SECTION 33 10 00

WATER UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Water main pipe, hydrants, valves, fittings, and miscellaneous appurtences.

B. Related Section
1. Section 31 23 00 – Excavation and Fill
2. Section 33 05 05 – Trenching and Backfilling
3. Section 33 05 17 – Adjust Miscellaneous Structures

1.02 REFERENCES

A. American Society of Testing Materials (ASTM)
1. A48 – Gray Iron Castings.
2. A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings
3. A307 – Carbon Steel Bolts and Studs, 60,000-PSI Tensile Strength
4. A536 – Standard Specification for Ductile Iron Castings.
5. A674 – Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
6. C578 – Specification for Rigid, Cellular Polystyrene Thermal Insulation.
7. D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC) Compounds.
8. F477 – Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

B. American Water Works Association (AWWA):
1. C116 – American National Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
2. C153 – American National Standard for Ductile-Iron Compact Fittings for Water Service.
3. C504 – AWWA Standard for Rubber-Seated Butterfly Valves.
4. C515 – AWWA Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
5. C550 – American National Standard for Protective Interior Coatings for Valves and Hydrants.
6. C600 – AWWA Standard for Installation of Ductile-Iron Water Main and Their Appurtenances.
7. C651 – AWWA Standard for Disinfecting Water Mains.

8. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inches through 12 inches, for water distribution.

1.03 SUBMITTALS

A. Submittals shall conform to Section 01 33 00. Submit Product Data for the following items:
   1. Pipe, fittings, valves, and hydrants.
   2. Joint restraint and corrosion resistant coatings.
   3. Tracer wire.

1.04 SEQUENCING AND SCHEDULING

A. Notify the City a minimum of 48 hours prior to performing Work. Contractor is responsible to notify the City Fire Department of the intended shutdown.

B. Notify all customers connected to water system to be shut down 48 hours in advance of shut down.

C. City will open and close existing valves.

D. Successfully complete required test and inspections before restoration of surface.

PART 2 PRODUCTS

2.01 BOLT ASSEMBLIES

A. Tee-Head Bolts
   1. General: Shall be Stainless Steel conforming to requirements of ASTM F593 and ASTM F594, Alloy Group 1, 2, or 3.

B. Stainless Steel Bolts
   1. General: Conform to requirements of ASTM F593 and ASTM F594, Alloy Group 1, 2, or 3.
   2. Approved for use as exterior bolts for hydrants and gate valves.

2.02 POLYVINYL CHLORIDE (PVC) PLASTIC PIPE AND FITTINGS

A. General: Pipe shall be made of compounds conforming to ASTM D1784 in accordance with the material requirements of AWWA C900 (4 inch to 12 inch diameter pipe).

B. Design: Cast-iron-pipe-equivalent outside diameter.

C. Joints: Integral bell with elastomeric gasket joints providing a water-tight seal conforming to ASTM F477.

D. Fittings: Conform to Ductile Irion Pipe (DIP) and Fittings specified in this Section.

E. Marking: Conform to AWWA C900

2.03 HYDRANT

A. General Requirements: AWWA Standard C502

B. Shall be Waterous, Pacer, or approved equal.

C. Two 2-1/2 inch hose connections.

D. One 4-1/2 inch pumper connection.

E. National standard operating nut.

F. 5-inch valve opening.

G. 6-inch mechanical joint pipe connection.

H. Break-off flange with breakable rod coupling.

I. 8’-0” cover.

J. Centerline of the nozzles shall be 27 to 33 inches above finish grade.

K. Hydrants shall be set on a concrete pad six inches thick and eighteen inches square.

L. Base of hydrants shall be surrounded by ten cubic feet of crushed rock to take up water from drip valves.

2.04 GATE VALVE AND BOX

A. General Requirement: AWWA C515

B. Non-rising stem (NRS), opening by turning counter clockwise, 2 inches square operating nut.

C. O-ring seals.

D. Mechanical joint ends conforming to AWWA C111/A21.11.

E. Exterior Bolt Assemblies: Conform to Paragraph 2.01 – Bolt Assemblies.

F. All internal and external surfaces of the valve body and bonnet shall have a fusion bonded epoxy coating complying with ANSI/AWWA C550 and C116/A21.16

G. Valve Boxes
   1. 3-piece, ductile iron.
   2. Adjustable for 8 foot depth of cover.
   3. Valve and box considered as integral units.
   4. 5-1/4 inch diameter shafts.
   5. "Stay put" type drop covers, "WATER" on top with extended skirts.

2.05 BUTTERFLY VALVE AND BOX

A. General Requirement: AWWA C504.

B. Mechanical joint valve ends conforming to AWWA C111/A21.11

C. AWWA C504 Class 150B valve shaft diameter

D. Valve Body: High strength cast iron conforming to ASTM A126, Class B.

E. Valve Vane: High-strength cast iron conforming to ASTM A48, Class 40, rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel self-locked screws.

F. O-ring seal.

G. Exterior Bolt Assemblies: Conform to paragraph 2.01 – Bolt Assemblies.

H. Operator
   1. Traveling nut type sealed, gasketed, and lubricated for underground service.
   2. Open counter clockwise
   3. 2 inch square operating nut.

I. Valve Box
   1. 3-piece, ductile iron.
   2. Adjustable for 7-1/2 foot depth of cover.
   3. Valve and box considered as integral units.
   4. 5-1/4 inch diameter shafts.
   5. "Stay put" type drop covers, "WATER" on top with extended skirts.

2.06 JOINT RESTRAINT

A. Mechanical Joint Restraint: Not allowed on existing cast iron pipe.
   1. Ductile iron conforming to ASTM A 536
   2. Working Pressure: Minimum 250 psi
   3. EBAA Iron, Inc. Megalug, Star Pipe Strargrip, or approved equal.
   4. Casting body and wedge assemblies coating.
      a. Fusion bonded epoxy per ANSI/AWWA C116/A2.

B. Tie Rods: ¾ inch diameter rods stainless steel.

2.07 INSULATION

A. Polystyrene Insulation: Extruded type conforming to ASTM C578, Type VI, VII or V.

2.08 TRACER WIRE

A. Conform to the applicable requirements of NEMA WC3, WC5, and WC7.

B. Shall be Underwriters Laboratories (UL) listed for use in direct burial applications (e.g. USE, UF, or tracer wire).

C. Conductor: Minimum No. 12 AWG Solid Core Copper Tracer Wire rated to 30 volts.

D. Magnetized Tracer Boxes: Snake Pit Magnetized Tracer Box, www.copperheadwire.com, or approved equal.
   1. Lite Duty XL Box: For use in turf areas.
   2. Concrete/Driveway Box: For use in concrete driveway.

2.09 CORPORATION STOP

A. Conform to the requirements of Section 33 12 12.

2.10 WATER SERVICE PIPE

A. Conform to the requirements of Section 33 12 12.

PART 3 EXECUTION

3.01 PREPARATION

A. Conform to the requirements of Section 33 05 05.

3.02 PIPE INSTALLATION

A. Install pipe and fittings in accordance with the manufacturer's instructions and with the details shown on the Drawings.

B. Permanently support, remove, relocate, or reconstruct existing utility pipes, cables, structures, or other appurtenances when they obstruct the line, grade, or location of the pipe or appurtenance.

C. Remove all dirt and foreign matter from the inside of pipe.

D. All jointing of mechanical joint pipe and push-on joint pipe in accordance to AWWA C600.

E. Outside of the spigot and the inside of the bell, wire brush, wipe clean and dry. Keep pipe ends clean until joints are made.

F. Lay and maintain pipe and appurtenances to the alignment, grade, and location shown on the Drawings. No deviation from the Drawing alignment, grade, or location is allowed, unless approved by the Engineer. No pipe shall be laid in water or when the trench conditions are unsuitable for such work.

G. Precautions shall be taken to prevent debris or groundwater from entering the pipe being laid.

3.03 INSTALLATION OF HYDRANT

A. Location as shown on Drawings.

B. Set on 8-inch concrete block, or approved equal concrete base.

C. Brace according to Drawings.

D. After each hydrant has been set, place around the base of the hydrant not less than 1 cubic yard of course filter aggregate. Carefully place 2 layers of polyethylene, minimum 4 mm thickness each, over the rock to prevent backfill material from entering voids in the drain rock.

E. Maintain hydrants in a plumb position during the backfilling operation.

F. Attach a fiberglass marker to the hydrant using an existing flange bolt located at the back of the hydrant.

3.04 INSTALLATION OF VALVE

A. Set and joint valves to new pipe in the manner as specified for cleaning, laying, and jointing pipe.

B. Valves and boxes shall be supported on an 8-inch concrete block as shown on the Drawings.

C. Maintain valve box centered and plumb over the operating nut of the valve.

D. Set top of valve box flush with the existing surface to provide 12 inches of upward adjustment.

3.05 ANCHORAGE

A. Restrain all bends and fitting with mechanical joint restraints and poured in place thrust blocking.

3.06 POLYETHYLENE ENCASEMENT

A. All ductile iron pipe, valves, valve boxes, fittings and appurtenances, shall be fully encased in polyethylene film of 8 mil nominal thickness.

B. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, off-sets, etc.

C. Sheet film shall be provided and used for encasing all odd-shaped appurtenances such as valves, tees, crosses, etc.

D. Encasement shall be held in place with adhesive tape.

E. Any rips or punctures shall be repaired by placing additional encasement.

F. Polyethylene encasement shall not be installed below a point 6 inches above the drain outlet of hydrants.

3.06 INSULATION

A. Review insulation installation with Engineer.
   1. Place insulation between water pipe and sanitary pipe when water main or service is within 1 foot above or below the sanitary pipe.
   2. Place insulation between storm sewer pipe and water main or water service when pipes are separated by less than 2 feet.

3.07 TRACER WIRE

A. Attach to bolt on break off flange of all hydrants, valves, and curb stops. Contractor will furnish and install cast bronze ground clamp to be installed on curb stop just below the cap on the standpipe.

B. Attach to magnetized tracer box per manufacturer's specifications.
   1. Seal tracer wire leads and brass wire harness per manufacturer's specifications.

C. All joined splices and connections shall be fully enclosed using a 3M brand Scotchfil Electrical Insulation Putty, or approved equal.

D. Splices shall not be more frequent than 1 splice per 250 feet.

E. Tracer wire shall be laid below all pipe, fittings, and hydrants.

3.08 TEMPORARY WATER SERVICE

A. On projects where watermain is being replaced, install and maintain temporary water service to all homes, apartments, and/or businesses as shown on the Drawings.
   1. Submit a detailed temporary water service plan to the City for approval. The temporary water service plan shall be approved a minimum 2 weeks prior to installation of the temporary water service system. Coordinate connections and service interruptions with the property owners, Owner and Engineer 72 hours in advance.
   2. The temporary service shall provide adequate volume and pressure to the properties.
   3. Use a minimum of 3 inch diameter main line and ¾-inch service line. The Contractor shall perform a pressure test and bacteria test on all temporary water lines prior to making any connections to homes or terminating existing water service.
   4. The Contractor shall install any main line valves that may be required to shut off or isolate an area based on the Contractors schedule of work or temporary water system. All valves installed shall be installed in their permanent location as shown on the Drawings per the new water main location.
   5. Coordinate all Work with the City. If staging of the temporary system is necessary, provide a schedule and description of how this is to be accomplished.
   6. Provide ramping and/or shallow trenching at street and driveway crossings.
   7. Provide emergency contact information for evenings and weekends.
   8. Maintain, inspect, and adjust the temporary piping as needed or directed throughout the construction.

3.09 PIPE CONFLICTS

A. Shall apply to any crossings under existing cast iron pipe and any pipe conflicts where a minimum clear separation 1 foot is not possible.

B. Cut the water main beyond the proposed sewer trench wall.

C. Remove the abandoned water main and install offset as shown on the Drawings or as encountered during construction.

3.10 PROTECTION

A. Existing valves and hydrants shall be operated by the City.

B. Securely plug all water main openings promptly before suspension of Work at any time to prevent earth or other substances from entering the water main.

3.11 FIELD QUALITY CONTROL

A. Perform hydrostatic pressure, disinfection, and conductivity tests.
   1. The City will observe all tests and visually inspect final Work for compliance.

B. Hydrostatic Pressure Test
   1. Minimum Test Pressure: 150 psi.
   2. Test Duration: 2 hours.
   3. Criteria: No drop in pressure allowed.
   4. Testing Gauge: Liquid filled, 4-1/2 inch diameter, labeled in 1-psi increments, such as Ashcroft Model 1082, or approved equal.
   5. Test all lines, including hydrant leads, water services, and stubs.

C. Disinfection
   1. General Requirement: AWWA C651 – Disinfecting Water Mains (Tablet Method).
   2. Place hypochlorite tablets in each section of pipe and all appurtenances.
   3. The estimated number of tablets required per 20 foot length of pipe based on 3-1/4 grain available chlorine per tablet is as follows:

Diameter of Watermain	**No. of Tablets**
4 inches	1
6 Inches	2
8 Inches	3
10 Inches	4
12 Inches	5
16 Inches	9
18 Inches	12
20 Inches	14
24 Inches	20

4. Contractor shall use a Project specific number of tablets to disinfect water main for 24 hours with at least 50 ppm available chlorine, with a residual of at least 10 ppm throughout the length of the main at the end of the 24-hour period.
5. Flushing may begin after the chlorinated water has been allowed to disinfect the new pipe for 24 hours. Contractor shall schedule flushing with the City at least 24 hours in advance.
6. 1 bacteria test is required for every 2,000 feet of water main installed.

D. Continuity Test (PVC)
1. Test to be completed on the tracer wire after installation of all Project utilities.
2. Fill all lines prior to the test.
3. Test all lines including hydrant leads, water services, and stubs.
4. Test: Physically locate all pipes with use of an electronic utility locating device.