SECTION 02675
POTABLE WATER SYSTEMS

PART 1 -- GENERAL

1.1 SECTION DESCRIPTION

A. This section includes materials and performance standards, and Contractor responsibilities associated with the furnishing of all labor, materials, equipment and incidentals required to properly install, complete, and make ready for operation all potable water systems and appurtenances as shown on the Drawings and as specified herein.

B. Materials shall include, but not be limited to, the following:

1. Water Mains
2. Valves
3. Hydrants
4. Tapping Tees and Valves
5. Wire Locators

1.2 RELATED SECTIONS

A. Section 01100 - Design Criteria

B. Section 02620 – High Density Polyethylene Pressure Pipe

C. Section 02640 – Utility Valves and Appurtenances

D. Section 02645 – Fire Hydrant Assemblies

E. Section 02670 – Performance Testing of Pressure Pipelines

1.3 SUBMITTALS

A. Submit shop drawings of all materials for water mains, fittings, valves, hydrants and services to be installed for approval, prior to ordering material.

B. Manufacturer and Fabricator Certification

PART 2 -- PRODUCTS

2.1 WATER MAINS

A. General

1. All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer, the batch number, the location of the plant, strength designation, and standards as applicable.

B. Polyvinyl Chloride (PVC)

1. PVC Water Main 4 inch to 12-inch diameter (4" – 12") shall be DR-18 manufactured to ductile iron pipe outside dimensions and in compliance with AWWA Standard C900 (Pressure Class 150). The pipe shall have an integral bell end and gasket seal with the joint in compliance with the requirements of ASTM D3139. Pipe and fittings must be assembled with nontoxic lubricant. The pipe shall be approved by the National Sanitation Foundation for use as a potable water main. The pipe color shall be blue or white with "Water Main" permanently printed on three sides for the entire length of the pipe.

2. PVC Water Main 14 inch to 20-inch diameter (14" – 20") shall be DR-18 manufactured to ductile iron pipe outside dimensions and in compliance with AWWA C905 (Pressure rating 235). The pipe shall have an integral bell end and gasket seal with the joint in compliance with the requirements of ASTM D3139. The pipe shall be approved by the National Sanitation Foundation for use as a potable water main. The pipe color shall be blue or white with "Water Main" permanently printed on three sides the entire length of the pipe.

3. Connections for pipe two inches or greater in diameter shall be rubber compression ring-type. Pipe shall be extruded with integral thickened wall bells without increase in dimension ration (DR). Rubber ring gaskets shall consist of synthetic compounds meeting the requirements of ASTM Designation D869 and suitable for the designated service.

4. Fittings: Ductile iron fittings shall be used on all PVC C900 & C905 mains. Fittings shall conform to AWWA/ANSI C110/A21.10 or AWWA/ANSI C or AWWA/ANSI C153/A21.53 for compact fittings with a minimum pressure rating of 350 psi.

C. Ductile Iron Pipe and Fittings

1. Ductile iron pipe shall be a minimum Pressure Class 350. SLCU reserves the right to require a different thickness class for unusual or non-standard laying conditions. Adequate protective measures against corrosion shall be

determined by SLCU and the Engineer.

2. Ductile iron pipe shall conform to latest standards of ANSI/AWWA C150/A21.50 for the thickness design of ductile iron pipe and ANSI/AWWA C151/A21.51 for ductile iron pipe centrifugally cast in metal molds or sand-lined molds. Flanged end pipe shall be Class 53, minimum.

3. Ductile iron fittings shall conform to AWWA/ANSI C110/A21.10 or AWWA/ANSI C153/A21.53 for compact fittings, with a minimum pressure rating of 350 psi.

4. Joints for ductile iron pipe shall conform to the latest standard of ANSI/AWWA C111/A21.11 for rubber gasket joints and ANSI/AWWA C115/A21.15 for threaded flanges. All buried joints at fittings must be restrained, mechanical joints. Restrained joint assemblies with mechanical joint pipe shall be by approved restraining devices.

5. Ductile iron pipe shall be cement-lined and the lining shall conform to the latest standards of ANSI/AWWA C104/A21.4.

6. Flanged pipes and connections, including all bolts, nuts, and gaskets, shall be in accordance with AWWA/ANSI C115/A21.15. Flanges shall be threaded unless otherwise noted. All above ground flanges shall be flat faced unless they are mating up to existing raised flanges. All gaskets shall be full faced 1/8" thick, minimum. All hardware shall be stainless steel.

7. Ductile iron pipe shall be required in the following circumstances:

   a) Water Main 24 inches in diameter and larger.
   b) Within 10 feet of sewage facilities or pipes.
   c) Within 15 feet of buildings, canals or lakes.
   d) Crossings under sewage or storm pipes in accordance with parallel/horizontal separation requirements.
   e) Crossings over sewage or storm pipes in accordance with parallel/horizontal separation requirements.
   f) Carrier pipe for jack and bores (restrained joints).
   g) Aerial crossings.
   h) Ductile iron pipe may be mandated by SLCU in any instance of off-site or on-site construction where future abuse to the line is possible due to location or circumstances, extensive length under pavement, or in private property away from County rights-of-way.

F. High Density Polyethylene Pipe

1. High-density polyethylene (HDPE) pipe shall meet all requirements of AWWA C906, latest revisions. See Section 02620 of these specifications for other requirements related to HDPE pipe.

G. Coatings and Linings

1. Buried Ductile iron pipe and fittings for all water service shall receive an exterior asphalt coating and shall be cement mortar lined and bituminous sealed in accordance with AWWA/ANSI C104/A21.4 and C151/A21.51.

2. Machined surfaces shall be cleaned and coated with a suitable rust-preventive coating at the shop immediately after being machined.

3. Ductile iron pipe exposed to the atmosphere and all above ground applications shall be cleaned and given a new inhibitive primer coat at the place of manufacturer. The prime coat shall be compatible with the finish coat of alkyd enamel. A minimum primer dry film thickness of 3 mils. A field prime coat shall be applied in areas where the initial prime coat is damaged in the field.

4. After installation, all above ground ductile iron piping shall receive two or more coats of a high grade, gloss or semigloss alkyd enamel coating. Each coat shall have a minimum dry thickness of 3 mils. All related piping shall be the same color as specified by SLCU.

5. All required polyethylene encasement shall comply with AWWA/ANSI C105/A21.5, "Polyethylene Encasement for Gray and Ductile Cast Iron Piping for Water and other liquids.

2.2 SERVICE CONNECTIONS, BLOW-OFFS AND SAMPLE POINTS

A. Polyethylene Tubing

1. Polyethylene tubing shall only be used for service connections, blow-offs, and bacteriological sample points. Polyethylene tubing shall conform to AWWA C901 subject to the following design criteria: Standard Code Designation PE3408, Pipe Class 200, and Dimension Ration (DR) 9.

2. Tubing shall bear identification markings, which shall remain legible during normal handling, storage, and installation, and which have been applied in a manner that will not reduce the strength of the product or otherwise damage the tubing. Marking on the tubing shall include the following and shall be applied at intervals of not more than 5 feet: Nominal size, material code designation, dimension ratio, pressure class, manufacturer's name or trademark and production record code, and seal (mark) of the testing agency that certified the suitability of the tubing material for potable water products.

3. Joints for polyethylene tubing shall be of the compression type utilizing a totally confined grip seal and coupling nut. Stainless steel tube stiffener

insert shall also be used for tubing services.

4. All fittings and stops to be high quality water works brass. No PVC fittings or adapters will be permitted. Fittings shall be brass equipped with compression-type connectors.

2.3 VALVES

A. Gate valves 12 inch and smaller shall be ductile iron, resilient seat type with mechanical joints conforming to AWWA C509, latest revision.

B. Butterfly valves shall be used for valves 14" and larger except for 14" and larger wet taps, where tapping valves are required. Butterfly valves shall be ductile iron body, tight closing, rubber seat type and shall meet the requirements of AWWA C504, latest revision.

C. Reference Section 02640 for additional requirements related to valves.

2.4 HYDRANTS

A. Fire Hydrants shall conform to the latest AWWA specifications C502. Working pressure of hydrants shall be a minimum of 150 psi.

B. Reference Section 02645 for additional requirements related to fire hydrants.

2.5 TAPPING TEES AND VALVES

A. Tapping sleeves shall be 304 stainless steel with flanged outlets.

B. Tapping valves shall be resilient seat type with working pressure of not less than 200 psi.

C. Reference Section 02640 for additional requirements related to tapping sleeves and valves.

2.6 LOCATOR FOR WATER PIPE

A. On all pipe construction, 10 gauge THWN insulated stranded copper wire shall be laid and secured on top of pipe.

PART 3 -- EXECUTION

3.1 EXISTING FACILITIES

A. Contractor is required to verify location of existing utility mains and valve configurations in all connection areas prior to beginning of construction in that area. Any discrepancies between the construction drawings and field conditions shall be brought to the attention of the Engineer of Record prior to construction in that area.

B. It will be the Contractor's responsibility to verify all existing utilities (telephone, gas, electric, cable, water, reclaimed water, and sewer services, etc.), whether shown in the construction drawings or not. The locations of all existing utilities indicated on the plans are shown for general informational purposes only. Any damage to existing utilities or services shall be repaired by the particular utility, or the Contractor, under direct authorization and supervision of the particular utility with all repair costs being incurred by the Contractor. Any discrepancies between the construction drawings and existing field conditions shall be brought to the attention of the Engineer of Record or his representative prior to construction in that area.

3.2 INSTALLATION:

A. General Requirements:

1. Piping and fittings shall be installed in accordance with these Standards and in general with the manufacturer's recommendations for the applicable service.
2. Piping shall be installed along straight line and grade between fittings, or other defined points, unless other definite lines of alignment deflection or grade change have been established. Modification to approved alignment or grade during construction shall receive prior approval from the Engineer and all resulting design conflict shall be resolved by the Engineer prior to proceeding. The standard minimum cover for utility mains shall be as follows:

Mains 8" diameter & less	30" cover
Mains 14" diameter & more	48" cover
Low Pressure Mains	48" cover
Mains 10” & 12”	36” cover

Protective concrete slabs are required in accordance with the construction details when the cover is less than the standard minimums shown above. Where waterways, canals, ditches, or other cuts are crossed, protective concrete slabs are also required across and to ten feet each side of the bottom. Additionally, approved utility crossing signs may be required along the pipe alignment at each side of the canal, etc. Signs shall be approved by SLCU and Agency having jurisdiction over said waterway.

3. All pipe shall be laid to line in a clean, dry trench on line and grade with all valves and appurtenances plumb. Backfill shall be clean suitable fill.

4. Materials shall be cleaned and maintained clean, with all coatings protected from damage. The interior of the pipe shall be free of dirt and debris, and when work is not in progress, all open ends shall be plugged, with an approved device.

5. Pipe and fittings, or other items shall be inspected prior to installation and any items showing a fracture or other defect shall be rejected. Additionally, any pipe or fitting which has received a severe blow that may have caused an incipient fracture indicated beyond that visible, may be salvaged by cutting off the damaged section 12 inches past, providing the remaining pipe is sound. Discoloration of PVC due to exposure to the sun may result in pipe rejection.

6. Underground piping shall not be driven to grade by striking it. When the pipe has been properly bedded, enough compacted backfill shall be placed to hold the utility in correct alignment. If necessary, precaution shall be taken to prevent flotation.

7. Jointing shall be by the manufacturer's approved method and shall not require undue force to accomplish full satisfactory seating and assembly. Connections at structures shall be cut accurately and worked into place without forcing and shall align with the connecting point. Flanged joints shall be made up tight, but with care taken to prevent undue strain upon equipment or other items. Suitable flange filler rings shall be installed where required to provide suitable joints. The installation shall be permanently water tight, with no visible leakage at joints, connections with structures or other locations, under operational or testing conditions. Material that in jointing does not remain completely seated and/or watertight shall be rejected.

8. Underground pressure piping systems shall be securely anchored by acceptable means at all tees, plugs, caps, bends and valves, and at all other locations where unbalanced forces exist or as directed by SLCU or Engineer of Record. Restrained joints shall be used in accordance with manufacturer's recommendations. Reference the SLCU Standard Construction Details for requirements related to pipe restraints.

9. Acceptable pipe restraint devices are Uni-Flange, Mega-Lug, or approved equal restraining systems. Shop drawing shall specify the particular system to be utilized and no substitutions will be allowed after approval without resubmittal of shop drawings and written approval by SLCU. Every pipe joint that is required to be restrained shall be inspected by SLCU or Engineer of Record prior to the Contractor backfilling the restrained joint.

10. Exposed systems shall be supported as necessary to hold the piping and appurtenances in a firm, substantial manner to the required lines and grades indicated, with no undue piping stresses transmitted to equipment or other items. Pipe aboveground outside of buildings shall be supported on concrete supports or premanufactured adjustable pipe supports.

11. Subaqueous pipe laying may be permitted where conditions make it impractical to lay pipe "in the dry", provided the Contractor submits his plans for laying pipe under water to SLCU and Engineer and obtains advance approval thereof. All subaqueous crossings shall be made in accordance with all approved permits.

12. Special Exterior Protection for Corrosion: Extra protection shall be provided for underground cast or ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement in accordance with the requirements of AWWA C105, through the area of concern. Soil-test evaluation to determine the necessity for extra protection in suspect areas shall be as set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, cast or ductile iron pipe crossing said utility shall be protected for a distance of 20 feet to each side, and when installed parallel to and within ten feet of, protection shall also be provided. Steel pipe shall <u>not</u> be installed in severe corrosion areas.

13. In case of conflict between various installation requirements the more stringent requirement shall apply.

14. All pipeline laying, testing, etc. shall be performed in the presence of SLCU and/or engineer of Record or their designated representative.

15. Pipeline joint deflections shall be as stated within Uni-Bell Handbook of PVC Pipe or the manufacturer's maximum allowable deflection, whichever is less.

B. Ductile Iron Pipe: Installation shall be performed in accordance with the applicable provisions of AWWA Standard C600 and the manufacturer’s recommendations.

C. Polyvinyl Chloride Pipe (C900 & C905): Installation shall be performed in accordance with the applicable provisions of AWWA C-900, ASTM D-2774, AWWA Manual M23 and the manufacturers recommendations. Lubrication used for pipe and fitting joints shall be nontoxic.

D. Parallel/Horizontal Separation

1. Reference requirements in Section 01100, Design Criteria for horizontal and vertical separation requirements.

E. Valves

1. All valves shall be placed according to plan unless relocation is mutually agreed to. Record or as built drawings shall reflect the actual location and size of all mains, hydrants, services and valves.

F. Connecting Tapping Tees and Valves

1. A SLCU representative shall approve each location proposed for connection of the new system to the existing system before the tapping sleeve is installed. Tapping sleeves shall not be installed within 3 feet of any joint or fitting. Before installation of tapping tee, the area to be tapped and the tapping tee shall be cleaned with potable water. After all sand, dirt and debris have been removed from the main, the tapping tee, the tapping valve and the area where the tapping tee is to be installed on the existing main shall be swabbed with a chlorine or bleach solution with at least 100 ppm of chlorine.

   After the tapping tee is attached to the main, the gate valve shall be closed and tapping tee and gate valve assembly shall be pressured tested at 150 psi for a minimum of 1 hour with water. A SLCU representative shall witness the pressure test. No visible leaks or loss of pressure shall be evident. After pressure testing, the main may be tapped. Only shell type cutters shall be used. The coupon from the hole that is cut shall be delivered to SLCU.

H. Locator for Water Pipe

1. THWN insulated, stranded copper wire shall be laid and secured on top of pipe. Wire shall be continuous from valve box to valve box, wrapped two times around each joint of pipe and extended inside each valve box to enable location devices to be attached without digging up the valve box (see Standard Construction Details).

   Service wire shall be laid in the trench with all services connected to the main wire and wrapped around the service piping or tubing. Wire for potable water shall be blue in color.

   All wire connections shall be made with Dri-Splice wire connectors, Imperial Snip-Snap fittings filled with waterproof silicone sealant or approved equal. All splices shall be inspected by SLCU before burial.

I. Cleaning and Flushing

1. After its installation, the complete water system (including all mains, services, hydrants, blow-offs, air release valves and all other appurtenances) shall be thoroughly flushed to remove all foreign matter. SLCU shall be notified at least 24 hours in advance of any flushing activities. Reference

Section 02670 for additional requirements related to cleaning and flushing.

J. Pressure Testing

1. All mains shall be tested for leakage. Water shall be supplied to the main and pumped to the required 150 psi pressure. The main tested shall either be isolated from presently potable lines or protected from leakage by a double valve arrangement.

2. SLCU shall be notified at least 48 hours in advance of any testing procedures. After flushing is completed, line pressure shall be applied to the complete water system to determine if any major defects are present. The complete water system shall then be tested at a pressure of 150 psi for a period of not less than two hours. SLCU may, at its discretion, increase the period to four hours. No visible movement of the systems shall occur and leakage shall not exceed:

$$L = \frac{N * D * \sqrt{P}}{7400}$$

Where L = Leakage in gallons
N = Number of joints in test section
P = Test pressure in psi
D = Diameter of pipe in inches

(For P = 150 p.s.i., L= ND (.001655))

3. Reference Section 02670 for additional requirements related to pressure testing.

K. Disinfection and Bacteriological Testing

1. After pressure testing, the complete water system shall be chlorinated to achieve a minimum combined chlorine residual of at least 50 parts per million. The chlorine solution shall remain in the water system for at least 24 hours. The complete water system shall then be flushed to remove the strong chlorine solution.

2. Test samples for bacterial analysis shall be taken by SLCU. A charge of $25.00 per sample will be made if retesting is required through no fault of SLCU.

3. Reference Section 02670 for additional requirements related to disinfection and bacteriological testing.

*** * END OF SECTION * ***