

## SECTION 33 14 13

### WATER DISTRIBUTION PIPING, VALVES, HYDRANTS, AND APPURTENANCES

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Section Includes Installation of:
  - 1. Pipe and fittings for public water mains and service connections.
  - 2. Valves, fire hydrants, blow offs, sampling stations, air release assemblies, and other water distributions appurtenances.
  
- B. Related Requirements:
  - 1. CFPUA Material Specification Manual (MSM).
  - 2. Section 03 05 00, Concrete.
  - 3. Section 09 91 00, Painting and Protective Coatings.
  - 4. Section 31 23 34, Excavating, Trenching, Dewatering and Backfilling.
  - 5. Section 33 01 12, Identification for Utilities Piping.
  - 6. Section 33 05 05.31, Hydrostatic Testing.
  - 7. Section 33 05 09.33, Thrust Restraint for Utility Piping.
  - 8. Section 33 05 13, Precast Concrete Manholes and Utility Structures.
  - 9. Section 33 14 14, Public Water Service Connections.
  - 10. Section 33 14 20, Disinfection of Water Pipelines, Facilities and Appurtenances.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
  
- B. American Society of Mechanical Engineers:
  - 1. ASME B16.1 – Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
  
- C. ASTM International:
  - 1. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
  - 2. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).
  - 3. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
  - 4. ASTM D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 5. ASTM D2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
  - 6. ASTM D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
  - 7. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

8. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
9. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association:

1. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray Iron Fittings.
7. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast.
8. AWWA C153 – Ductile-Iron Compact Fittings.
9. AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.
10. AWWA C502 – Dry-Barrel Fire Hydrants.
11. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
12. AWWA C512 – Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
13. AWWA C550 – Protective Interior Coatings for Valves and Hydrants.
14. AWWA C600 – Installation of Ductile-Iron Mains and Their Appurtenances.
15. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
16. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), for Water Transmission and Distribution.
17. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
18. AWWA C906 – Polyethylene Pressure Pipe and Fittings, 4-In. Through 65-In. for Waterworks.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-60 – Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Association:

1. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
2. NFPA 291 – Recommended Practice for Fire Flow Testing and Marking of Hydrants.

G. NSF International:

1. NSF 61 – Drinking Water System Components - Health Effects.
2. NSF 372 – Drinking Water System Components - Lead Content.

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Section 01 30 00, Administrative Requirements

- B. Coordination:
1. Coordinate Work of this Section with termination of water main connection at Site boundary, connection to CFPUA, and trenching.
  2. The existing system must be kept in operation at all times. Where connections are made to existing mains or other shutdowns are necessary, permission must be obtained and arrangements must be made with the CFPUA Distribution ORC, Utility Services Division for removing from service those mains that will be affected.
  3. No valves are to be operated unless a CFPUA representative is present. Any valves operated without a CFPUA representative present or a directive may be subject of penalties in accordance with CFPUA's ordinance.
  4. Notify CFPUA no less than two business days prior to an event requiring a CFPUA representative to be present.
  5. The Contractor shall, at least two business days in advance, notify citizens subject to interruption of service by means of door hangers or any other approved method of the starting time and duration of such interruption.

#### 1.4 SUBMITTALS

- A. Section 01 33 00, Submittals: Requirements for submittals.
- B. Product Data/Source Quality:
1. Manufacturer information regarding pipe, pipe fittings, valves, hydrants and appurtenances including component material, assembly and parts diagrams.
  2. Shop test results and inspection data, certified by manufacturer.
- C. Testing Procedures:
1. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER and CFPUA approval prior to commencing testing.
- D. Manufacturer Instructions:
1. Detailed instructions on installation requirements, including storage and handling procedures.
- E. Manufacturer's Certificate:
1. Certify that products meet or exceed specified requirements.
- F. Field Quality-Control Submittals:
1. Results of Contractor-furnished laboratory testing and field test results.

#### 1.5 CLOSEOUT SUBMITTALS:

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Project Record Documents:
1. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work.
  2. Record actual locations of piping mains, valves, hydrants, connections, thrust restraints, elevations, and other utilities found and not indicated on design plans.

- C. Operations and Maintenance Data:
  - 1. Furnish in operations and maintenance manuals complete data for materials in accordance with Section 01 60 00, Product Requirements.

## 1.6 QUALITY ASSURANCE

- A. Qualifications: Company specializing in manufacturing products specified in the CFPUA Materials Specification Manual.
  - 1. Cast manufacturer's name, pressure rating, and year of fabrication into valve body.
- B. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.
- C. Perform Work according to AWWA and PVC Pipe Association standards.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00, Product Requirements.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Block individual and stockpiled pipe lengths to prevent moving.
  - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
  - 4. Store PE and PVC materials out of sunlight.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## 1.8 SITE CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

## 1.9 WARRANTY

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Furnish 10-year manufacturer's warranty for valves.

## PART 2 PRODUCTS

### 2.1 CFPUA MATERIAL SPECIFICATION MANUAL

- A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

<b>MSM Section</b>	<b>Material</b>
A	Pipe
B	Fittings and Accessories
C	Joint Restraints
D	Valves and Accessories
E	Fire Hydrants
F	Service Saddles and Tapping Devices
I	Castings & Aluminum Access Covers
K	Miscellaneous
L	Electrical
M	Coatings and Sealants

## 2.2 MATERIALS & ACCESSORIES

- A. Bedding, Cover, and Backfill:
1. As specified in Section 31 23 34, Excavating, Trenching, Dewatering and Backfilling.
- B. Pipe Location Wire: As specified in Section 33 01 12, Identification for Utilities Piping.
- C. Thrust Restraints: As specified in Section 33 05 09.33, Thrust Restraint for Utility Piping.
- D. Service Connections: As specified in Section 33 14 14, Public Water Service Connections.
- E. Vaults and Utility Boxes: As specified in Section 33 05 13, Precast Concrete Manholes and Utility Structures.
- F. Fire Hydrant Drainage Gravel: Provide #57 Stone.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Identify project horizontal and vertical control points, establish easement and right-of-way lines, stakeout construction points for work and pipeline alignments, establish limits of disturbance.
- C. Determine exact location and size of water mains, valves, hydrants, and appurtenances from Drawings
- D. Verify location and elevation of existing facilities prior to excavation and installation of proposed interconnecting water mains, valves, and hydrants.

### 3.2 PREPARATION

- A. Section 01 35 00, Special Procedures.
  - 1. Pre-construction Site Audio/Video Inspections and Photography:
  - 2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
- B. Section 01 70 00, Execution and Closeout Requirements.
- C. All materials, unless otherwise directed, shall be unloaded as nearby as possible to the location of installation by the Contractor. Materials shall be handled with care to avoid damage.
- D. All materials found during the progress of work to have flaws, cracks, or other defects will be rejected by the Engineer regardless of whether or not it has been installed and shall be replaced by and at the expense of the Contractor.
- E. All PVC pressure pipe, upon delivery to the site and until such time as it is placed in the trench, shall be shielded from the weather and direct sunlight to prevent pipe deterioration.
- F. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surfaces, interior linings and components. If any part of the coating, lining or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer prior to attempting installation.
- G. Pipe Cutting:
  - 1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
  - 2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
  - 3. Grind edges smooth with beveled end for push-on connections.
- H. Remove scale and dirt on inside and outside before assembly.
- I. Prepare pipe connections to equipment with flanges or unions.

### 3.3 INSTALLATION

- A. Placement: As specified in Section 31 23 34, Trenching, Excavation, Dewatering and Backfilling.
  - 1. All mains shall be laid and maintained at the required lines and grades with fittings, valves and appurtenances at the described locations. All pipe shall be laid to the depth as shown on the drawings, or when a depth is not indicated, with a minimum cover of thirty-six (36) inches and a maximum of (60) inches below finished grade. Grade lines shall be set by the Contractor. Realignment must be approved by the Engineer. The Contractor shall have suitable survey equipment on the site at all times.

2. After placement in the trench the spigot end of the pipe shall be centered in the bell and the pipe shall be driven home and then brought to the proper line and grade by tamping approved backfill material under it, except for the bell. Joint deflection shall not exceed manufacturer's limit.
3. The Work shall at all times progress with caution so as to prevent damage to underground obstructions both known and unknown. Should an obstruction not shown on the drawings be encountered, the Engineer shall be immediately notified and he shall be responsible for alteration to the design should realignment be necessary. Notify the Engineer far enough in advance to allow the realignment to be accomplished by deflection in the pipe joints.

B. Pipe and Fittings:

1. Handle and assemble pipe according to manufacturer instructions.
2. Install pipe and fittings in strict conformance with AWWA C600.
3. Install plastic pipe in conformance with ASTM D2774 and recommended practices of the UNI-BELL Plastic Pipe Association.
4. Joint Deflection: Maximum joint deflection shall meet requirements of AWWA C600 or AWWA Manual of Practice M23.
5. Prevent foreign material from entering pipe during placement. Seal pipe openings with watertight plugs during Work stoppages using plugs designed for that purpose. If trench contains standing water in joining zone, plug shall remain in place until the trench has been pumped dry before proceeding pipe laying.
6. Allow for expansion and contraction without stressing pipe or joints.
7. Install access fittings to permit disinfection of water system performed under Section 33 14 20 – Disinfection of Water Distribution Mains.
  - a. Blowoffs shall be installed for pipe flushing, disinfection, and test sampling.
  - b. Blowoffs shall be located as follows:
    - 1) Dead ends.
    - 2) Stub-outs greater than one pipe section in length for future interconnecting mains.
    - 3) Valves closed against disinfection, flushing, and sampling.
  - c. Blowoff should be installed as follows:
    - 1) Opening pointing downward.
    - 2) Minimum 24-inches clearance between opening and ground for proper sampling.
8. Cover: Measure depth of cover from final surface grade to top of pipe barrel and record.
9. Jointing:
  - a. Fused HDPE:
    - 1) HDPE Pipe shall be joined by the butt-fusion process in accordance with pipe manufacturer's directions.
    - 2) Contractor shall provide butt-fusion technicians who are trained and certified by the HDPE pipe manufacturer to complete the project. The date of technician certification shall not exceed 12 months before commencing construction.
    - 3) Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure.

- 4) The internal and external beads resulting from the butt-fusion process shall be visible and examined for penetration 360 degrees around the pipe diameter.
  - 5) DI/HDPE Mechanical Joint Adaptors shall be ductile iron mechanical joint fittings per CFPUA Material Specification Manual and shall be joined to the HDPE pipe by a heat-fused joint on one end, and connected to a ductile iron pipe valve, or fitting with a mechanical joint on the other end.
  - 6) Solvent epoxy cementing, electro-fusion couplings and mechanical joining with bolt on wrap around clamps or mechanical joints without an adapter shall not be used for connections.
- b. Push-On Joints:
- 1) The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove dirt, grit, oil or excess coatings and other foreign matter. For ductile iron pipe, the gasket shall be flexed inward and inserted in the gasket recess of the bell socket.
  - 2) A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot ends, care will be taken to avoid contact with the ground.
  - 3) The joint shall be completed by forcing the plain end to the bottom of the socket with a forked tool or jacking device or other approved method. All pipe shall have depth mark prior to insertion. Pipe cut in the field shall be filed to resemble the spigot end of manufactured pipe.
  - 4) When deflection is required the joint shall be completed prior to setting the deflection. The deflection shall conform to applicable AWWA Standards or manufacturer's recommendation.
- c. Mechanical Joints:
- 1) The inside of the socket, the outside of the spigot end and the gland shall be thoroughly cleaned and or washed with an approved solution to remove dirt, grit, oil or excess coatings and foreign matter to improve gasket seating.
  - 2) The gland shall then be placed on the plain end of the pipe with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end of the pipe.
  - 3) The pipe shall be inserted into the socket and the gasket pressed firmly and evenly into the gasket recess. The joint shall be kept straight during the assembly and any deflection required shall be done after the joint has been assembled but prior to tightening the bolts.
- C. Valves:
1. Valves shall be set and joined to the pipe and each type of joint as specified for pipe.
  2. Cast iron valve boxes shall be firmly supported, maintained centered and plumb over the operating nut of the valve. Outside of paved areas, valve boxes shall be set in a 2' diameter x 6" thick concrete collar. The box cover shall be flush with the surface of the finished pavement. All water main valve box lids shall have the word "WATER" cast in the lid.
  3. All reasonable effort must be made to locate valves/valve boxes, back of curb, in grass areas and at street corners, whenever possible.
  4. Valve boxes in areas that will require sod at a later date must be left one to two inches above existing grade (to allow for sod thickness).



5. All valves must be centered over the operating nut/wheel and all valves, after being fully opened, will be backed off one-quarter turn to prevent them from being jammed open. This procedure should take place only after the main has passed pressure testing and has been certified by the Engineer.
  6. Should the operating nut be more than three feet below the final grade, an extension shall be supplied and installed by the Contractor. The extension shall bring the nut to within twelve (12) inches of final grade.
- D. Installing Valves on Existing Mains
1. When installing valves in existing mains (cutting-in), the Contractor shall insure that the pipe is kept clean at all times and no debris, ground water, mud, oil, etc., will make their way into the pipe.
- E. Installation of Tapping Sleeves and Valves
1. Install the tapping sleeve and valve and pressure test prior to making the tap.
  2. If leaks are present, the Contractor shall repair them to the satisfaction of the Engineer or Resident Project Representative.
  3. Complete the tapping operation and close tapping valve.
  4. Tapping valve shall not be opened until new main has been tested and certified for operation.
- F. Hydrants
1. Each hydrant shall be connected to the main with a 6-inch branch line.
  2. Hydrants shall be set with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18 inches above the finished surrounding grade and the operating nut not more than 48 inches above the finished surrounding grade.
  3. Set fire hydrants with safety flange not more than 6 inches and not less than 2 inches above grade.
  4. The hydrant shall be set in a bed of # 57 stone which shall surround the barrel at least 12 inches in all directions.
  5. Hydrants and tees (runs and branches) shall be restrained using field-applied restraint system per CFPUA MSM.
  6. Provide support blocking and drainage gravel while installing fire hydrants; do not block drain hole.
  7. After main-line pressure testing, flush fire hydrants and check for proper drainage.
- G. Thrust Restraints: As specified in Section 33 05 09.33, Thrust Restraint for Utility Piping.
1. New main construction shall be restrained by means of field or factory applied systems as shown on the Engineer drawings.
  2. Thrust blocks in new mains is prohibited except when directed by the Engineer.
  3. Where a fitting or device is to be inserted into an existing main, thrust blocking shall be installed as directed by the Engineer or CFPUA.
- H. Polyethylene (PE) encasement when indicated for ductile iron pipe and fittings:
1. Encase piping in PE as indicated on Drawings to prevent contact with surrounding soil material or insulation from adjacent cathodic protection system.
  2. Comply with AWWA C105.
  3. Where pipe exits ground, terminate encasement 3 to 6 inches above surface.

- I. Pipe Locator Wire: Install per Section 33 01 12, Identification for Utilities Piping.
- J. Service Connections: As specified in Section 33 14 14, Public Water Service Connections.
- K. Disinfection of Potable Water Piping Systems: As specified in Section 33 14 20, Disinfection of Water Distribution Mains.
- L. Pipe Markers: According to CFPUA Details and Material Specification Manual.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Section 33 05 05.31, Hydrostatic Testing.
  - 1. Pressure test piping system according to AWWA C600.
- C. Section 33 14 20, Disinfection of Water Pipelines, Facilities, and Appurtenances.
- D. Pigging – Flushing and Cleaning Alternative for Large Mains
  - 1. For mains where flowrates cannot be achieved to create minimum cleaning velocities of 2 feet per second or greater, cleaning of the new piping system by pigging methods shall be established for the project by the Engineer. Pigging includes the following measures:
    - a. Pig launching and retrieval equipment to minimize additional valves, fittings and auxiliary water supplies.
    - b. Valves and blowoff assemblies, which are installed as part of the project, shall be used as much as possible to minimize the number of temporary ports required for pigging.
    - c. Pig materials used shall be specifically manufactured for flushing and cleaning pressure pipes, bends and valves. The pigs shall be able to go through bends, open valves and fittings, and provide adequate cleaning of the pipe.
    - d. Pigging shall be accomplished by the controlled and pressurized passage of a series of hydraulic or pneumatic polyurethane plugs of varying dimensions, coatings, and densities.
    - e. Pigs shall be selected by the Contractor and approved by the Engineer.
    - f. The Contractor shall provide means to enter the pig into the system, control and regulate flow, monitor flows and pressures, and to remove the pig from the system.
    - g. The Contractor shall maintain constant surveillance of the pig while active in the pipe system and immediately report problems encountered or any malfunctions discovered in the piping system.

END OF SECTION