



## SECTION 221113 - WATER DISTRIBUTION PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
  - 1. Wiring Diagrams: Power, signal, and control wiring for alarms.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

#### 1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
  - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
  - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.



- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- G. NSF Compliance:
  - 1. Comply with NSF 14 for plastic potable-water-service piping.
  - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use 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.
- D. 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.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

#### 1.5 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:



1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Engineer's written permission.

## 1.6 COORDINATION

- A. Coordinate connection to water main with utility company.

## PART 2 - PRODUCTS

### 2.1 MATERIAL IDENTIFICATION

- A. Each length of pipe shall have plainly and permanently marked thereon the following information, as well as any additional information specifically noted in the sections below:
  1. Pipe class or strength designation.
  2. Manufacturer's name or trademark.
  3. Nominal pipe size.

### 2.2 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.
  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. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  2. Gaskets: AWWA C111, rubber.
- C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
  1. Grooved-End, Ductile-Iron Pipe Appurtenances:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Anvil International, Inc.
      - 2) Victaulic Company of America.
      - 3) Approved Equal.



- b. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
- c. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

## 2.3 PE PIPE AND FITTINGS

- A. PE, ASTM Pipe: ASTM D 2239, SDR No. 9; with PE compound number required to give pressure rating not less than 160 psig.
  - 1. Insert Fittings for PE Pipe: ASTM D 2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
  - 2. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- B. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 160 psig.
  - 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 160 psig.
- C. PE, Fire-Service Pipe: ASTM F 714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG Class 150.
  - 1. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

## 2.4 PVC PIPE AND FITTINGS

- A. PVC, AWWA Pipe: AWWA C900, Class 150, 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 150, 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.



## 2.5 SPECIAL PIPE FITTINGS

### A. Ductile-Iron Rigid Expansion Joints:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. EBAA Iron, Inc.
  - b. U.S. Pipe and Foundry Company.
3. Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - a. Pressure Rating: 250 psig minimum.

### B. Ductile-Iron Flexible Expansion Joints:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. EBAA Iron, Inc.
  - b. Hays Fluid Controls; a division of ROMAC Industries Inc.
  - c. Star Pipe Products.
3. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - a. Pressure Rating: 250 psig minimum.

## 2.6 JOINING MATERIALS

- A. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

## 2.7 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.



B. Tubular-Sleeve Pipe Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Dresser, Inc.; Dresser Piping Specialties.
  - b. Ford Meter Box Company, Inc. (The); Pipe Products Div.
  - c. Hays Fluid Controls; a division of ROMAC Industries Inc.
  - d. JCM Industries.
  - e. Smith-Blair, Inc.
  - f. Hymax.
  - g. Romac.
2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
  - a. Standard: AWWA C219.
  - b. Center-Sleeve Material: Stainless steel.
  - c. Gasket Material: Natural or synthetic rubber.
  - d. Pressure Rating: 150 psig minimum.
  - e. Metal Component Finish: Corrosion-resistant coating or material.

2.8 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.
2. Form: Sheet or tube.
3. Material: LLDPE film of 0.008-inch minimum thickness, or high-density, crosslaminated PE film of 0.004-inch minimum thickness.
4. Material: High-density, crosslaminated PE film of 0.004-inch minimum thickness.
5. Color: Black.

2.9 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American AVK Co.; Valves & Fittings Div.
  - b. American Cast Iron Pipe Co.; American Flow Control Div.
  - c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
  - d. Crane Co.; Crane Valve Group; Stockham Div.
  - e. East Jordan Iron Works, Inc.
  - f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
  - g. McWane, Inc.; Kennedy Valve Div.
  - h. McWane, Inc.; M & H Valve Company Div.



- i. McWane, Inc.; Tyler Pipe Div.; Utilities Div.
  - j. Mueller Co.; Water Products Div.
  - k. NIBCO INC.
  - l. U.S. Pipe and Foundry Company.
  - m. Approved Equal.
2. Nonrising-Stem, Resilient-Seated Gate Valves:
- a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
    - 1) Standard: AWWA C509.
    - 2) Minimum Pressure Rating: 200 psig.
    - 3) End Connections: Mechanical joint.
    - 4) Interior Coating: Complying with AWWA C550.
3. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
- a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
    - 1) Standard: AWWA C509.
    - 2) Minimum Pressure Rating: 250 psig.
    - 3) End Connections: Push on or mechanical joint.
    - 4) Interior Coating: Complying with AWWA C550.

## 2.10 GATE VALVE ACCESSORIES AND SPECIALTIES

### A. Tapping-Sleeve Assemblies:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
  - b. East Jordan Iron Works, Inc.
  - c. Flowserve.
  - d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
  - e. McWane, Inc.; Kennedy Valve Div.
  - f. McWane, Inc.; M & H Valve Company Div.
  - g. Mueller Co.; Water Products Div.
  - h. U.S. Pipe and Foundry Company.
  - i. Approved Equal.
- 2. Description: Sleeve and valve compatible with drilling machine.
  - a. Standard: MSS SP-60.
  - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.



- c. Valve: AWWA, cast-iron, nonrising-stem, metal resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
  
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include 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 approximately 5 inches in diameter.
  - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
  
- C. 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.

## 2.11 CHECK VALVES

### A. AWWA Check Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American AVK Co.; Valves & Fittings Div.
  - b. American Cast Iron Pipe Co.; American Flow Control Div.
  - c. APCO Williamette; Valve and Primer Corporation.
  - d. Crane Co.; Crane Valve Group; Crane Valves.
  - e. Crane Co.; Crane Valve Group; Stockham Div.
  - f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
  - g. McWane, Inc.; Kennedy Valve Div.
  - h. McWane, Inc.; M & H Valve Company Div.
  - i. Mueller Co.; Water Products Div.
  - j. NIBCO INC.
  - k. Watts Water Technologies, Inc.
  - l. Approved Equal.
  
- 2. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
  - a. Standard: AWWA C508.
  - b. Pressure Rating: 175 psig.

## 2.12 DETECTOR CHECK VALVES

### A. Detector Check Valves:

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Ames Fire & Waterworks; a division of Watts Regulator Co.





- b. Badger Meter, Inc.
  - c. FEBCO; SPX Valves & Controls.
  - d. Globe Fire Sprinkler Corporation.
  - e. McWane, Inc.; Kennedy Valve Div.
  - f. Mueller Co.; Hersey Meters.
  - g. Victaulic Company of America.
  - h. Viking Corporation.
  - i. Watts Water Technologies, Inc.
  - j. Approved Equal.
2. Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.
- a. Standards: UL 312 and FMG approved.
  - b. Pressure Rating: 175 psig.

## 2.13 CORPORATION VALVES AND CURB VALVES

### A. Manufacturers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ford Meter Box Company, Inc. (The); Pipe Products Div.
  - b. Mueller Co.; Water Products Div.
  - c. Approved Equal.

### B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

- 1. Service Saddle: Ductile iron or stainless steel with seal and AWWA C800, threaded outlet for corporation valve.
- 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.

## 2.14 WATER METERS

### A. Water meters will be furnished by utility company.

## 2.15 WATER METER BOXES (FOR 2" WATER METERS AND SMALLER)

### A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.

- 1. Option: Base section may be cast-iron, PVC, clay, or other pipe.

### B. Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.



- C. Description: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.

## 2.16 CONCRETE VAULTS (FOR GREATER THAN 2" WATER METERS)

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
  - 1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
  - 2. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
    - a. Dimension: 24-inch minimum diameter, unless otherwise indicated.
  - 3. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

## 2.17 FIRE HYDRANTS

- A. Dry-Barrel Fire Hydrants:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. McWane, Inc.; M & H Valve Company Div.
    - b. Mueller Co.; Water Products Div.
  - 2. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4 inch main valve, drain valve, and NPS 6 inch mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
    - a. Standard: AWWA C502.
    - b. Pressure Rating: 150 psig minimum.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.



- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be any of the following:
  - 1. PE, ASTM pipe; molded PE fittings; and heat-fusion joints.
  - 2. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.
- F. Underground water-service piping NPS 4 to NPS 8 shall be any of the following:
  - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
  - 2. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.
  - 3. NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA C900, Class 200 fabricated or molded fittings; and gasketed joints.
  - 4. NPS 8: PVC, AWWA Class 200 pipe; PVC, AWWA C900, Class 200 fabricated push-on-joint, ductile-iron mechanical-joint, ductile-iron fittings; and gasketed joints.
- G. Water Meter Box water-service piping NPS 3/4 to NPS 2 shall be same as underground water-service piping.
- H. Aboveground and vault water-service piping NPS 3/4 to NPS 3 shall be any of the following:
  - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
- I. Aboveground and vault water-service piping NPS 4 to NPS 8 shall be any of the following:
  - 1. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.
- J. Underground fire-service-main piping NPS 4 to NPS 12 shall be any of the following:
  - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
- K. Aboveground and vault fire-service-main Piping NPS 4 to NPS 12 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

### 3.2 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.



- B. Standard details indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
  2. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

### 3.3 PIPING SYSTEMS - COMMON REQUIREMENTS

### 3.4 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
1. If the pipe being tapped is NPS 1 and smaller, taps shall be made at the 10 o'clock or 2 o'clock positions of the pipe being tapped.
  2. If the pipe being tapped is larger than NPS 1, taps shall be made at the 9 o'clock or 3 o'clock positions of the pipe being tapped.
- B. Make connections larger than NPS 2 with tapping machine according to the following:
1. Install tapping sleeve and tapping valve according to MSS SP-60.
  2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
  3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
  4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Make connections NPS 2 and smaller with drilling machine according to the following:
1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
  2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
  3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
  4. Install corporation valves into service-saddle assemblies.
  5. Install manifold for multiple taps in water main.
  6. Install curb valve in water-service piping with head pointing up and with service box.
- D. Comply with NFPA 24 for fire-service-main piping materials and installation.
1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
  2. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.



- F. Install PE pipe according to ASTM D 2774 and ASTM F 645.
- G. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- H. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
  - 1. Under Driveways: With at least 36 inches cover over top.
  - 2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.
- I. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
  - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- K. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

### 3.5 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
  - 1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
  - 2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
  - 3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
  - 4. PE Piping Insert-Fitting Joints: Use stainless steel insert fittings and fasteners according to fitting manufacturer's written instructions.
  - 5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
  - 6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

### 3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
  - 1. Concrete thrust blocks.
  - 2. Locking mechanical joints.
  - 3. Set-screw mechanical retainer glands.



4. Bolted flanged joints.
5. Heat-fused joints.
6. 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.

### 3.7 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

### 3.8 DETECTOR-CHECK VALVE INSTALLATION

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

### 3.9 WATER METER INSTALLATION

- A. Water meter to be installed by utility.

### 3.10 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water meter installation according to utility company's directions.

### 3.11 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

### 3.12 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.



3.13 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, and on each branch located adjacent to tee, anchor with restrained joints or thrust blocks, and support in upright position.
- B. AWWA Fire Hydrants: Comply with AWWA M17.

3.14 CONNECTIONS

- A. Standard details indicate general arrangement of piping, fittings, and specialties.
- B. Connect water-distribution piping to utility water main. Use stainless steel tapping saddle and tapping valve.
- C. Connect waste piping from concrete vault drains to storm-drainage system.

3.15 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate report for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Deflection.
    - b. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - c. Infiltration: Water leakage into piping.
    - d. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Testing Requirements.
  - 1. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
    - a. Do not enclose, cover, or put into service before inspection and approval.
    - b. Test completed piping systems according to requirements of authorities having jurisdiction.
    - c. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
    - d. Submit separate report for each test.
    - e. The Contractor shall furnish all materials, labor, and equipment to perform all testing. Water for testing purposes may be provided by the Town and arranged for by the Contractor. The Contractor shall coordinate with the Town of Surf City for the use of water for testing.
    - f. Temporary taps and air releases shall be permissible to facilitate testing.



- g. All testing shall be performed in the presence of the applicant, the Professional Engineer, or other authorized representative.
  - h. The results of all testing shall be maintained by the applicant as part of the construction record documentation.
2. General:
- a. The Contractor shall furnish all materials, labor, and equipment to perform all testing. Water for testing purposes may be obtained from the Town of Surf City. The Contractor shall reimburse the Town for all water used; based upon the Town's water rate structure.
  - b. All water or wastewater used during testing must be returned to the Town of Surf City sanitary sewer system after proper coordination with the Town of Surf City.
  - c. The Town reserves the right to require further testing, as necessary, to assure that all components and infrastructure are performing in accordance with the manufacturer recommendations and Town specifications. All testing, repairs and/or readjustments, and necessary re-testing, shall be at no additional cost to the Town.
  - d. All on-site testing and/or installation verification shall be performed in the presence of the Inspector or other representative authorized by the Town.
  - e. All testing, installation verification, and training, shall be performed in the presence of, or by, an experienced, competent, and authorized manufacturers' representative.
  - f. Factory testing shall consist of testing all operating functions of the equipment under varying operating conditions to assure that it will perform as specified. Any specific testing that may be required is discussed under the individual equipment items below. Results of factory testing shall be presented to the Town prior to delivery of the equipment.
  - g. Installation verification shall consist of a visit to the site by a manufacturer's representative to inspect, check, adjust if necessary, and approve the equipment installation. The manufacturer's representative shall certify that the equipment has been properly installed and lubricated, is in accurate alignment, and is free from any undue stress imposed by connecting piping or anchor bolts. Any specific verification requirements are discussed under the individual equipment items below. Results of the installation verification shall be presented to the Town prior to start-up of the equipment.
  - h. On-site testing shall consist of all manual and automatic operating functions under various operating conditions, including full load conditions. The equipment shall also be tested under adverse or emergency conditions. All alarms and remote signals shall also be tested. Any specific testing that may be required is discussed under the individual equipment items below. Results of the on-site testing shall be presented to the Town prior to final acceptance of the project.
  - i. All functions and systems, even those not specifically listed below, shall be tested to ensure proper operation under normal and emergency situations.
  - j. All defective equipment or malfunctioning systems shall be replaced or corrected, and the full system placed in a fully operational condition to the satisfaction of the Town, at no cost to the Town.
  - k. Results of all factory testing, installation certifications, and on-site operational testing shall be provided to the Town of Surf City in the final construction documents as described in the Submittals portion of this specification section.





3. Pipe Testing.

- a. Prior to testing any segment of pipe, care shall be taken to prevent the pipe from moving while under pressure.
- b. Water used for testing pipe installations shall either be disposed in a nearby sanitary sewer, as authorized by the local sewer authority, or in another location in accordance with state and federal laws and regulations.
- c. Hydrostatic Pressure Test.
  - 1) A hydrostatic pressure test shall be performed on each segment of installed pipe. Test at pressure not less than 1.5 times the maximum system operating pressure, but not less than 150 psig.
    - a) Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
    - b) PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
  - 2) The pressure test may be performed concurrently or separately with the leakage test.
- d. Leakage Tests
  - 1) A leakage test shall be performed on each segment of installed pipe at the hydrostatic pressure not less than 1.5 times the maximum system operating pressure, but not less than 150 psig.
  - 2) Leakage shall be measured with a calibrated test meter and shall not exceed the amount given by the following formula:

$$L = \frac{SD \sqrt{P}}{148,000}$$

L = Allowable leakage (gallons per hour)  
S = Length of pipe segment tested (feet)  
D = Nominal diameter of pipe segment tested (inches)  
P = Test pressure (pounds per square inch)

All visible leaks shall be repaired regardless of the amount of leakage. If leakage exceeds this rate, the applicant is responsible for assuring that the cause of test failure is determined, all necessary repairs are made, and repeating the test until the pipe segment passes.

- 3) The leakage test may be performed concurrently or separately with the pressure test.
- 4) Each layer of fill or backfill over the pipe shall be compacted to a density needed to accommodate the use of the pipe installation area or otherwise may be required (e.g., encroachment agreement with the North Carolina Department of Transportation, etc.).

C. Inspections



1. All materials and equipment used in the construction of the wastewater pumping system must be verified for compliance with the specifications (or other approval granted by the Town) by the Engineer prior to installation. Non-conforming materials or equipment shall be immediately removed from the job site.
2. Compliance with plans and specifications shall be verified on a regular basis by the Engineer.

D. Repairs

1. PVC Pipe - Replace damaged section with PVC Pipe and install a Fernco coupling at each end encased in concrete.
2. HDPE Pipe - Replace damaged section with new HDPE pipeline section and install electrofusion couplings at both ends; minor breaches may be repaired with an electrofusion repair coupling as deemed appropriate by manufacturer's representative.
3. Installation
  - a. All repairs to damaged sanitary pipes in paved areas shall be backfilled with ABC stone (crusher run) to a density of 95 percent Standard Proctor.
  - b. All repairs to damaged sanitary pipes shall be bedded with 6-inches of washed stone and compacted to a minimum of 95% Standard Proctor density before installing the new joint of ductile iron.
4. Operational Test
  - a. Before the operational test is conducted, the required copies of the Operation and Maintenance Manuals shall be delivered to the Town of Surf City and the wetwell shall be thoroughly cleaned to remove dirt, mud, gravel and other foreign debris. The operational test shall check the proper functioning of the pumps and pump controls. The pump and motor serial numbers shall be verified. All components and motor serial numbers shall be verified. All components of the pump station shall be checked to ensure that they are capable of performing the service intended. The operational test shall be performed by the Town of Surf City. The Contractor or Developer shall ensure that a representative from the pump station equipment manufacturer is present at the operational test to review proper operation of the equipment with the Town of Surf City personnel.
5. Visual Testing and Observation
  - a. All materials used must be approved by the Town prior to installation. Rejected materials shall be immediately removed from the job.
6. Video Assessment and Cleaning
  - a. As a final measure required for acceptance, the Contractor shall clean and televise all newly installed pipes prior to acceptance by the Town. The Contractor shall televise the pipe and all lateral connections installed from the upstream to downstream manhole with no reverse setups or cutaways. Throughout shooting, the camera shall be panned and tilted for a complete view of the main. Lighting shall be adequate to view the entire main and service connections from beginning to end. The video inspection shall be submitted to the Town on a videotape or DVD and formatted with software compatible and readable by the Town of Surf



City. The Town shall not be responsible for purchasing additional software necessary to view the videos.

- b. The camera shall be advanced at a uniform rate that allows a full and thorough inspection of the new pipe. The camera shall be a color, pan, and tilt camera. The picture quality and resolution shall be acceptable and sufficient to allow a complete inspection with no lapses in coverage. The length of the pipe shall be measured and recorded on the video screen. The distance counter shall be calibrated before shooting the inspection video.
- c. The Contractor shall clean the pipes ahead of video inspection with a high-velocity water jet. The video inspection shall take place within 2-hours of cleaning operations as witnessed by the Town. All construction debris shall be collected and shall not be released into the sewer system.
- d. The Town's representative shall be present throughout the cleaning and televising of the pipes to verify that the video work complies with the specifications.
- e. Prior to submitting the video's to the Town, the Contractor shall label the videos with the following information:
  - 1) Name of the Project/Development.
  - 2) Name and contact information of responsible party.
  - 3) Date of televising.
  - 4) Manhole identification as shown on the design plans.

### 3.16 IDENTIFICATION

#### A. Metallic pipes:

1. Install continuous underground detectable blue warning tape at 12" above center of pipe during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.
2. Install tracer wire at 12" above center of pipe during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.

#### B. Non-metallic pipes:

1. Install continuous underground detectable blue warning tape taped to top of center of pipe during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.
2. Install tracer wire taped to top of center of pipe during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.

#### C. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel.

### 3.17 CLEANING

#### A. Clean and disinfect water-distribution piping as follows:



1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities and submit to utility.

END OF SECTION 221113