
SECTION 221113 – FACILITY WATER, SEWER AND STORM WATER SERVICE PIPING

Latest Update 05-02-2021 See Underlined Text for Edits.

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specification and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 22.

1.2 SUMMARY

- A. This Section includes the requirements for potable water service, sanitary and storm water piping and specialties below grade from five (5) feet outside the building to the points of connection to meter vaults and to the municipal utilities and includes the following: <Edit for particular project>

1. Cast iron pipe and fittings.
2. Ductile iron pipe and fittings.
3. Copper pipe and fittings.
4. Transition couplings.
5. Cleanouts.
6. Sanitary and storm water manholes.
7. Concrete.
8. Piping specialties.
9. Encasement for underground metal piping.
10. Gate valves.
11. Gate valve accessories and specialties.
12. Water meters and vaults.
13. Water meter boxes.
14. Sterilization of Potable Water Systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each specified product, include manufacturers cut sheets, dimensional data, performance data, installation instructions, specified options, and warranty information.
- B. Shop Drawings: Provide details for precast concrete manholes and meter vault assemblies and indicate dimensions, method of field assembly, and components.

1.4 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Field quality control test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Include a copy each approved submittal along with any applicable maintenance data in the project operation and maintenance manual.

1.6 COORDINATION

- A. Coordinate the installation of the potable water, sanitary, and storm water service mains with the Baltimore City Department of Public Works (BCDPW) all other trades that have work close to and/or in the same area of the project site.

1.7 QUALITY ASSURANCE

- A. Service Components and Accessories: All utility service components and accessories shall be installed using new materials designed and built in accordance with the best practices of the industry. Each major item or material shall bear the manufacturer's name and nominal size, if applicable.
- B. Installing Contractor: The contractor installing the exterior water mains, including the meter vaults and meter assemblies, sanitary mains, storm water mains, related manholes and the connections to the city utilities shall be licensed and approved by The Baltimore City Department of Public Works (BCDPW) and has been a contractor in good standing with the BCDPW for at least ten (10) years.
- C. 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.
- D. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- E. NSF Compliance:
 - 1. Comply with NSF 61 for materials for water service piping and specialties for domestic water.

1.8 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 a building.
- F. Protect flanges, fittings, and specialties from moisture and dirt.

1.9 PROJECT CONDITIONS

- A. Interruption of Existing Utility Services: Do not interrupt existing utility services (water, sanitary and/or storm water) to facilities occupied by UMB or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify UMB Office of Facilities Management no fewer than ten (10) working days in advance of proposed interruption of existing utility services.
 - 2. Do not proceed with interruption of existing utility services without written permission from the UMB Design & Construction Department.

1.10 WARRANTY AND GUARENTEE

- A. Comply with Section 220000 “Basic Mechanical Requirements – Plumbing” for warranty and guarantee requirements.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Material Design and Selection: Facility water, drainage and sewer pipe, fittings, and specialties shall be designed and selected, for the intended use, in accordance with the sizes on the drawings and the requirements of this specification.
- B. Acceptable Manufacturers:
 - 1. Ductile Iron Water Service Pipe: All ductile iron pipe and fittings shall be by one (1) of the following manufacturers:
 - a. American (American Cast Iron Pipe Company).
 - b. US Pipe Company.
 - c. Atlantic States Cast Iron Pipe Company.
 - 2. Cast Iron Sanitary and Storm Water Pipe - Hub and Spigot Cast Iron Piping System: All cast iron pipe and fittings shall be by one (1) of the following manufacturers:
 - a. Charlotte Pipe Company
 - b. Tyler Pipe Company
 - 3. Water Service Valves: All water service valves exterior to the building shall be by one (1) of the following manufacturers:
 - a. American (American Cast Iron Pipe Company).
 - b. US Pipe Company.
 - c. Atlantic States Cast Iron Pipe Company.
 - 4. Cleanouts: All cleanouts exterior to the building shall be by one (1) of the following manufacturers:
 - a. Josam Company.
 - b. Smith, Jay R. Mfg. Co.
 - c. Tyler Pipe.
 - d. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

C. PIPE APPLICATION SCHEDULE

Pipe System	Pipe Material	Fitting Material	Joint Material
Sanitary and Storm Water Piping Mains Below Grade from five (5) feet beyond the building to connections to the city utilities	Cast Iron: Service Weight, Hub and Spigot Piping 4 inch – 15 inch, ASTM A74	Cast Iron <u>Fittings: 4 inch – 15 inch</u> , Service Weight, Hub and Spigot, ASTM A74	Hub and Spigot, Lead and Oakum joints or compression gaskets, ASTM C 564
	All Cast Iron Soil Pipe and Fittings shall be marked with the Collective Trade Mark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.		
Potable Water Service Piping Systems Below Grade from five (5) feet beyond the building to Connections to the Meter Vault and the city water service.	Copper Tube: Piping 3/4 inch to 2 inches: ASTM B88, Type ‘L’, Seamless, Water Tube, hard drawn temper.	<u>Copper Fittings: 3/4 inch to 2 inch</u> , ASTM E B16.22, wrought copper or copper alloy solder joint, 150 lb.	ASTM B32, alloy Sb5 (95 percent tin, and 5 % antimony), with 0.2 % maximum lead content
Potable Water Service Piping Mains Below Grade from five (5) feet beyond the building to connections the Meter Vault and the city water service	Piping 2-1/2 inch and larger: Ductile Iron: AWWA C151/A21.15 or AWWA C104 cement mortar lining.	Piping 2-1/2 inch and larger: Ductile Iron: AWWA C110 or AWWA C153/A21.53 with AWWA C104 cement mortar lining.	Push on or mechanical joints and gaskets: Joints - AWWA C151, Gaskets - AWWA C111/A21.11, rubber.

2.2 NON PRESSURE TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion resistant metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Cast Iron Soil Pipes: ASTM C 564, rubber.
2. For Concrete Pipes: ASTM C 443, rubber.

2.3 CLEANOUTS

A. Description: ASME A112.36.2M, round, gray iron housing with clamping device and round, secured, scoriated, gray iron cover. Include gray iron ferrule with inside calk or spigot connection and countersunk, tapered thread, brass closure plug.

1. Top Loading Classification(s): [Light Duty] [Medium Duty] [Heavy Duty] [and] [Extra-Heavy Duty]. <Edit for project>
2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast iron soil pipe and fittings.

2.4 SANITARY AND STORM WATER MANHOLES <Delete if not required>

A. Standard Precast Concrete Manholes: Provide standard precast concrete manholes, covers, and all necessary components in accordance with the BCDPW Specifications and Standard Details.

2.5 CONCRETE

A. General: Cast in place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 1% through manhole

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4%.

D. Ballast and Pipe Supports: Portland cement design mix, 3,000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.6 JOINING MATERIALS

A. Refer to Section "Common Work Results for Utilities" for commonly used joining materials.

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. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Unions:

a. Description:

1) Standard: ASSE 1079.

2) Pressure Rating: 125 psig minimum at 180°F.

3) End Connections: Solder joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Description:

1) Standard: ASSE 1079.

2) Factory fabricated, bolted, companion flange assembly.

3) Pressure Rating: 125 psig minimum at 180°F.

4) End Connections: Solder joint copper alloy and threaded ferrous;
threaded solder joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Description:

1) Non conducting materials for field assembly of companion flanges.

- 2) Pressure Rating: 150 psig.
 - 3) Gasket: Neoprene or phenolic.
 - 4) Bolt Sleeves: Phenolic or polyethylene.
 - 5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
- a. Description:
 - 1) Standard: IAPMO PS 66
 - 2) Electroplated steel nipple complying with ASTM F 1545.
 - 3) Pressure Rating: 300 psig at 225°F.
 - 4) End Connections: Male threaded or grooved.
 - 5) Lining: Inert and noncorrosive, propylene.

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 min mum thickness.
4. Material: LLDPE film of 0.008 inch minimum thickness, or high density, cross laminated PE film of 0.004 inch minimum thickness.
5. Material: High density, cross laminated PE film of 0.004 inch minimum thickness.

2.9 GATE VALVES

- A. AWWA, Cast Iron Gate Valves: Provide gate valves exterior piping in accordance with the BCDPW Specifications and Standard Details.

2.10 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Gate Valve Accessories and Specialties: Provide gate valve accessories and specialties in accordance with the BCDPW Specifications and Standard Details for tapping sleeve assemblies, and valve boxes.

2.11 WATER METERS

- A. Water Meters: Detector check and FM water meters, will be furnished by and obtained from the BCDPW, Bureau of Water and Wastewater, Utility Engineering Division.
- B. Provide individual water meters for the buildings domestic water service and fire protection service in the same meter vault per BCDPW Specifications and Standards.

2.12 WATER METER BOXES

- A. General: Where indicated water meter boxes shall be 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, complying the BCDPW Specifications and Details. <Delete if not Required>

2.13 STERILIZATION OF POTABLE WATER SERVICE

- A. See Division 22 Specification Section "Sterilization of Potable Water Systems" for cleaning and sterilizing the potable water service piping to the building.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Division 31 Specification Section "Earth Moving".

3.2 PIPING APPLICATIONS FOR POTABLE WATER

- 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 the following:
 1. Soft copper tube, ASTM B 88, Type L; wrought copper, solder joint fittings; and brazed 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 or mechanical joint pipe; ductile iron, mechanical joint fittings; joints.
- G. Water Meter Box Water Service Piping NPS 3/4 to NPS 2 shall be same as underground water service piping.

3.3 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.

3.4 PIPING INSTALLATION FOR POTABLE WATER

- A. Water Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. 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.
- D. 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.
- E. 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."
- F. 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.

- G. Bury piping with depth of cover over top at least thirty (30) inches, with top at least twelve (12) inches below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least thirty six (36) inches cover over top.
 - 2. In Loose Gravelly Soil and Rock: With at least twelve (12) inches additional cover.
- H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- I. 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.
- J. Sleeves are specified in Division 22 Specification Section "Sleeves, Sleeve Seals and Escutcheons for Plumbing Piping."
- K. Mechanical sleeve seals are specified in Division 22 Specification Section "Sleeves, Sleeve Seals and Escutcheons for Plumbing Piping."
- L. 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 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer and storm drain piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe jacking process of micro tunneling.
- F. Install gravity flow, nonpressure, sewer and drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1% unless otherwise indicated.
 - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast in place concrete supports or anchors.
 - 3. Install piping with thirty six (36) inch minimum cover.
 - 4. Install hub and spigot, cast iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 5. Install ductile iron, gravity sewer piping according to ASTM A 746.
- G. Install force-main, pressure piping according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast in place concrete supports or anchors.
 - 2. Install piping with thirty six (36) inch minimum cover.
 - 3. Install ductile iron pressure piping according to AWWA C600 or AWWA M41.
 - 4. Install ductile-iron special fittings according to AWWA C600.
- H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.6 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated and in accordance with the BCDPW Specifications and Standard Details
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Install FRP manholes according to manufacturer's written instructions.
- D. Form continuous concrete channels and benches between inlets and outlet.
- E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops three (3) inches above finished surface elsewhere unless otherwise indicated.

- F. Install manhole cover inserts in frame and immediately below cover.

3.7 CONCRETE PLACEMENT

- A. Place cast in place concrete according to ACI 318.

3.8 BACKWATER VALVE INSTALLATION

- A. Install horizontal type backwater valves in piping manholes or pits.
- B. Install combination horizontal and manual gate valves in piping and in manholes.
- C. Install terminal type backwater valves on end of piping and in manholes. Secure units to sidewalls.

3.9 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Light Duty, top loading classification cleanouts in earth or unpaved foot traffic areas.
 - 2. Use Medium Duty, top loading classification cleanouts in paved foot-traffic areas.
 - 3. Use Heavy Duty, top loading classification cleanouts in vehicle traffic service areas.
 - 4. Use Extra Heavy Duty, top loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast in place concrete block, eighteen (18) inches by eighteen (18) inches by twelve (12) inches deep. Set with tops one (1) inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.10 JOINT CONSTRUCTION

- A. See Section "Common Work Results for Utilities" for basic piping joint construction.
- B. Make pipe joints according to the following:
 - 1. Copper Tubing, Pressure Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure seal fitting manufacturer.
 - 2. Ductile Iron Piping, Gasketed Joints for Water Service Piping: AWWA C600 and AWWA M41.
 - 3. Ductile Iron Piping, Gasketed Joints for Fire Service Main Piping: UL 194.

4. 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.
5. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - a. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
 - b. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
 - c. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.11 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. 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.

3.12 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.
- C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast iron indicator post.
- D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.13 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties in accordance with the BCDPW Specifications and Standard Details.

3.14 ROUGHING IN FOR WATER METERS

- A. Rough in piping and specialties for water meter installation in accordance with the BCDPW Specifications and Standard Details

3.15 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface in accordance with the BCDPW Specifications and Standard Details.
- B. Install water meter boxes in grass or earth areas with top two (2) inches above surface.

3.16 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891 and in accordance with the BCDPW Specifications and Standard Details

3.17 CONNECTIONS

- A. Connect water-distribution piping to interior domestic water and fire-suppression piping.
- B. Ground equipment according to Division 26, Specification Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26, Specification Section "Low-Voltage Electrical Power Conductors and Cables."

3.18 CONNECTIONS FOR STORM AND SEWER PIPING

- A. Connect nonpressure, gravity flow drainage piping to building's sanitary building drains specified in Division 22 Specification Section "Sanitary, Chemical and Vent Piping Systems."
- B. Connect non pressure, gravity flow drainage piping in building's storm building drainage specified in this section.
- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus six (6) inch overlap with not less than six (6) inches of concrete with twenty eight (28) day compressive strength of 3,000 psi.

2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than six (6) inches of concrete with twenty eight (28) day compressive strength of 3,000 psi.
- D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow three (3) inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in six (6) inches of concrete for minimum length of twelve (12) inches to provide additional support of collar from connection to undisturbed ground.
1. Use concrete that will attain a minimum twenty eight (28) day compressive strength of 3,000 psi unless otherwise indicated.
 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- E. Connect to grease oil and sand interceptors specified in Division 22, Section "Sanitary Waste Interceptors."

3.19 FIELD QUALITY CONTROL

- A. Piping Tests:
- B. Prepare and submit test reports.

3.20 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Specification Section "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic water service piping, on main electrical meter panel. See Division 33 Specification Section "Common Work Results for Utilities" for identifying devices.

3.21 FIELD QUALITY CONTROL FOR STORM AND SEWER PIPING

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately twenty four (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. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5% of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. 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. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least twenty four (24) hours' advance notice.
 4. Submit separate report for each test.
 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - a. Fill sewer piping with water. Test with pressure of at least ten (10) foot head of water, and maintain such pressure without leakage for at least four (4) hours.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
 - b. Option: Test concrete gravity sewer piping according to ASTM C 924.
 7. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than one and one half (1-1/2) 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.
- 8. Manholes: Perform hydraulic test according to ASTM C 969.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 221113