

## **SECTION 33 10 00**

### **WATER UTILITIES**

#### **PART I - GENERAL**

##### **1.1 DESCRIPTION**

- A. This section specifies materials and procedures for construction of underground water distribution for domestic and/or fire supply systems outside the building that are complete and ready for operation. This includes piping, structures, appurtenances and all other incidentals.

##### **1.2 RELATED WORK**

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- B. Concrete: Section 03 30 00, CAST IN-PLACE CONCRETE.
- C. Fire Protection System connection: Section 21 12 00, FIRE-SUPPRESSION STANDPIPES.
- D. General plumbing: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- F. Erosion and Sediment Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

##### **1.3 DEFINITIONS**

- A. Water distribution system: Pipelines and appurtenances which are part of the distribution system outside the building for potable water and fire supply.
- B. Water service line: Pipeline from main line to 5 feet outside of building.

##### **1.4 ABBREVIATIONS**

- A. PVC: Polyvinyl chloride plastic.
- B. DI: Ductile iron pipe.
- C. WOG: Water, Oil and Gas.

##### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Ensure that valves are dry and internally protected against rust and corrosion. Protect valves against damage to threaded ends and flange faces.

- B. Use a sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- C. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- D. Protect stored piping from moisture and dirt by elevating above grade. Protect flanges, fittings, and specialties from moisture and dirt.
- E. Store plastic piping protected from direct sunlight and support to prevent sagging and bending.
- F. Cleanliness of Piping and Equipment Systems:
  - 1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
  - 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.

#### **1.6 COORDINATION**

- A. Coordinate connection to water main with Public Utility company.
- B. Coordinate water service lines with building contractor.

#### **1.7 QUALITY ASSURANCE:**

- A. Products Criteria:
  - 1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
  - 2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least three years. Digital electronic devices, software and systems such as controls, instruments or computer work stations shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years.
- C. Regulatory requirements:
  - 1. Comply with the rules and regulations of the public utility company having jurisdiction over the connection to public water lines and the extension and/or modifications to public utility systems.

2. Comply with the rules and regulations of the Federal and/or Local Health Department..
  3. Comply with rules and regulations of Federal and/or Local authorities having jurisdiction for fire-suppression water-service piping including materials, hose threads, installation and testing.
- D. Provide certification of factory hydrostatic testing of not less than 500 psi (3.5 MPa) in accordance with AWWA C151. Piping materials shall bear the label, stamp or other markings of the specified testing agency.
- E. Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
  2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
  3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
  4. All welds shall be stamped according to the provisions of the American Welding Society.
- F. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Resident Engineer prior to installation.
- G. Applicable codes:
1. Plumbing Systems: IPC, International Plumbing Code.
  2. Electrical components, devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.
  3. Fire-service main products shall be listed in the FM Global "Approval Guide" or Underwriters Laboratories (UL) "Fire Protection Equipment Directory".

## **1.8 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI):
- MSS SP-60-2004 Connecting Flange Joint Between Tapping Sleeves and Tapping Valves

MSS SP-108-2002 Resilient-Seated Cast Iron, Eccentric Plug Valves

MSS SP-123-1998(R2006) Non-Ferrous Threaded and Solder-Joint  
Unions for Use With Copper Water Tube

C. American Society of Mechanical Engineers (ASME):

A112.1.2-2004 Air Gaps in Plumbing Systems (for Plumbing Fixtures  
and Water-Connected Receptors))

A112.6.3-2001 Floor Drains

B16.1-2010 Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125,  
250

B16.18-2001 Cast Copper Alloy Solder Joint Pressure Fittings

B16.22-2001 Wrought Copper and Copper Alloy Solder Joint Pressure  
Fittings

B16.24-2006 Cast Copper Alloy Pipe Flanges and Flanged Fittings;  
Classes 150, 300, 600, 900, 1500 and 2500

B31 Code for Pressure Piping Standards

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

A36/A36M-08 Carbon Structural Steel

A48/A48M-08(2008) Gray Iron Castings

A536-84(2009) Ductile Iron Castings

A674-10 Polyethylene Encasement for Ductile Iron Pipe for Water or  
Other Liquids

B61-08 Steam or Valve Bronze Castings

B62-09 Composition Bronze or Ounce Metal Castings

B88/B88M-09 Seamless Copper Water Tube

C651-05 Disinfecting Water Mains

C858-10e1 Underground Precast Utility Structures

D1785-06 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80,  
and 120

D2239-03 Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on  
Controlled Inside Diameter

D2464-06 Threaded Poly (Vinyl Chloride) PVC Pipe Fittings, Schedule  
80

D2466-06 Poly (Vinyl Chloride) (PVC) Pipe Fittings, Schedule 40

D2467-06 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule  
80

- D2609-02(2008) Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
- D3350-10a Polyethylene Plastics Pipe and Fittings Materials
- F714-10 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- F1267-07 Metal, Expanded, Steel
- E. American Water Works Association (AWWA):
  - B300-10 Hypochlorites
  - B301-10 Liquid Chlorine
  - C104-08 Cement–Mortar Lining for Ductile Iron Pipe and Fittings
  - C105/A21.5-10 Polyethylene Encasement for Ductile Iron Pipe Systems
  - C110-08 Ductile Iron and Gray-Iron Fittings
  - C111/A21.11-07 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
  - C115/A21.11-11 Flanged Ductile Iron Pipe with Ductile Iron or Gray-Iron Threaded Flanges
  - C151/A21.51-09 Ductile Iron Pipe, Centrifugally Cast
  - C153/A21.53-11 Ductile Iron Compact Fittings for Water Service
  - C502-05 Dry-Barrel Fire Hydrants
  - C503-05 Wet-Barrel Fire Hydrants
  - C504-10 Rubber-Seated Butterfly Valves
  - C508-09 Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS
  - C509-09 Resilient-Seated Gate Valves for Water Supply Service
  - C510-07 Double Check Valve Backflow Prevention Assembly
  - C511-07 Reduced-Pressure Principle Backflow Prevention Assembly
  - C512-07 Air Release, Air/Vacuum and Combination Air Valves
  - C550-05 Protective Interior Coatings for Valves and Hydrants
  - C600-10 Installation of Ductile Iron Mains and Their Appurtenances
  - C605-11 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
  - C606-11 Grooved and Shouldered Joints
  - C651-05 Disinfecting Water Mains
  - C700-09 Cold-Water Meters, “Displacement Type,” Bronze Main Case

- C800-05      Underground Service Line Valves and Fittings
- C900-09      Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
- C906-07      Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 64 In. (1,600 mm), for Water Distribution and Transmission
- C907-04      Injection-Molded PVC Pressure Fittings, 4 Inch through 12 Inch (100 mm through 300 mm), for Water Distribution
- M23-2nd Ed. PVC Pipe, Design and Installation
- M44-2nd Ed. Distribution Valves: Selection, Installation, Field Testing and Maintenance
- F.      National Fire Protection Association (NFPA):
  - NFPA 24-2010 Ed. Installation of Private Fire Service Mains and Their Appurtenances
  - NFPA 1963-2009 Ed.      Fire Hose Connections
- G.      NSF International (NSF):
  - NSF/ANSI 14 (2013)      Plastics Piping System Components and Related Materials
  - NSF/ANSI 61-2012 Drinking Water System Components - Health Effects
  - NSF/ANSI 372-2011      Drinking Water System Components – Lead Content
- H.      American Welding Society (AWS):
  - A5.8/A5.8M-2004      Filler Metals for Brazing and Braze Welding
- I.      American Society of Safety Engineers (ASSE):
  - 1003-2009      Water Pressure Reducing Valves
  - 1015-2009      Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies
  - 1020-2004      Pressure Vacuum Breaker Assembly
  - 1047-2009      Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies
  - 1048-2009      Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies
  - 1060-2006      Performance Requirements for Outdoor Enclosures for Fluid Conveying Components
- J.      Underwriters' Laboratories (UL):
  - 246      Hydrants for Fire-Protection Service

- 262 Gate Valves for Fire-Protection Service
- 312 Check Valves for Fire-Protection Service
- 405 Fire Department Connection Devices
- 753 Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service
- 789 Indicator Posts for Fire-Protection Service
- 1091 Butterfly Valves for Fire-Protection Service
- 1285 Pipe and Couplings, Polyvinyl Chloride (PVC), and Oriented Polyvinyl Chloride (PVCO) for Underground Fire Service

## **1.9 WARRANTY**

- A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of one year from final acceptance. Further, the Contractor will furnish all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF/ANSI 61 or NSF 372.
- B. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended.

### **2.2 FACTORY-ASSEMBLED PRODUCTS**

- A. Standardization of components shall be maximized to reduce spare part requirements. The contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

### **2.3 SAFETY GUARDS**

- A. All equipment shall have moving parts protected to prevent personal injury. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gauge sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 1/4 inch (6 mm) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.

### **2.4 LIFTING ATTACHMENTS**

- A. Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

## **2.5 DUCTILE IRON PIPE AND FITTINGS**

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated, 350 psi (2400 kPa).
  - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Flanged Ductile Iron Pipe: AWWA C115/A21.11, with factory applied screwed long hub flanges.
  - 1. Flanges: ASME B16.1 for 250 psi (1725 kPa) pressure ratings, as necessary.
  - 2. Wall Sleeve Castings, size and types shown on the drawings, shall be hot dipped galvanized per ASTM A123.
  - 3. Pipe and fittings exposed to view in the finished work are to be painted in accordance with Section 09 91 00, PAINTING. Pipe shall be shop primed with one coat of rust inhibitive primer. Final paint color shall match the final wall color.
  - 4. Exterior Pipe Coating: The exterior of pipe shall have the standard asphaltic coating.

## **2.6 POLYVINYL CHLORIDE PIPE AND FITTINGS**

- A. PVC, Schedule 40 Pipe: ASTM D1785.
  - 1. PVC, Schedule 40 Socket Fittings: ASTM D2466.
- B. PVC, Schedule 80 Pipe: ASTM D1785.
  - 1. PVC, Schedule 80 Socket Fittings: ASTM D2467.
  - 2. PVC, Schedule 80 Threaded Fittings: ASTM D2464.
- C. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.
  - 1. Comply with UL 1285 for fire-service mains if indicated.
  - 2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.



4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - a. Gaskets: AWWA C111, rubber.
5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

## 2.7 COPPER TUBE AND FITTINGS

- A. Soft Copper Tubing: ASTM B88, Type K water tube, annealed temper.
- B. Hard Copper Tubing: ASTM B88, Type K water tube, drawn temper.
- C. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper alloy, solder joint pressure fittings.
- D. Brazing Alloy: AWS A5.8/A5.8M, Classification BCuP.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder joint ends. ASME B16.24, Class 300 flanges if required to match piping.
- F. Copper Unions: ANSI MSS SP-123, cast copper alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

## 2.8 VALVES

- A. Gate Valves: AWWA C509, Non-rising Stem, Resilient Seat, 200 psi (1380 kPa).
  1. Valves 3 inches (75 mm) and larger: Resilient seat valve with gray- or ductile iron body and bonnet; cast iron or bronze double-disc gate; bronze gate rings; non-rising bronze stem and stem nut.
  2. Interior and exterior coating: AWWA C550, thermo-setting or fusion epoxy.
  3. Underground valve nut: Furnish valves with 2 inch (50 mm) nut for socket wrench operation.
  4. Aboveground and pit operation: Furnish valves with hand wheels.
  5. End connections shall be mechanical joint match main line pipe.
- B. Gate Valve Accessories and Specialties
  1. Tapping-Sleeve Assembly: ANSI MSS SP-60; sleeve and valve to be compatible with the drilling matching.
    - a. Tapping Sleeve: Ductile Iron or Stainless-Steel, two-piece bolted sleeve. Sleeve to match the size and type of pipe material being tapped.

- b. Valve shall include one raised face flange mating tapping-sleeve flange.
  2. Valve Boxes: AWWA M44 with top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel.
  3. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut. (Provide two wrenches for Project.)
  4. Indicator Posts: UL 789, FMG approved, vertical-type, cast iron body with operating wrench, extension rod, and adjustable cast iron barrel of length required for depth of burial of valve.
- C. Swing Check Valves:
  1. Valves smaller than 2 inches (25 mm): ASTM B61, resilient seat, bronze body and bonnet, pressure rating of 200 psi (1380 kPa). Ends to match main line piping.
  2. Valves 2 inches (25 mm) or larger: AWWA 508, resilient seat valve with iron body and bonnet, pressure rating of 200 psi (1380 kPa).
  3. Coating: AWWA C550, fusion epoxy coated.
- D. Butterfly Valves
  1. Rubber-Seated Butterfly Valve: AWWA C504.
    - a. Provide rubber seated butterfly valve cast or ductile iron body, flanged, minimum pressure of 150 psi (1035 kPa).
  2. UL Butterfly Valve: UL 1091 and FMG approved.
    - a. Provide metal on resilient material seating butterfly valves that are UL 1091 and FMG approved, castor ductile iron body flanged minimum pressure of 175 psi (1207 kPa).
- E. Plug Valves: ANSI MSS SP-108, resilient-seated eccentric plug valve, minimum pressure of 175 psi (1207 kPa).
- F. Corporation Valves and Curb Valves
  1. Curb Valves: AWWA C800, bronze body, ground-key plug or ball, wide tee head, with inlet and outlet matching service piping material, minimum pressure of 200 psi (1375 kPa).
  2. Service Boxes for Curb Valves: AWWA M44, cast iron telescoping top section; plug shall include lettering "WATER"; bottom section with base that fits over curb valve.
  3. Shutoff Rods: Steel, tee-handle with one pointed end. Stem length shall extend 2 feet (600 mm) above top of valve box for operation of deepest buried valve, with slotted end matching curb valve.

## 2.9 CONCRETE VAULTS

- A. Precast, reinforced-concrete vault: ASTM C858, designed for AASHTO H20-44 load designation.
  - 1. Ladder: ASTM A36, steel or polyethylene-encased steel steps.
  - 2. Drain: ASME A112.6.3, cast iron floor drain with outlet. Include body anchor flange, light-duty cast iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.
  - 3. Manhole Frame and Cover: ASTM A48, Class No. 35A minimum tensile strength, 24 inch (610 mm) minimum diameter, unless otherwise indicated.
  - 4. Manhole Frame and Cover: ASTM A536, Grade 60-40-18, ductile iron, 24 inch (610 mm) minimum diameter, unless otherwise indicated.

## 2.10 FIRE HYDRANTS

- A. All hydrants shall have removable interiors capable of replacement without digging up the hydrant and be packable under pressure. Threaded joints or spindles shall be bronze and upper and lower barrels shall be of equal diameter. Upper barrel shall be of sufficient length to permit setting hydrant with barrel flange not more than 4 inches (100 mm) above finished grade. All fire hydrants shall have 6 inch (150 mm) bottom connection. Provide of hydrant wrenches not less than 14 inches (350 mm) long. Pressure Rating: 250 psi (1725 kPa). Hydrant valve shall open by turning operating nut to left or counterclockwise. Exterior finish shall be red alkyd-gloss enamel paint, unless otherwise indicated. Outlet threads shall meet NFPA 1963, with external hose thread used by local fire department. Include cast iron caps with steel chains and Pentagon, 1-1/2 inch (38 mm) point to flat operating and cap nuts.

## 2.11 WARNING TAPE

- A. Warning tape shall be standard, 4 mil. Polyethylene, 3 inch (76 mm) wide tape, detectable type, blue with black letters and imprinted with "CAUTION BURIED WATER LINE BELOW".

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Use pipe, fittings, and joining methods for piping systems according to the following applications.
  - 1. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
  - 2. Do not use flanges or unions for underground piping.

3. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

### 3.2 VALVE APPLICATIONS

- A. Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, non-rising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, non-rising-stem, metal resilient -seated gate valves with valve box.
  2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast iron, non-rising-stem gate valves with indicator post.
  3. Use the following for valves in vaults and aboveground:
    - a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, non-rising stem.
    - b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
    - c. Check Valves: AWWA C508, swing type.

### 3.3 DUCTILE IRON PIPE

- A. Install Ductile Iron, water-service piping according to AWWA C600 and AWWA M41-3rd Edition.
  1. Install PE corrosion-protection encasement according to ASTM A674 or AWWA C105/A21.5.
- B. Pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.
- C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with push-on bell to conform to the manufactured spigot end. Cement lining shall be undamaged.
- D. Push on joints shall be made in strict accordance with the manufacturer's instruction. Pipe shall be laid with bell ends looking ahead.

### 3.4 PVC PIPE

- A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA C605. Place selected material and thoroughly compacted to one foot above the top of the pipe.
- B. Install Copper Tracer Wire, No. 14 AWG solid, single conductor, insulated. Install in the trench with piping to allow location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder per ASTM 828. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 1000 feet (300 m) provide a 5 pound (2.3 kg) magnesium anode attached to the main tracer wire by solder. The solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall also be attached at the end of each line.

### **3.5 COPPER PIPE**

- A. Copper piping shall be installed in accordance with the Copper Development Association's Copper Tube Handbook and manufacturer's recommendations.
- B. Copper piping shall be bedded in 6 inches (150 mm) of sand.

### **3.6 ANCHORAGE INSTALLATION**

- A. Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include: concrete thrust blocks, locking mechanical joints, set-screw mechanical retainer glands, bolted flanged joints, pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
  - 1. Gasketed-Joint, Ductile Iron, Water-Service Piping: According to AWWA C600.
  - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
  - 3. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

### **3.7 VALVE INSTALLATION**

- A. AWWA Valves: Install each underground valve with stem pointing up and with valve box.
- B. UL/FMG, Valves: Install each underground valve and valves in vaults with stem pointing up and with vertical cast iron indicator post.
- C. MSS Valves: Install as component of connected piping system.
- D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

- E. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. // Install full-size valved bypass. //
- F. Relief Valves: Install aboveground with shutoff valve on inlet.
- G. Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

### **3.8 FIRE HYDRANT INSTALLATION**

- A. Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
  - 1. Install Wet-Barrel Fire Hydrants with valve below frost line. Provide for drainage.

### **3.9 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Install water service lines to a point of connection within approximately 5 feet (1500 mm) outside of building(s) to which service is to be connected and make connections thereto. If building services have not been installed provide temporary caps and mark for future connection.

### **3.10 FIELD QUALITY CONTROL**

- A. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Prior to final acceptance, provide a video record of all piping from the building to the municipal connection to show the lines are free from obstructions, properly sloped and joined.
- C. Perform hydrostatic tests at not less than one-and-one-half times working pressure for two hours.
  - 1. Increase pressure in 50-psi (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psi (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- D. Prepare reports of testing activities.

### **3.11 IDENTIFICATION**

- A. Install continuous underground warning tape 12 inches (300 mm) directly over piping.

### **3.12 CLEANING**

- A. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

- B. Use purging and disinfecting procedure prescribed by local utility provider or other authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
1. Fill the water system with a water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
  2. Drain the system of the previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow system to stand for 3 hours.
  3. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
  4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- C. Prepare reports of purging and disinfecting activities.

**END OF SECTION 33 10 00**