

SECTION 02615

WATER MAINS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Installing and repairing water mains and fittings, in excess of 2" diameter.

B. Related work specified elsewhere:

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|----|---|---------------|
| 1. | Boring and Jacking: | Section 02150 |
| 2. | Trenching, Backfilling, and Compacting: | Section 02221 |
| 3. | Soil Erosion and Sedimentation Control: | Section 02270 |
| 4. | Finish Grading, Seeding, and Sodding: | Section 02485 |
| 5. | Valves and Fire Hydrants: | Section 02640 |
| 6. | Water Service Connections: | Section 02642 |
| 7. | Testing and Disinfecting Water Mains: | Section 02653 |
| 8. | Cement Concrete for Utility Construction: | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Water Works Associations (AWWA) most recent revisions:

- C104 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe Fittings for Water
- C105 Polyethylene Encasement for Ductile Iron Pipe Systems
- C110 Gray Iron and ductile Iron Fittings 3-inch through 48 inches
- C111 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
- C115 Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges
- C116 Protective Fusion-Bonded Epoxy Coatings for Interior & Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Supply Service
- C150 Thickness Design of Ductile Iron Pipe
- C151 Ductile Iron Pipe for Water or other Liquids
- C153 Ductile Iron Compact Fittings, 3 inch through 24 inch for Water Service
- C600 Installation of Ductile Iron Water Mains and Appurtenances

B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

1.03 SUBMITTALS

A. Manufacturers' Literature:

1. Submit two copies of manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints for approval of the Engineer. Include manufacturers' recommendations for deflection in pipe joints.

B. Certificates:

1. Submit two copies of certifications for each type of pipe, fittings, gaskets, lubricants or other joint materials from the manufacturers attesting that each of these meets or exceeds specifications requirements.

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCTS DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

1. Do not place materials on private property without written permission from the property Municipality.
2. During loading, transporting and unloading, exercise care to prevent damage to materials.
3. Do not drop pipe or fittings. Avoid shock or damage at all times.
4. Use padded slings, hooks and tongs to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

1. Do not stack higher than Maximum Staking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.
2. Keep interior of pipe and fittings free from dirt, water or other foreign matter.
3. Store gaskets for mechanical and push-on joints in cool location out of direct sunlight and not in contact with petroleum products.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Ductile Iron Pipe: AWWA C151, minimum 6" diameter.

1. Cement mortar lined in accordance with AWWA C104.

2. Class as indicated on the Construction Drawings, minimum Class 52.

B. Ductile Iron and Cast Iron Fittings: AWWA C110:

1. Cement mortar lined in accordance with AWWA C104.

2. Pressure rating as indicated on the Construction Drawings, minimum 350 psi for mechanical joint; 250 psi for flanged joint.

3. All tees and bends deflecting 22.5 degrees or more require a concrete thrust block.

C. Joints:

1. Mechanical or push-on joints conforming with AWWA C111.

2. Flanged joints conforming with AWWA C110 and AWWA C115.

D. Wedges: Brass wedges in joints shall be McWane or equal.

2.02 REPAIR PRODUCTS

A. Couplings - as approved by the Municipality.

B. Clamps

1. Gridded gasket

2. Full gasket coverage

3. Stainless steel hardware

4. Stainless steel material

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavate trenches as specified in Section 02221 to a point 6" below invert grade with bell holes dug as required. Provide at least 3'-6" ft. of cover from the top of the pipe to the finished grade elevation.

3.02 PIPE BEDDING

A. Place select excavated material as bedding.

B. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported for the entire length of the barrel.

3.03 PIPE LAYING

- A. Clean and inspect each length of pipe or fitting before lowering in the trench. Do not lower pipe into the trench except that which is to be immediately installed.
- B. Lay pipe to a uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings, and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- C. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.
- D. Assemble joints as recommended by the manufacturer. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement.
- E. Check each pipe installed as to line and grade in place. Correct deviations immediately. Deflection of pipe joints in excess of maximum recommended by manufacturer will be cause for rejection.
- F. Install fittings and valves as pipe laying progresses. Do not support weight of fittings and valves from pipe.
- G. When the work is not in progress, and at the end of each work day, securely plug the ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- H. Backfill concurrently with pipe laying to hold installed pipe in place. When pipe laying is terminated for any reason, provide at least 2 feet of backfill over all pipe except the last piece laid and the joints. Do not use flowable fill containing fly ash with ductile iron pipe.
- I. Joint Assembly
 - 1. Push-on Joints:
 - a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
 - b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
 - c. Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.
 - d. Install 3 brass wedges between bell and spigot to ensure electrical continuity.

2. Mechanical Joints:

- a. Wash the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180° apart, alternately.

Torque Required:

<u>Bolt Size, In.</u>	<u>Torque, Ft.-Lbs.</u>
5/8	40 - 60
3/4	60 - 90
1	70 - 100

- J. The Municipality will inspect water mains and all testing before backfill is placed. Backfill to half -O.D. of pipe only unless otherwise directed by the Municipality.

3.04 CUTTING

- A. Cut pipe full depth with rotary wheel cutter or saw without damaging pipe or lining.
- B. Grind cut ends and rough edges smooth. Bevel end for push-on joints.

3.05 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits as follows:
 - 1. Ductile Iron Pipe: <12" dia. - 5° maximum deflection per joint.
>12" dia. - 3° maximum deflection per joint.

3.06 THRUST RESTRAINT

- A. Provide all valves, tees, bends, caps, and plugs with concrete thrust blocks in accordance with Standard Detail 03050-3. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair.
- B. Furnish and install tie rods, clamps, set screw retainer glands, or restrained joints if indicated on the Construction Drawings or required by the Engineer. Protect metal restrained joint components against corrosion by applying a bituminous coating.

3.07 SPECIAL CONDITIONS

- A. Connections to existing facilities.

- 1. Construct connections as shown on the Construction Drawings.
- 2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the Municipality.
- B. Stream Crossings: See Section 02221.
- C. Highway and Railroad Crossings:
 - 1. Install water mains crossing under highways and railroads as shown on the Construction Drawings. Comply with Railroad Company, Pennsylvania Department of Transportation, and municipal permits acquired for contract.
 - 2. When casing pipe is indicated, install as specified in Section 02150.
- D. Bridge or Aerial Crossings:
 - 1. For aboveground water mains attached to a bridge or other structural supports, furnish and install all supports, hangers and fastenings as shown on the Construction Drawings.
 - 2. Provide insulation and jacket as indicated on the Construction Drawings.
- E. Wall Sleeves:
 - 1. Provide pipes passing through concrete or masonry construction with sleeves and mechanical seal of the type and size required or as indicated on the Construction Drawings.

3.08 COMPLETION

- A. Test and disinfect water mains as specified in Section 02653.

3.09 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 02221.
- B. Restore other areas in accordance with local regulations.

END OF SECTION