

SECTION 33 11 00

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Site water piping and fittings including domestic waterline and fire sprinkler system waterline including valves, fire hydrants and appurtanences.
- B. Connection of site water system to municipal water systems and testing.
- C. Utility line Detection tape

1.2 RELATED SECTIONS

- A. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities
- B. Local Governing Authority and Code Requirements
- C. Construction Drawings

1.3 PUBLIC WORK

- A. Comply with the City of Centerton, AR, standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for Public Utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

1.4 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers (ASME) latest edition
 - B 16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- B. American Society for Testing and Materials (ASTM) latest edition
 - B 88 Seamless Copper Water Tube
 - D 1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
 - D 2241 Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
 - D 2564 Poly(Vinyl Chloride) (PVC) Solvent Cement
 - D 2672 Poly(Vinyl Chloride) (PVC) Integrally Molded Bell Ends for Solvent-Cemented Pipe Joints
 - D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

33 11 00-1

- D 3139 Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals
- F 477 Elastomeric gaskets and lubricant
- F 656 Poly(Vinyl Chloride) (PVC) Cement Primer

C. American National Standards Institute (ANSI) latest edition
A21.8

D. American Water Works Association (AWWA) latest edition

- C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- C105 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
- C110/C153 Ductile-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
- C111 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- C151 Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- C500 Gate Valves for Water and Sewage Systems
- C502 Dry-Barrel Fire Hydrants
- C504 Rubber-Seated Butterfly Valves
- C508 Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS
- C509 Resilient-Seated Gate Valves for Water and Sewage Systems
- C600 Installation of Ductile-Iron Water Mains and Appurtenances
- C606 Grooved and Shouldered Joints
- C651 Disinfecting Water Mains
- C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

E. Underwriters Laboratories (UL) latest edition
246 Hydrants for Fire Protection Service

1.4 QUALITY ASSURANCE

- A. Perform installation in accordance with applicable utility company or municipality requirements.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Compaction testing of trench backfill shall be performed in accordance with Section 31 23 33.
- D. Water distribution system pipe installed below grade and outside building shall be tested in accordance with the following procedures:
 - 1. Perform testing of pipe materials, joints, and other materials incorporated into construction of water mains and force mains to determine leakage and watertightness. Pressure pipeline shall be tested in accordance with Section 4 of AWWA C600. In event state or local code requires more stringent test, the more stringent shall apply.

2. Pressure Test:

After pipe has been laid, newly laid pipe or valved section thereof shall be subjected to hydrostatic pressure of at least 1.5 times working pressure at point of testing and not less than 1.25 times working pressure at highest point along test section.

3. Leakage Test:

Leakage test shall be conducted concurrently with pressure test. Leakage is defined as quantity of water that must be supplied into newly laid pipeline or valved section thereof to maintain pressure within 5 psi of specified test pressure after air in pipeline has been expelled and pipeline has been filled with water. Leakage shall not be measured by drop in pressure in test section over period of time.

No pipeline installation will be accepted if leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133200}$$

L = allowable leakage, (gallons per hour)

S = length of pipe tested, (feet)

D = nominal diameter of pipe, (inches)

P = average test pressure during test, (psig)

4. Visible Leakage:

Visible leaks shall be repaired regardless of amount of leakage measured.

5. Acceptance of Installation:

If test of pipe laid in place discloses leakage greater than that specified, Contractor shall, at his own expense, locate leak and make repairs as necessary until leakage is within specified allowance.

Supply water for testing at no expense to Owner.

1.5 SUBMITTALS

- A. Product Data: Provide submittal data on pipe materials, pipe fittings, hydrants, valves, and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed state or local requirements.
- C. Furnish 1 copy of results of leakage test and pressure test to the Owner or his designated representative and utility company upon completion of water distribution backfilling operations.

1.6 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.

33 11 00-3

- B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

PART 2 PRODUCTS

2.1 PIPE

- A. Pipe sizes less than 3-in. that are installed below grade and outside building shall comply with one or combination of following:
 - 1. Water piping buried **beyond 5 feet** of building perimeter:
 - a. Seamless Copper Tubing: Type "K" soft copper to comply with ASTM B 88 and installed with wrought copper (95-5 Tin Antimony solder joint) fittings in accordance with ASME B 16.22.
 - b. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall conform to ASTM D 2241 with SDR 21 rating and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 1784 material classification. Pipe joints using solvent cement shall be integrally molded bell ends in accordance with ASTM D 2672. Cement primer shall comply with ASTM F656 and solvent cement shall comply with ASTM D2564.
 - 2. Water Piping buried **within 5 feet** of building
 - a. Copper Pipe: ASTM B 42, hard drawn.
 - i. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - ii. Joints: AWA A5.8, BCuP silver braze.
- B. Pipe sizes 3-in. and larger that are installed below grade and outside building shall comply with one or a combination of the following:
 - 1. Ductile Iron Water Pipe: In accordance with AWWA C151, pressure class 150 or greater. Fittings shall be either mechanical joint, push-on joint or locked-joint complying with AWWA C110 or AWWA C153. Elastomeric gaskets and lubricant shall comply with ASTM F477 or AWWA C111.
 - 2. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall meet the requirements of AWWA C900, rated DR 18 (Class 150). Pipe shall be continually marked as required for smaller pipes. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3139. Elastomeric gaskets and lubricant shall comply with ASTM F477 or AWWA C111.

2.2 GATE VALVES - 3 inch and Larger

- A. Manufacturers:
Resilient Seat Gate Valves by American-Darling, Mueller or approved equal.
- B. AWWA C500, Ductile Iron body, non-rising stem with square nut, resilient seat, mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

2.3 BALL VALVES - Smaller than 3 inch

- A. Manufacturers:
Mueller Oriseal or approved equal.
- B. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

2.4 BUTTERFLY VALVES - 3 inch and larger.

- A. AWWA C504, Ductile Iron body, bronze or heat treated ductile iron disc, resilient replaceable seat, mechanical joint ends, infinite position lever handle.

2.5 CHECK VALVES - 3 inch and larger.

- A. AWWA C 508, Ductile Iron body, mechanical joint ends

2.6 POST INDICATOR VALVES - From 4-in. to 14-in.

- A. F-5760 and/or NFPA 13 or local codes, whichever is more stringent.

2.7 BACKFLOW PREVENTORS - Comply with applicable local code and/or NFPA 24

2.8 FIRE HYDRANTS

- A. Fire Hydrants: Type as required by utility company and as shown on Construction Drawings.
- B. Hydrant Extensions: Fabricate in multiples of 6-in. with rod and coupling to increase barrel length.
- C. Hose and Steamer Connections: Match size and thread as required by applicable utility company, with two hose nozzles and one pumper nozzle.
- D. Finish: Apply primer and 2 coats of enamel or special coating of color as required by applicable utility company.

2.9 DETECTION TAPE

- A. Provide metallic detection tape installed approximately 12" above pipe installed on site outside of building footprint. Tape shall be continuous and be marked indicating water line.

2.10 ACCESSORIES

33 11 00-5

- A. Thrust Blocking: Place 2,500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil. Refer to applicable detail on construction drawings for requirements.
- B. Locked or restrained joint fittings can be installed in lieu of thrust blocking requirements where vertical changes in direction are required if approved by governing authority.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

- A. Ream pipe ends and remove burrs prior to assembly.
- B. Remove scale and dirt, on inside and outside, prior to assembly.
- C. Prepare and properly align pipe for connections to equipment.
- D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 BEDDING

- A. Excavate pipe trench and place bedding material in accordance with Section 31 23 33.

3.4 INSTALLATION - PIPE AND FITTINGS

- A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes.
- B. Install pipe and fittings in accordance with AWWA C600.
- C. Install pipe to allow for expansion and contraction without stressing pipe or joints as specified by pipe manufacturer.
- D. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

- E. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions that cause the least interference with the operation of existing pipeline and in compliance with local utility company requirements.
- F. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.
- G. Establish elevations of buried piping in accordance with Section 31 23 33.
- H. Backfill trench in accordance with Section 31 23 33

3.5 INSTALLATION - VALVES AND HYDRANTS

- A. Install gate valves as indicated on Construction Drawings and supported on concrete pads with valve stem vertical and plumb. Install valve boxes in manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.
- B. Install fire hydrant assemblies where and as indicated on Construction Drawings in vertical and plumb position with steamer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to street, roadway, or parking lot drive or toward protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly brace on side opposite inlet pipe against undisturbed soil and concrete thrust blocking. Place a minimum of 6 cu. ft of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Exercise care when backfilling and compacting so proper vertical position will not be altered.

3.6 DISINFECTION OF WATER PIPING SYSTEM

- A. Disinfect distribution system with chlorine before acceptance for domestic operation. Amount of chlorine shall be such as to provide dosage of not less than 50 parts per million. Thoroughly flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours, system shall be flushed with clean water until residual chlorine content is not greater than 1.0 part per million. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriologically test in accordance with AWWA C651. Do not place distribution system in service until approval is obtained from local governing authorities.

3.7 SERVICE CONNECTIONS

- A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventor if required and water meter with by-pass valves and sand strainer.

END SECTION

33 11 00-7