SP- 230189
(New)

SPECIAL PROVISIONS
FOR
WATER MAIN PIPE AND FITTINGS

Linn County
IM-380-6(487)14--13-57

Effective Date
July 30, 2024

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

230189.01 GENERAL.

A. Section Includes.

- Pipe
- Fittings
- Special Fittings
- Pipeline Accessories

B. Description of Work.

1. Water Mains – This item includes furnishing and installing water pipe in accordance with the Contract Documents.

2. Water Services – This item includes furnishing and installing water services and obtaining a water service tap on an existing water main.

C. Submittals.

1. Submit product information for joint restraint system to be used.

2. Submit Certificate of Compliance indicating materials incorporated into the work comply with the Contract Documents.

D. Delivery, Storage and Handling.

1. Remove pipe and fittings contaminated with mud and surface water from the site; do not use in construction unless thoroughly cleaned, inspected, and approved by the Engineer.

2. Store material in accordance with the manufacturers' recommendations and in locations that will minimize the interference with operations, minimize environmental damage and protect adjacent areas from flooding, runoff and sediment deposition. PVC pipe must be protected from direct exposure to ultraviolet light.

E. Scheduling and Conflicts.
Discontinue work affected by any conflicts discovered or any changes needed to accommodate unknown or changed conditions and notify the Engineer.

F. Special Requirements.

1. A City of Cedar Rapids right-of-way permit is required for water main or service line installation or repair work within City street right-of-way. Unless otherwise noted, for City funded water Capital Improvement Projects the Cedar Rapids Utilities Department –Water Division (herein after referred to as the "Water Division") will pay the permit fee. The Contractor is required to complete the application.

2. Private Mains and Fire Lines: The Water Division will not furnish any materials for private water mains, fire protection lines, or service lines. All materials installed prior to a meter and backflow preventer, in private systems shall meet the same specifications as for public systems, including polyethylene wrap and tracer wire.

3. The Water Division will not sell or loan materials from its pipe and fitting inventory except when water service to the public has been interrupted and repair parts are not readily available from other sources. A service charge will be added to the cost of the materials sold to the Contractor out of inventory.

4. Coordination for Water Service Stubs.
- **a.** Water main to be in service and all tests passed prior to ordering taps.
- **b.** Property corners are to be staked and visible prior to making tap.
- **c.** Notify Cedar Rapids Water Engineering (319-286-5950) at least 24 hours ahead of need for all taps.
- **d.** Taps 2 inches or smaller: Made by Cedar Rapids Meter Shop (319-286-5930).
  - **1)** Confirming and/or cancellation: Notify the day of installation.
  - **2)** To schedule taps for the morning, contact Meter Shop between 7:30 a.m. and 8:00 a.m.
  - **3)** To schedule taps for the afternoon, contact Meter Shop between 11:30 a.m. and noon.
  - **4)** Contractor to comply with City safety standards and requirements.
- **e.** Taps larger than 2 inches and up to 12 inches: Made by Cedar Rapids Water Distribution (319-286-5950).
  - **1)** Schedule with Water Engineering and Water Distribution at least 24 hours prior to when tap is needed.
  - **2)** To cancel, contact Water Distribution no later than 7:00 a.m. on the day of the scheduled tap.
  - **3)** Taps must be scheduled to occur prior to 2:00 p.m.
  - **4)** Taps will not be performed on private water mains or water services.
  - **5)** Contractor to have tapping sleeve and valve installed on water main and holding 100 psi test pressure prior to Water Distribution arriving to complete the tap.
  - **6)** Contractor to provide properly sized trench with protective system for tapping machine and personnel. Excavate trench a minimum of 6 feet from and 3 feet on each side of tapping valve. Failure to provide will result in no tap and reschedule.
  - **7)** Contractor to comply with City safety standards and requirements.
- **f.** Taps larger than 12 inches: Made by qualified Contractor.
  - **1)** Submit Contractor qualifications and tapping plan detail to the Engineer for approval.
  - **2)** Schedule with Water Engineering and Water Distribution at least 24 hours in advance

of commencement of work. Taps are not allowed without authorized Water Division staff on site.

5. **Equipment and Labor Furnished by the City of Cedar Rapids.**
   - **a.** The Water Division will furnish labor and tapping equipment necessary to make taps from 1 inch to 12 inches in diameter that are a part of a City funded Capital Improvement Project.
   - **b.** The Water Division will furnish all labor and equipment to operate public water system valves and fire hydrants in conjunction with the work.

6. **Reuse of Water Service Lines:** Water service lines must meet the following requirements when a new structure is proposed to replace a prior structure on a site.
   - **a.** Water service lines 2 inches or smaller must meet local and plumbing codes.
     - **1)** Water service lines installed prior to January 1, 2014 must be replaced.
     - **2)** Water service lines and taps must be 1 inch minimum and utilize a tapping saddle.
   - **b.** Water service lines larger than 2 inches must meet local and plumbing codes.
     - **1)** Gate valves installed prior to January 1, 2012 must be replaced.

7. **Verification of Private Water Service Lines.**
   The Contractor shall record in the plan set (if available) the diameter, material, and address of water service lines 2 inches or smaller for water service replacements or reconnections. The Contractor shall also record a time-stamped photo of each private water service during excavation and provide to the Water Division.

230189.02 MATERIALS.

A. Water Main.

1. **Ductile Iron Pipe (DIP).**
   - **a. Minimum Thickness Class**
     - **1) 4 inch through 24 inch:** Thickness Class 52 per AWWA C151.
     - **2) 30 inch through 48 inch:** As specified in the contract documents.
   - **b. Joint Type:** Use push-on type, unless otherwise specified in the contract documents or as authorized by the Engineer.
     - **1) Push-on:** According to AWWA C111.
     - **2) Mechanical:** According to AWWA C111.
     - **3) Restrained, Buried:** Pipe manufacturer's standard field removable system.
     - **4) Restrained, in Structures:** Restraining gland, flanged or grooved/shouldered.
     - **5) Restrained, in Casing:** Pipe manufacturer's standard field removable system.
     - **6) Gaskets:** According to AWWA C111. All public water main shall be installed with nitrile gaskets impermeable to hydrocarbons.
     - **7) Lining:** Cement-mortar lined, according to AWWA C104 with seal coat.
     - **8) Exterior Coating:** Asphaltic.
     - **9) Markings on Pipe:** Name of manufacturer, size and class, spigot insertion depth gauge.

2. **Polyvinyl Chloride (PVC) Pipe:** The use of PVC pipe is only allowable in areas of previously undeveloped Agricultural and Rural, Residential, Mixed Use, Urban Form, Public, and Special Land Use Districts. Traditional Industrial Mixed Use and Light Industrial Land Use Districts will be reviewed for the use of PVC pipe. PVC can be used as isolation spool pieces in cathodic protection systems. Comply with AWWA C900 with gray iron pipe equivalent outside diameters. PVC is not allowed within 500 feet of a Contaminated Site, Underground Storage Tank (UST), or Leaking Underground Storage Tank (LUST).
   - **a. Minimum Wall Thickness.**
     - **1) 4 inch through 12 inch:** Pressure Class 235, DR 18
       - **a)** Where static pressures exceed 100 psi, install Pressure Class 305, DR 14.

2) **Sizes smaller than 4 inch**: Not allowed.
3) **Sizes larger than 12 inch**: Not allowed.

b. **Joint Type:** Use push-on type, unless otherwise specified in the contract documents or as authorized by the Engineer.
1) **Push-on:** According to AWWA C900.
2) **Integral Restrained Joint:** AWWA C900 pipe with restraining system manufactured integrally into pipe end.
3) **Mechanical Restrained Joint:** Ductile iron mechanical device designed for joint restraint of AWWA C900 pipe complying with the requirements of ASTM F 1674.

c. **Markings on Pipe:** Name of manufacturer, size and class, spigot insertion depth gauge, and National Sanitation Foundation (NSF) seal.

d. **Fire Hydrant Assemblies:** PVC pipe shall not be used in Fire Hydrant Assemblies from the anchor tee, tapping sleeve, or auxiliary valve (for hydrants at the end of a watermain).

B. Bolts For Water Main And Fittings.
Use corrosion resistant bolts.

1. **Tee-bolts and Hexagonal Nuts for Mechanical Joints.**
a. High-strength, low-alloy steel manufactured according to AWWA C111.
b. Include ceramic-filled, baked-on, fluorocarbon resin coating for bolts and nuts.
c. Include factory-applied lubricant that produces low coefficient of friction for ease of installation.

2. **Other Bolts and Nuts**: 304 or 316 stainless steel for clamps, sleeves, saddles, etc. Includes factory-applied lubricant that produces low coefficient of friction to prevent galling and for ease of installation.

C. Fittings.

1. **For DIP and PVC:** Comply with AWWA C110 (ductile iron or gray iron) or AWWA C153 (ductile iron). Fittings shall be smooth and pit free. Coatings shall be uniform and undamaged.
a. **Joint Type**.
1) For pipe sizes 4 inch through 48 inch, use restrained mechanical joint complying with AWWA C111. Provide follower gland using breakaway torque bolts to engage thrust restraint.
a) Minimum pressure rating same as connecting pipe. For fittings between dissimilar pipes, the minimum pressure rating is the lesser of the two pipes.
b) Suitable for buried service.
c) Joint restraint system to be field installable, field removable, and re-installable.
2) Use of alternate restraint systems must be approved by the Engineer. Restraint systems must be designed for the pipe material on which they are used.
3) **Manufacturers.**
a) EBAA Iron, Inc. Eastland, TX. “Megalug”.
b) Star Pipe Products, Inc. Houston, TX. “StarGrip”.
c) Romac Industries, Inc. Bothel, WA. “Grip Ring”.
d) Tyler Union Anniston, AL. “TUFGrip”.

b. **Lined:** Cement-mortar lined according to AWWA C104 with asphalt coating.
c. **Wall Thickness**: Comply with AWWA C153.
d. **Gaskets:** Comply with AWWA C111, match pipe joint gaskets.
e. **Long Body Sleeves**: Required.

2. **Flange Adapter.**
a. **Body:** Ductile iron complying with ASTM A 536.
b. **End Rings (Follower Rings):** Ductile iron complying with ASTM A 536.
c. **Gaskets:** New rubber compounded for water service and resistant to permanent set. Material shall be the same as pipe joint gaskets.

d. Bolts and Nuts: High strength, low alloy corrosion resistant steel or carbon steel bolts complying with ASTM A 307.

e. Model.

1) Dresser Manufacturing Division, Bradford, PA. Style 127.

2) Smith-Blair, Texarkana, AK. Style 912.

3) Substitutions require engineering approval.

3. Pipe Coupling.

a. Straight Couplings.

1) Center Sleeve (Center Ring): Steel pipe or tubing complying with ASTM A 53 or ASTM A 512, or formed carbon steel with a minimum yield of 30,000 psi.

2) End Ring (Follower Ring): Ductile iron complying with ASTM A 536, or steel meeting or exceeding the requirements of ASTM A 576, grade 1010-1020.

b. Extended Range Couplings.

1) Body: Complying with AWWA C219.

2) Casting: Carbon steel complying with ASTM A 53 or ductile iron complying with ASTM A 536.

3) End Rings: Carbon steel complying with ASTM A 283 or ductile iron complying with ASTM A 536, one bolt per end ring.

4) Pressure: 260 psi minimum.

5) Manufacturer and Model.

a) Romac Industries, Inc., Macro HP

b) Romac Industries, Inc., Alpha

c) Hymax Industries, Hymax 2

d) Total Piping Solutions, TX3

c. Gaskets: Gasket shall be NSF 61 certified NBR nitrile rubber. New rubber compounded for water service and resistant to permanent set.

d. Bolts and Nuts: Stainless steel according to ASTM A 240, Type 304.

e. Use ductile iron mechanical joint sleeves for pipe sizes up to and including 12 inch.

f. Use carbon steel or ductile iron couplings for pipe sizes greater than 12 inches, or as authorized by the Engineer.

g. Minimum laying length 14 inches; Minimum yield strength 30,000 psi.

h. Bodies of couplings are to be epoxy coated, per AWWA C213.

D. Concrete Thrust Block.

1. Use Iowa DOT Class C Concrete (minimum compressive strength 3000 psi).

2. Comply with the contract documents for dimensions and installation of thrust blocks. Comply with Standard Road Plan WM-101.

3. Use for all pipe sizes 16 inches in diameter and smaller. For pipe sizes greater than 16 inches in diameter, use thrust blocks or restrained joint system conforming to the Ductile Iron Pipe Research Association's (DIPRA) "Thrust Restraint Design for Ductile Iron Pipe" current editions, and when specified.

E. Pipeline Accessories.

1. Polyethylene Wrap:

a. Comply with AWWA C105.

b. Provide tubes or sheets with 8 mil minimum thickness.

2. Tracer System: Comply with Figure 5910.102.

a. Tracer Wire.

1) Open Cut: Solid Single Copper Conductor.

a) Size: No. 12 AWG.

b) **Insulation Material:** Linear low-density polyethylene (LLDPE) installation suitable for direct burial applications.
c) **Insulation Thickness:** 0.045 inches, minimum.
d) **Tensile Strength:** 150 pounds, minimum.
e) **Operating Voltage:** Rated for 30 volts.

2) **Directional Drilling/Boring or Open Cut: Bimetallic Copper Clad Steel Conductor.**
a) **Size:** No. 12 AWG.
b) **Rating:** Direct burial.
c) **Operating Voltage:** Rated for 30 volts.
d) **Conductivity:** 21%.
e) **Copper Cladding:** 3% of conductor diameter, minimum.
f) **Insulation Material:** High density, high molecular weight polyethylene.
g) **Insulation Thickness:** 0.045 inches, minimum.
h) **Tensile Strength:** 1100 pounds, minimum.

b. Ground Rod: 3/8 inch diameter, 60 inch steel rod uniformly coated with metallically bonded electrolytic copper.
c. Ground-rod Clamp: High-strength, corrosion-resistant copper alloy.
d. Splice Kit: Inline resin splice kit with split bolt (1 kV and 5 kV) for use with single conductor and unshielded cable splices in direct bury and submersible applications.
e. Tracer Wire Attachment Strap: Install stainless steel hydrant strap.
f. Receptacle Post: 1 pound per foot channel post 4 feet long. Grimco, Inc. UP-1 or equal.
g. Terminations: Scotchcast Terminating Kit or equal.

3. Rigid Pipe Insulation: Insulate water mains, water services, and other utility structures as specified within contract documents or as directed by the Engineer.
a. Comply with ASTM C 578.
b. Thickness: 4 inch, minimum.
c. Compressive strength: 25 psi, minimum.
d. R-Value: 5 per inch of thickness, minimum.

4. Restraining Rods: Steel. Minimum yield strength of 36,000 psi.

F. Special Gaskets.

1. For soils contaminated with gasoline, use neoprene or nitrile gaskets.

2. For soils contaminated with volatile organic compounds, use nitrile or fluorocarbon gaskets.

3. For other soil contaminants, contact the Engineer for the required gasket.

G. Water Service Pipe and Appurtenances.

1. Controlling Standards.
Municipal Code “CHAPTER 12, WATER SERVICE”, plus local plumbing and fire codes.

2. Materials.
a. Copper Pipe.
1) Comply with ASTM B 88.
2) Wall Thickness: Type K.
b. DIP: As specified in Article SP-230189.02, A. Polyethylene wrap and tracer wire are required.
c. PVC: As specified in Article SP-230189.02, A. Polyethylene wrap is required around all fittings. Tracer wire is required.

3. Corporation Stops, Curb Stops and Curb Stop Boxes.

a. Corporation Stop.
- **1)** 1 inch minimum ball valve with 300 psi rating.
- **2)** Stop inlet with AWWA threads.
- **3) Manufacturer and Model.**
  - **a)** Mueller B-25000.
  - **b)** AY McDonald 74701B.
  - **c)** Ford FB600.

b. Electrically Isolating Corporation Stops.
- **1)** 1 inch minimum ball valve with molded EPDM seat.
- **2)** Stop inlet with AWWA threads.
- **3)** Solid one-piece tee-head and stem with EPDM O-ring in stem.
- **4)** Factory-assembled nylon insulator between the body assembly and flared copper/nut service line. Individual or field-installed threaded nylon or plastic components are not acceptable.
- **5)** Metal threaded components. All assembly threads secured with adhesive to prevent unintentional disassembly and to render unit leak resistant to 300 psi working pressure.
- **6) Manufacturer and Model.**
  - **a)** Mueller N35000N.
  - **b)** AY McDonald 74701B with 74755DB, or 74701BDB.

c. Curb Stop.
- **1)** 1 inch minimum ball valve with 300 psi rating.
- **2)** Valve size same as service size.
- **3)** Quarter-turn check.
- **4) Manufacturer and Model.**
  - **a)** Mueller H-15154 or H-25154.
  - **b)** AY McDonald 76104.
  - **c)** Ford B22-M.

d. Curb Stop Box.
- **1)** 1 1/2 inch diameter upper half, Minneapolis pattern.
- **2)** Adjustable height from 5 feet to 6 feet.
- **3)** All lids to be equipped with 1 1/2 inch cast iron pentagon plug.
- **4) Manufacturer and Model.**
  - **a)** Mueller H-10302.
  - **b)** AY McDonald 5622AC.

e. Lids for Stop Boxes in Sidewalk Pavement.
- **1)** Meter box cover with inset 8 inch locking lid utilizing bronze pentagon bolt.
- **2)** Cast iron frame, 4 inch deep.
- **3) Manufacturer and Model.**
  - **a)** Ford Type A1.
  - **b)** AY McDonald 74M1AWO.

f. Lids for Stop Boxes in Driveway Pavement.
- **1)** Cast iron valve box extension.
- **2)** 5 1/4 inch locking lid utilizing bronze pentagon bolt.
- **3) Manufacturer and Model.**
  - **a)** Trumbull 367-5036 (extension), 367-5045 (locking lid).
  - **b)** Bingham & Taylor Fig. 6016-B 4 inch (extension), Fig. 4904-L (cover).
  - **c)** SIP Model 6306 (extension), Model 6355 (locking lid).

4. Tapping Saddle:
- **a.** Body: Brass or ductile iron with fusion bonded epoxy coating.
- **b.** Single or double stainless steel strap with 4 fasteners and nitrile gasket seal.
- **c. Manufacturer and Model.**
  - **1)** AY McDonald – 3845 series.
  - **2)** Smith Blair – 317, 325 or 397 series.
  - **3)** Romac 202NS.

4) Mueller – DR2S series.

230189.03 CONSTRUCTION.

A. Pipe Installation.

1. General.

a. Stake right-of-way in new subdivisions prior to water main construction.
b. Install only approved materials.
c. Do not use deformed, defective, gouged, or otherwise damaged pipes, fittings or materials.
d. Keep trench free of water. Clean pipe interior prior to placement in the trench.
e. Install pipe with fittings and valves to the lines and grades specified in the contract documents, with a maximum allowable variation of 3 inches.
f. Clean joint surfaces thoroughly and apply lubricant approved for use with potable water and recommended by the manufacturer.
g. Push pipe joint to the indication line on the spigot end of the pipe before making any joint deflections.
h. Pipe & Joint Deflection.
1) DIP: Limit joint deflections to one degree less than pipe manufacturer's recommended maximum limit.
2) PVC: Limit joint deflections to 4 inches maximum offset per joint, or less per manufacturer's recommended maximum limit. Excavation equipment shall not be used to obtain offset. No deflection of the pipe is allowed.
i. Tighten bolts in a joint evenly around the pipe.
j. Install concrete thrust blocks on all fittings or install restrained joint system, and when specified in the contract documents, also install concrete thrust blocks. Thrust blocks to comply with Standard Road Plan WM-101.
k. Keep exposed pipe ends closed with rodent-proof end gates at all times when pipe installation is not occurring.
l. Close the ends of the installed pipe with watertight plugs during nights and non-working days.
m. Do not allow any water from the new pipeline to enter the existing distribution system piping until testing and disinfection are successfully completed.
n. As much as is practical, do not locate water service lines under proposed driveways or sidewalks.
o. Install water stops in the trench at locations identified in the plans or contract documents. Construct of excavated clay material compacted to 95% of optimum density (ASTM D698).
p. Install pipe with MINIMUM cover per size as follows:

10 inch and smaller water main	5' 6" Minimum cover over pipe
12 inch to 20 inch water main	5' 0" Minimum cover over pipe
24 inch to 30 inch water main	4' 6" Minimum cover over pipe
36 inch to 54 inch water main	4' 0" Minimum cover over pipe

2. Trenched.

a. Excavate trench and place pipe bedding and backfill material as specified in Section 2552 of the Standard Specifications.
b. Provide uniform bearing along the full length of the pipe barrel. Provide bell holes.

3. Trenchless: Comply with Section 2553 of the Standard Specifications**.**

B. Additional Requirements for DIP Installation.

1. Utilize full-length gauged pipe for field cuts. Alternatively, field-gauge pipe selected for cutting to verify the outside diameter is within allowable tolerances.

2. Cut the pipe perpendicular to the pipe barrel. Do not damage the cement lining. Bevel cut the ends for push-on joints according to the manufacturer's recommendations.

3. Encase all pipe, valves, and fittings with polyethylene wrap according to Article SP-230189.03, D.

4. Pipe re-rounding may be performed in accordance with manufacturer's recommendations for installation. Do not damage the cement-mortar lining. Pipes that are deemed to be excessively out-of-round may be rejected by the Engineer.

C. Additional Requirements for PVC Pipe Installation.

1. Cut the pipe perpendicular to the pipe barrel. Deburr and bevel cut spigot end of the pipe barrel to match factory bevel. Re-mark the insertion line.

2. When connecting to shallow-depth bells, such as on some cast iron fittings or valves, cut the spigot end square to remove factory bevel. Deburr the end and form a partial bevel on the end.

D. Polyethylene Encasement Installation.

1. Apply polyethylene encasement to buried ductile iron pipe and to buried fittings, fire hydrants, appurtenances, and on copper service lines from the main to a distance 4 feet from the main. The polyethylene encasement is used to prevent contact between the pipe and the bedding material, but need not be airtight or watertight. Repair all cuts and tears.

2. Install polyethylene encasement according to AWWA C105, using tubes or flat sheets, and pipe manufacturer's recommendations.

3. Do not expose the polyethylene encasement to sunlight for long periods before installation.

4. Remove all lumps of clay, mud, cinders, etc. on the pipe surface before encasing the pipe. Take care to prevent soil or bedding material from becoming trapped between the pipe and polyethylene.

5. Lift polyethylene-encased pipe with a fabric-type sling or padded cable.

6. Secure and repair encasement material using polyethylene tape, or replace as necessary.

7. In cases where the water main is to be installed using a "push" or Horizontal Directional Drilling (HDD) technique, install polyethylene wrap in two layers with each layer being separately secured and taped.

E. Tracer System Installation.

1. Install tracer wire on all publicly and privately owned water mains and fire service lines irrespective of water main material. Comply with Standard Road Plan WM-102 for tracer wire installation.

2. Install tracer wire continuously along top center of pipe. Do not install wire along bottom of pipe. Attach wire to pipe at midpoint of each pipe length; use 2 inch wide, 10 mil thickness

polyethylene pressure-sensitive tape.

3. Bring double run of wire to surface at each mainline and hydrant valve location; strip ends and connect together with split bolt. Holes in valve boxes for tracer wire are to be drilled and not sawn.

4. Terminate exposed tracer wire at hydrants. Secure to traffic flange with stainless steel straps and hardware. Install the tracer wire and stainless steel straps on property side of hydrant (away from street).

5. Install ground rods adjacent to connections to existing piping and at locations specified in the contract documents or as directed by the Engineer.

6. Bring two wires to the surface at each fire hydrant location and terminate with a tracer wire station.

7. Final inspection of the tracer system will be conducted at the completion of the project and prior to acceptance by the Engineer. Verify the electrical continuity of the system. Repair discontinuities.

F. Conflicts.

1. **Horizontal Separation of Gravity Sewers from Water Mains.**
   a. **Sanitary and Combined Sewers.**
      1) Separate gravity sanitary and combined sewer mains from water mains by a horizontal distance of at least 10 feet unless:
         a) The top of a sewer main is at least 18 inches below the bottom of the water main, and
         b) The sewer is placed in a separate trench or in the same trench on a bench of undisturbed earth at a minimum horizontal separation of 3 feet from the water main.
      2) Maintain the maximum feasible separation distance in all cases. When it is impossible to obtain the required horizontal clearance of 3 feet and a vertical clearance of 18 inches between sewers and water mains, provide a linear separation of at least 2 feet and one of the following:
         a) Construct sanitary and combined sewers of water main materials meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.
         b) Enclose the water main in a watertight casing pipe with an evenly spaced annular gap and watertight end seals.
   b. **Storm Sewers.**
      Separate storm sewers and water mains by at least 10 feet measured edge-to-edge unless it is impossible to do so. When impossible to maintain a 10 feet horizontal separation, maintain a minimum separation of 3 feet and utilize one of the following within 10 feet measured edge-to-edge:
      1) Construct the water main of ductile iron pipe with gaskets impermeable to hydrocarbons.
      2) Enclose the water main in a watertight casing pipe with evenly spaced annular gap and watertight end seals.
      3) Construct storm sewer pipe of water main materials meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.
      4) Construct storm sewers of reinforced concrete pipe with gaskets manufactured according to ASTM C 443 meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.

2. **Horizontal Separation of Water Mains from Sanitary and Combined Sewer Manholes.** Ensure water pipes do not pass through or come in contact with any part of a sanitary or

combined sewer manhole. Maintain a minimum horizontal separation of 3 feet.

3. Horizontal Separation of Sewer Force Mains from Water Mains.
Separate sewer force mains and water mains by a horizontal distance of at least 10 feet unless:

a. The force main is constructed of water main materials meeting a minimum pressure rating of 150 psi and the requirements of Article 2553.02, A, 2 of the Standard Specifications and

b. The sewer force main is laid at least 4 linear feet from the water main.

4. Vertical Separation of Sewers and Water Main Crossovers.

a. Sanitary and Combined Sewers.

1) Vertically separate sanitary and combined sewers crossing under water mains by at least 18 inches when measured from the top of the sewer to the bottom of the water main. If physical conditions prohibit the separation, do not place the sewer closer than 6 inches below a water main or 6 inches above a water main. Maintain the maximum feasible separation distance in all cases. Ensure the sewer and water pipes are adequately supported and have watertight joints. Use a low permeability soil for backfill material within 10 feet of the point of crossing.

2) Where the sanitary sewer crosses over with at least 18 inches or less than 18 inches below a water main, utilize one of the following within 10 feet measured edge-to-edge horizontally, centered on the crossing:

a) Construct sanitary and combined sewers of water main material meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.

b) Enclose the water main in a watertight casing pipe with an evenly spaced annular gap and watertight end seals.

3) When impossible to maintain an 18 inch vertical separation when the sanitary sewer crosses over the water main, maintain a minimum vertical separation of 6 inches and utilize both of the following within 10 feet measured edge-to-edge centered on the crossing:

a) Construct sanitary and combined sewers of water main material meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications, and

b) Enclose the water main in a watertight casing pipe with an evenly spaced annular gap and watertight end seals.

b. Storm Sewers.

1) Vertically separate storm sewers from water mains by at least 18 inches measured between the outside edges of the water main and the storm sewer. Maintain the maximum feasible separation distance in all cases. Ensure the sewer and water pipes are adequately supported. Use a low permeability soil for backfill material within 10 feet of the point of crossing.

2) When impossible to maintain an 18 inch vertical separation when the water main crosses over the storm sewer, maintain a minimum vertical separation of 6 inches and utilize one of the following within 10 feet measured edge-to-edge centered on the crossing:

a) Construct the water main of ductile iron pipe with gaskets impermeable to hydrocarbons.

b) Enclose the water main in a watertight casing pipe with evenly spaced annular gap and watertight end seals.

c) Construct storm sewer pipe of water main materials meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.

d) Construct storm sewers of reinforced concrete pipe with gaskets manufactured according to ASTM C 443 meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.

3) When impossible to maintain an 18 inch vertical separation when the storm sewer crosses over the water, maintain a minimum vertical separation of 6 inches and utilize both of the following within 10 feet measured edge-to-edge centered on the

crossing:

a) Construct the water main of ductile iron pipe with gaskets impermeable to hydrocarbons, and

b) Construct storm sewers of reinforced concrete pipe with gaskets manufactured according to ASTM C 443 meeting the requirements of Article 2553.02, A, 2 of the Standard Specifications.

c. Surface Water Crossings.

Comply with the Recommended Standards for Water Works, 2012 Edition.

1) Above-water Crossings: Ensure the pipe is adequately supported and anchored; protected from vandalism, damage, and freezing; and accessible for repair or replacement.

2) Underwater Crossings: Provide a minimum cover of 5 feet over the pipe unless otherwise specified in the contract documents. When crossing water courses that are greater than 15 feet in width, provide the following:

a) pipe with flexible, restrained, or welded watertight joints,

b) valves at both ends of water crossings so the section can be isolated for testing or repair; ensure the valves are easily accessible and not subject to flooding, and

c) permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source.

G. Transitions In Piping Systems.

Where the specified material of a piping system entering or exiting a structure changes, make the change at the outside of the structure wall, beyond any wall pipe or wall fitting required, unless otherwise specified.

H. Structure Penetrations.

1. Wall Pipes.

a. Install where pipes penetrate and terminate at a wall or floor surface of a concrete structure, or where the pipe protrudes through the concrete wall or floor and the protrusion is otherwise unsupported.

b. Provide a waterstop flange near the center of the embedment length. The waterstop is to be cast integrally with the wall pipe, or fully welded to it around the pipe circumference.

2. Wall Sleeves.

a. Install where a pipe passes through a structure wall.

b. Sleeves in concrete walls are to be supplied with a waterstop collar, fully welded, and cast- in-place in the concrete.

I. Water Service Stub.

1. Coordination – See Article SP-230189.01, F, 4. Municipal Code “CHAPTER 12, WATER SERVICE” applies to water services.

2. Provide service tap and connection for each lot or property or as otherwise shown on the plans.

3. Prepare the site and make preparatory excavation at the location for the tap. Make taps at ten o’clock or two o’clock position unless corporation would have less than 5 feet of cover. When 5 feet of cover is not available, tap may be rotated downward no farther than the midpoint of the pipe.

4. Taps shall be no closer than 24 inches from the pipe bell or other corporation. Tapping saddle is required for all taps.

5. Wrap copper service lines with polyethylene to a point 4 feet from tap.

6. Copper service lines are to be continuous between the corporation stop and curb stop. If a joint is required, connect using a silver soldering method.

7. Provide fittings to accommodate differences in diameters between existing and proposed water service lines.

8. Flush and release air from all service lines replaced or reconnected.

J. Testing And Disinfection.
Test and disinfect according to Special Provisions for Testing and Disinfection.

K. Water Main Abandonment.
Verify with the Water Division that all services are no longer using the main to be abandoned.

1. Water mains to be abandoned in place must use mechanical devices specifically devised for such purposes to seal the ends of the pipe.

2. Mechanical joint plugs or mechanical joint caps with watertight gaskets must be installed at the termination points of the abandoned water main.

3. Install a MJ cap using a retaining gland according to Standard Road Plan WM-101 on the end of each pipe to be abandoned and each active pipe.

4. Specially fabricated, watertight gaskets are required, as directed by the Engineer, where water main exists in contaminated soil areas.

5. Oversized mechanical joint caps or plugs may be required depending upon the outside diameter of the existing water pipe.

6. Fill the pipe to be abandoned by pumping with flowable mortar, foamed cellular concrete, or CLSM.

L. Water Main Removal.
Verify with the Water Division that all services are no longer using the main and have been disconnected from the main to be removed.

1. Construct thrust block on each end of the active pipes according to Standard Road Plan WM-101.

2. Cut pipe to be removed a minimum of 5 feet from the closed valve on each end of the active pipes leaving a minimum of 12 inches of pipe exposed beyond the thrust block.

3. Install MJ cap using a retaining gland according to Standard Road Plan WM-101 at the end of each active pipe.

4. Oversized mechanical joint caps or plugs may be required depending on the outside diameter of the existing water pipe.

M. Water Service Line Abandonment.

1. Coordination – See Article SP-230189.01, F, 4. Municipal Code “CHAPTER 12, WATER SERVICE” applies to water services.

2. Disconnect water service at the main. The location of mains, where known, will be provided

by the City. The Contractor may be required to schedule excavations in certain streets in accordance with the requirements of the City. Methods of work on mains and services will be subject to prior approval and inspection by the Engineer.

3. Those water services controlled by a corporation stop on the main shall be disconnected at the main by closing the corporation stop and disconnecting the service line. Install a cap or corporation nut on the corporation stop. Upon completion of a water service disconnect, and inspection of the same.

4. Curb stops and risers must be completely removed from all abandoned service lines. The remaining service line, running toward the property, must be terminated in the following fashion:
   a. **Copper:** Install a copper cap using a silver soldering method.
   b. **Lead:** Flatten a minimum of 8 inches of lead pipe end, fold a minimum of 2 inches of flattened end back 180 degrees, then re-flatten forming a folded seal on the tail of the lead service line material.

5. All service lines larger than 2 inch, or manufactured from materials other than copper or lead, must be terminated at a point closest to the water main. Remove tapping valves from their associated tapping sleeves. Install a blind flange on the tapping sleeve, where possible, after the tapping valve is removed. If a blind flange cannot be installed, then cut the tapping sleeve out of the water main and insert a new spigot piece of water pipe in its place with pipe couplings.

6. Service lines that are terminated at a tee must be sealed by installing a mechanical plug, cap, or flange at the outlet of the tee. If this method of abandonment is not possible, at the direction of the Engineer, the tee must be cut out of the water main and a new spigot piece of pipe be inserted in its place. Unless this approach is called for on the drawings or in the contract documents, a change order to the contract price will be negotiated.

230189.04 METHOD OF MEASUREMENT.

A. Water Main.

1. **Trenched.**
   Each type and size of pipe installed in an open trench will be measured in linear feet along the centerline of the pipe, including the length through the fittings.

2. **Trenchless.**
   Each type and size of pipe installed by trenchless methods will be measured in linear feet along the centerline of the pipe.

3. **Removal.**
   Each type and size of pipe removed will be measured in linear feet from end to end along the centerline of the pipe.

4. **Abandonment, Fill and Plug.**
   Each type and size of pipe abandoned by filling and plugging will be measured in linear feet from end to end along the centerline of the pipe.

B. Water Main with Casing Pipe.

1. **Trenched.**
   Each type and size of pipe with casing pipe installed in an open trench will be measured in linear feet along the centerline of the casing pipe from end of casing to end of casing.

2. Trenchless.
Each type and size of pipe installed by trenchless methods with casing pipe will be measured in linear feet along the centerline of the casing pipe from end of casing to end of casing.

C. Fittings.
Each type and size of fitting installed as specified in the contract documents or as required for proper installation of the water main will be counted. Determine the total weight of fittings counted, in pounds, based on the standard fitting weights published in AWWA C153 for Ductile Iron Compact Fittings.

D. Water Service Stubs by Each.

1. Trenched.
Each type and size of water service stub from the water main to the stop box will be counted.

2. Trenchless.
Each type and size of water service stub from the water main to the stop box will be counted.

E. Water Service Stubs by Length.

1. Water Service Pipe, Trenched.
Each type and size of water service pipe will be measured in linear feet along the centerline of the pipe.

2. Water Service Pipe, Trenchless.
Each type and size of water service pipe will be measured in linear feet along the centerline of the pipe.

3. Water Service Corporation.
Each type and size of tapping saddle and water service corporation will be counted.

4. Water Service Curb Stop and Box.
Each type and size of water service curb stop and box will be counted.

F. Rigid Foam Board Insulation.
Measurement will be in square feet for insulation placed.

230189.04 METHOD OF MEASUREMENT AND BASIS OF PAYMENT.

A. Water Main.

1. Trenched.
Payment will be made at the unit price per linear foot for each type and size of pipe. Unit price includes, but is not limited to, trench excavation; dewatering; furnishing and installing pipe and gaskets; furnishing, placing, and compacting bedding and backfill material; and furnishing and installing tracer system and polyethylene wrap for ductile iron pipe and for fittings.

2. Trenchless.
Payment will be made at the unit price per linear foot for each type and size of pipe. Unit price includes, but is not limited to, furnishing and installing pipe and gaskets; trenchless installation materials and equipment; pit excavation; dewatering; placing and compacting backfill material; and furnishing and installing tracer system and polyethylene wrap for ductile iron pipe and for fittings.

3. **Removal.**
   Payment will be made at the unit price per linear foot for each type and size of pipe. Unit price includes, but is not limited to, trench excavation; removal and disposal of pipe; cutting and capping of pipe, and thrust blocks (if necessary); and furnishing, placing, and compacting bedding and backfill material.

4. **Abandonment, Fill and Plug.**
   Payment will be made at the unit price per linear foot for each type and size of pipe. Unit price includes, but is not limited to, trench excavation; dewatering; cutting and capping of pipe; furnishing and pumping flowable material to fill the pipe to be abandoned; and furnishing, placing, and compacting bedding and backfill material.

B. Water Main with Casing Pipe.

1. **Trenched.**
   Payment will be made at the unit price per linear foot for each type and size of carrier and casing pipe. Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, and gaskets; trench excavation; dewatering; furnishing, placing, and compacting bedding and backfill material; furnishing and installing casing spacers, end seals, and annular space fill material; and furnishing and installing tracer system and polyethylene wrap for ductile iron pipe and for fittings.

2. **Trenchless.**
   Payment will be made at the unit price per linear foot for each type and size of carrier and casing pipe. Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, and gaskets; trenchless installation materials and equipment; pit excavation; dewatering; furnishing, placing and compacting bedding and backfill material; furnishing and installing casing spacers, end seals, and annular space fill material; and furnishing and installing tracer system and polyethylene wrap for ductile iron pipe and for fittings.

C. Fittings.
Payment will be made at the unit price per pound for the total weight of all fittings counted. Unit price includes, but is not limited to, restrained joints, gaskets, and thrust blocks.

D. Water Service Stubs by Each.

1. **Trenched.**
   Payment will be made at the unit price for each type and size of water service stub. Unit price includes, but is not limited to, furnishing tapping saddle and corporation stop; furnishing and installing service pipe, curb stop, stop box, and locking lid for stop box (in sidewalk or driveway pavement only); trench excavation; dewatering; furnishing, placing, and compacting bedding and backfill material; furnishing and installing polyethylene wrap; connection to existing service pipe; verification of private water service lines; and abandonment or removal of existing service pipe, curb stop, and stop box (if necessary).

2. **Trenchless.**
   Payment will be made at the unit price for each type and size of water service stub. Unit price includes, but is not limited to, furnishing tapping saddle and corporation stop; furnishing and installing service pipe, curb stop, stop box, and locking lid for stop box (in sidewalk or driveway pavement only); trenchless installation materials and equipment; pit excavation; dewatering; furnishing, placing, and compacting bedding and backfill material; furnishing and installing polyethylene wrap; connection to existing service pipe; verification of private water service lines; and abandonment or removal of existing service pipe, curb stop, and stop box (if necessary).

E. Water Service Stubs by Length.

1. **Water Service Pipe, Trenched.**
   Payment will be made at the unit price per linear foot of each type and size of water service pipe. Unit price includes, but is not limited to, trench excavation; dewatering; furnishing and installing service pipe; furnishing, placing, and compacting bedding and backfill material; furnishing and installing polyethylene wrap; connection to existing service pipe; verification of private water service lines; and abandonment or removal of existing service pipe, curb stop, and stop box (if necessary).

2. **Water Service Pipe, Trenchless.**
   Payment will be made at the unit price per linear foot of each type and size of water service pipe. Unit price includes, but is not limited to, trenchless installation materials and equipment; pit excavation; dewatering; furnishing and installing service pipe; furnishing, placing, and compacting backfill material; furnishing and installing polyethylene wrap; connection to existing service pipe; verification of private water service lines; and abandonment or removal of existing service pipe, curb stop, and stop box (if necessary).

3. **Water Service Corporation.**
   Payment will be made at the unit price for each type and size of tapping saddle and water service corporation. Unit price includes, but is not limited to, trench excavation (if necessary); furnishing tapping saddle and water service corporation; connection to service pipe; and furnishing, placing, and compacting bedding and backfill material.

4. **Water Service Curb Stop and Box.**
   Payment will be made at the unit price for each type and size of water service curb stop and box. Unit price includes, but is not limited to, trench excavation (if necessary); furnishing and installing curb stop, stop box, and locking lid for stop box (in sidewalk or driveway pavement only); furnishing, placing, and compacting bedding and backfill material; furnishing and installing additional pipe for connection to existing service pipe; verification of private water service lines; and isolation of the existing water service line (crimp or freeze), and removal of existing curb stop and stop box (if necessary).

F. Rigid Foam Board Insulation.
Payment will be made at the unit price per square foot of insulation. Unit price includes, but is not limited to, trench excavation (if necessary); furnishing and placing insulation adjacent to pipe; and furnishing, placing, and compacting bedding and backfill material.