall open by turning counter clockwise.

2. Valves Smaller Than 3 Inches:

a. Nibco Scott T-143.
b. Crane 431-UB.
c. Milwaukee 1150.
d. Accepted equivalent.

3. Valves 3 Inches and Larger:

a. Iron body, bronze mounted, AWWA C500.

b. Crane 461/462, Nibco Scott F-619, Milwaukee F-2882 or accepted equivalent.

K. Fire Service Valves.

1. Design valves for a WOG working pressure of 175 psi minimum. Valves shall be UL listed and FM approved.

a. Connect valves as required for the piping in which they are installed.
b. Provide gate valves with a clear waterway equal to the full nominal diameter of the valve. Valve shall open by turning counter clockwise.

2. Underground Gate Valves:

a. Crane 4621/2.
b. Accepted equivalent.

3. Check Valves:

a. Crane 375.
b. Nibco Scott F-908-B
c. Accepted equivalent.

L. Domestic Water Reduced Pressure Backflow Preventer.

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NOTE TO SPECIFIER: Tank and water supply for EHPAs shall be valved and isolated from the municipal water supply. Edit non-design and size related items.

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1. Reduced Pressure Backflow Preventer: Full pipe sized and designed for a pressure drop not to exceed 13 psig at full flow, provided adequate water pressure may be maintained at the most remote water closet fixture while flushing plus a 5 psig safety margin.
2. Mount at heights complying with Miami-Dade Water and Sewer Department (M-DWS) Standard Details WS 4.18 latest edition.
3. 2 Inches and Smaller:

a. Watts Model FAE-909S, with bronze strainer and flanged adapter ends.
b. Provide drain line with Watts Model 909 AG Series air gap, as directed.

4. 3 Inches and Larger:

    a. Watts Model 909-S-QT-FDA, or accepted equivalent with FDA approved epoxy coated strainer and quarter turn FDA epoxy coated ball valve shut-offs.
    b. Provide drain line with Watts Model 909 AG Series air gap as directed. Provide intermediate support as required.

5. Provide fenced enclosure complete with top cover and lockable access door, either on side or top of fence, as required.

M. Fire Service Double Check Valve Detector Assembly.

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NOTE TO SPECIFIER: Edit non-design and size related items.

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1. Double Check Valve Detector Assembly: Full pipe sized, designed for fire protection system use, UL listed and FM approved.
2. Provide chains with locks and tamper switches. Installation of locks and tamper switches shall comply with NFPA 26 requirements and specifically Par. 21 (b), 2-3, and 2-6.2.3.
3. 3 Inches and Larger:

    a. Watts Model 709-DCDA or accepted equivalent, with AWWA epoxy coated UL listed and FM approved, OS&Y gate valves, CFM 5/8" x 3/4" meter and ball test cocks. Provide intermediate support as required.

4. Install according to manufacturer's published recommendations and M-DWS standard details.
5. Aboveground pipe and fittings shall be painted red.

N. Valve Boxes:

1. Cast Iron:

    a. Traffic type for use at all asphalted locations. Valve box shall be extension type with slide-type adjustment and flared base. Minimum metal thickness 3/16". Provide concrete minimum 8 inches deep and 8 inches around base of valve box.
    b. Cover shall have the work "Water".

c. Provide ductile iron riser pipe of sufficient diameter to surround valve's bolted bonnet and sufficient length to enter 6 inches into valve box proper.
d. Cast iron valve boxes may be used at non-traffic locations when approved by A/E.

2. Pre-Cast Concrete:

a. Shall be used in non-asphalted areas, have the word "Water" embossed or permanently affixed on the cover.
b. Valve boxes shall be Brooks Products Inc. 36, 37, 38 or 66 series having either cover or lid weighting not less than 16 pounds. Size of valve box shall be adjusted to the size of the valve.
c. Provide extensions as required so depth of box reaches bottom of valve.

3. Precast Polymer Concrete:

a. Quazite by Strongwell, Lenoir City, TN or accepted equivalent.
b. The word "Water" shall be permanently embossed on the cover.
c. Provide standard colors as selected by A/E.
d. Not to used where exposed to vehicular traffic.

O. Meters and Vaults: Water meters and vaults shall comply with the utility company having jurisdiction in the area.
P. Thrust Blocks, Tie Rods, and Socket Clamps:

1. Provide concrete for thrust blocks according to Section 03300 Cast-in Place Concrete. Provide thrust blocks for all push-on type joint water piping, at each pipe junction, dead ends, and change in direction.
2. Provide tie rods and socket clamps underground near each building entrance and elsewhere as required to prevent piping from joint disassembly or blow-out.
3. Transitions to aboveground piping shall be done sufficiently underground to minimize requirements for aboveground tie rods and socket clamps.

Q. Miscellaneous Items:

1. Disinfection:

a. Chlorinating materials complying with the following:

1) Chlorine, Liquid: AWWA B301.
2) Hypochlorite, Calcium, and Sodium: AWWA B300.

R. Piping Materials:

1. Domestic Water Piping:

a. Exterior Aboveground: Copper Type "L", except at aboveground backflow preventers where steel piping shall be used according to M-DWS and Public Works Manuals.
b. Exterior Underground: PVC, cast iron, ductile iron, "K" or "L" copper tubing.

2. Fire Water Distribution Piping Underground: PVC, cast iron or ductile iron.
3. Fire Water Distribution Piping Exterior Aboveground: Ductile iron.
4. Transition of underground to aboveground material shall be at the valve box designated for the building. Aboveground PVC piping is not allowed.

S. Post Indicator Valves:

1. Iron body bronze mounted flanged non-rising stem, solid wedge disc with vertical indicator post, Kennedy Fig.701 with valve with Fig.541 indicator or Mueller valve A2052-6 with A20800 indicator. Install at least 40 feet from the building being served.
2. The post indicator shall be approved by the fire department having jurisdiction in the area.

T. Fire Hydrant: Comply with WWA C502 and Miami-Dade County Fire Department Standards. Install in the vicinity of siamese fire department connection.

1. Pipe and Joint Coating: Coal tar enamel complying with AWWA C203.
2. Disinfection:

a. Chlorinating materials complying with the following:

1) Chlorine, Liquid: AWWA B301.

2) Hypochlorite, Calcium, and Sodium: AWWA B300.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Install main according to the requirements of authorities having jurisdiction and AWWA Standard C600.

3.03 HANDLING

A. Handle pipe and accessories to insure delivery to the trench in sound, undamaged condition.

1. Take care not to injure pipe coating.
2. Repair damaged coating or lining, if any, of any pipe or fitting in a satisfactory manner at no cost to the Board.
3. Do not place pipe or materials of any kind inside a pipe or fitting after coating has been applied.
4. Carry pipe into position. Do not drag it.
5. Pinch bars or tongs for aligning or turning pipe may be used only on bare ends of pipe.
6. Clean interior of pipe and accessories of foreign matter before lowering into trench.
7. Keep pipe clean during laying operations by plugging or other accepted method.
8. Inspect pipe for defects before installation.
9. Replace material found defective before or after laying with sound material without cost to the Board.
10. Store rubber gaskets not immediately installed in a cool, dark place.

3.04 PIPE CUTTING

A. Cut pipe in a neat and professional manner without damage to the pipe.

1. Cut with an accepted type of mechanical cutter unless otherwise recommended by manufacturer and authorized by

A/E.

a. Use a wheel cutter when practical.

3.05 LOCATING

A. Outside property Line:

1. Do not lay pipe closer horizontally than 10 feet from the edge of a sewer line except where bottom of water pipe will be at least 18 inches above the top of the sewer pipe.
2. For further requirements comply with Miami-Dade Water and Sewer Authority Department Standard Detail WS 4.61.

B. Inside property Line:

1. Do not lay pipe closer horizontally than 5 feet from the edge of a sewer line except where bottom of water pipe will be a least 12 inches above the top of the sewer pipe.
2. Comply with Florida Building Code (FBC) - Plumbing, paragraphs 608.3 and 608.4.
3. Where water lines do not meet the above conditions, encase sewer line in concrete, minimum 4 inches thick, for a distance of at least 5'-1" each side of the crossing, or sewer lines shall be made of cast iron pipe with no joint located within 5'-1" horizontally of crossing. The water line may also be sleeved, with the edges of the sleeve being caulked, for a distance of 5'-1" horizontally from the edge of the sewer line.
4. Water lines shall cross above sewage force mains a minimum of 2 feet above force main.

C. Do not lay water lines in same trench with sewer, gas, or fuel lines or electrical conduit.

D. Maintain a minimum vertical separation of 12 inches between pipes where non-ferrous metallic pipe (copper) crosses any ferrous piping material.

3.06 PLACING AND LAYING

A. Carefully lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other authorized equipment.

1. Do not drop or dump any water line materials into trench.
2. Avoid abrasion to pipe coating.
3. Lay pipe, except where necessary to make connections with other lines, with bells facing direction of laying.
4. Rest full length of each section of pipe solidly upon pipe bed, with recesses excavated to accommodate bells, coupling and joints.
5. Take up pipe that has had grade or joint disturbed after laying.
6. Do not lay pipe in water or when trench conditions are unsuitable for the work.
7. Securely close open end of pipe, fittings and valves when work is not in progress.
8. Keep water out of trench until jointing work is complete.
9. Repair damage to existing piping, or to new piping coating or lining in a satisfactory manner without cost to the Board.
10. Valve, plug, or cap and anchor pipe ends left for future connections.
11. Place a metallic location tape above all plastic lines, Seton 37220 or 37222 as required.
12. Provide clean sand minimum 6 inches all around plastic lines.

3.07 JOINTING

A. Cast Iron Pipe: Install push-on type joints according to AWWA C600.

B. Galvanized Steel Pipe: screw joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an acceptable graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

C. Copper Tubing: Sweat solder fittings using solder and flux. Connections made with solder containing lead are not allowed. Joints with lead shall be disassembled, solder remaining removed, and reconnected using the specified solder, at no additional cost to the Board.

D. Insulating Joints: Install according manufacturer's requirements.

E. Connections between different type of pipe and accessories shall be made with transition fittings accepted by A/E.

3.08 SETTING OF VALVES AND BOXES

A. Install where shown or specified, and set plumb at finished grade.

B. Valve boxes shall be centered on the valves.

1. Boxes shall be installed over each outside gate valve unless otherwise shown.
2. Where feasible, valves shall be located outside the area of roads and parking.
3. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.

3.09 METER, BACKFLOW PREVENTER, DETECTOR CHECK VALVE, AND VAULTS

A. Install according to local utility company standards, as specified, and as indicated on drawings.

3.010 FIRE HYDRANTS

A. Hydrants shall be installed according to the fire department having jurisdiction in the area.

3.011 THRUST BLOCKS

A. Plugs, caps, tees, and bends deflecting 22.5 degrees or more, either vertically or horizontally, on water lines 6 lines in diameter or larger, shall be provided with thrust blocking, or metal tie rods and clamps, or lugs.

B. Thrust blocking shall be concrete of a mix not leaner than 1 cement: 2-1/2 sand: 5 gravel and having a compressive strength of not less than 2,500 psi after 28 days.

C. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored.

D. Unless otherwise indicated the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth.

E. The sides of thrust blocks not subject to thrust may be

poured against forms.

F. The area of bearing shall be as shown.

G. Blocking shall be placed so that the fitting joints will be accessible for repair.

H. Steel rods and clamps shall be protected by galvanizing or by coating with coal tar enamel coating.

3.012 HYDROSTATIC PRESSURE TEST

A. Test:

1. After pipe is laid, joints completed, and trench partially backfilled, leaving joints exposed for examination, subject newly laid water piping or any valved section of water piping to a one hour, 150 psi hydrostatic pressure test, unless otherwise specified.
2. Open and close each valve several times during test.
3. Carefully examine exposed pipe, joints, fittings and valves during the partially open trench test.
4. Replace or remake joints showing visible leakage as necessary.
5. Remove and replace cracked or defective pipe, joints, fittings, or valves discovered after this pressure test with sound material.
6. Repeat test until results are satisfactory.
7. Replace, repair and retest as required at no cost to the Board -
8. Test shall be according to and accepted by the local utility company.
9. Test shall be also accepted by the A/E.

B. Time for Making Test:

1. Except joint material setting or where concrete reaction backing requires a 5-day delay, pipelines or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage any time after partial completion of backfill.
2. Cement mortar lined pipe may be filled with water as recommended by manufacturer before being subjected to pressure test.

C. Concurrent Hydrostatic Test and Disinfection:

1. Despite sequence of tests employed, results of pressure tests and disinfection shall be satisfactory as specified.

   a. Replace, repair, or retest as required at no cost to the Board.

2. Pressure test and disinfection may be conducted separately or hydrostatic tests and disinfection may be conducted concurrently, using water tested for disinfection to accomplish hydrostatic test.
3. If water is lost when treated for disinfection and air is admitted to piping unit being tested, or if any repair procedure results in contamination of piping unit, repeat disinfection procedures until satisfactory results are obtained.

3.013 DISINFECTION

A. Before acceptance of potable water operation, disinfect each unit of completed water piping as prescribed by AWWA C601.

3.014 CLEANUP

A. Upon completion of installation of water lines and appurtenances, remove debris and surplus materials resulting from work.

3.015 TESTS

A. Cost of tests by Contractor.

END OF SECTION