

SECTION 33 11 16.00
FACILITY WATER DISTRIBUTION PIPING (Water Mains)

PART 1 GENERAL**1.1 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:
1. Earth Moving (Trenching, Backfilling and Compacting): Section 31 20 00.02
 2. Erosion and Sedimentation Controls: Section 31 25 00
 3. Concrete (Trench Paving and Restoration): Section 32 13 13.02
 4. Concrete (Cement Concrete for Utility Construction): Section 32 13 13.03
 5. Facility Water Distribution Piping (Valves and Fire Hydrants): Section 33 11 16.02
 6. Facility Water Distribution Piping (Testing and disinfecting): Section 33 11 16.03
- C. Definitions: NONE
- D. Applicable Standard Details: NONE

1.2 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
 - C200 Steel Water Pipe 6 inches and Larger
 - C203 Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape Hot Applied
 - C205 Cement Mortar Protective Lining and Coating for Steel Water Pipe 4 inch and Larger - Shop Applied
 - C206 Field Welding of Steel Water Pipe
 - C207 Steel Pipe Flanges
 - C300 Reinforced Concrete Pressure Pipe, Steel Cylinder Type
 - C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and other Liquids
 - C302 Reinforced Concrete Pressure Pipe, Non-Cylinder Type, for Water and other Liquids
 - C303 Reinforced Concrete Water Pipe, Steel Cylinder Type, Pretensioned
 - C304 Design of Prestressed Concrete Cylinder Pipe Asbestos-Cement Pipe
 - C400 Asbestos-Cement Pressure Pipe, 4 inch through 16 inch for Water Distribution Systems
 - C401 Selection of Asbestos-Cement Pressure Pipe 4 inch through 16 inch
 - C402 Asbestos-Cement Transmission Pipe, 18 inch through 42 inch for Potable Water & Other Liquids

- C403 Selection of Asbestos-Cement Transmission & Feeder Main Pipe, sizes 18 inch through 42 inch
- C600 Installation of Ductile Iron Water Mains and Appurtenances
- C900 Poly (Vinyl Chloride) (PVC) Pressure Pipe, 4 inches through 12 inches, for water distribution
- 2. American Society for Testing and Materials (ASTM):
 - D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Plastic Pipe (SDR Series)
 - D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

1.3 **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.

1.4 **JOB CONDITIONS:** Section not utilized.

1.5 **PRODUCTS DELIVERY, STORAGE AND HANDLING**

- A. Delivery and Handling:
 - 1. Do not place materials on private property without written permission from the property OWNER.
 - 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 Stacking 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

2.1 **PIPE, FITTINGS AND JOINTS**

- A. Ductile Iron (DI):
 - 1. Ductile Iron Pipe: AWWA C150 and C151:
 - a. Cement mortar lined in accordance with AWWA C104.
 - b. Class, as indicated on the Contract Drawings, minimum Class 52.
 - 2. Ductile Iron and Cast Iron Fittings: AWWA C110:

- a. Cement mortar lined in accordance with AWWA C104.
 - b. Pressure rating as indicated on the Contract Drawings, minimum 350 psi for mechanical joint; 250 psi for flanged joint.
- 3. Joints:
 - a. Mechanical confirming with AWWA C111.
- B. Poly (Vinyl Chloride) (PVC) Plastic Pipe:
 - 1. Pipe:
 - a. Outside diameter dimension pipe: AWWA C900, pressure class and dimension ratio as indicated on the Contract Drawings.
 - 2. Manufactured from Poly (Vinyl Chloride) 1120 or 1220.
 - 3. National Sanitation Foundation Seal of Approval for use with potable water required.
 - 4. Joints: Push-on: ASTM D3139.
 - 5. Fittings: Cast or ductile iron fittings for PVC pressure pipe: AWWA C110.

2.2 **REPAIR PRODUCTS**

- A. Couplings:
 - 1. Threaded Compression ($\frac{1}{2}$ " - 2" nominal diameter pipe)
 - a. Short or long body style.
 - b. Conductive gasket.
 - c. 150 psi pressure rating.
 - d. Ductile iron material.
 - 2. Bolted Compression (4" - 12" nominal diameter pipe)
 - a. Where ever possible, the CONTRACTOR shall use manufactured fittings to connect to existing pressurized lines (*e.g.*, using ductile iron MJ elbow fittings).
 - b. Where ever the CONTRACTOR cannot use a manufacturer fitting, such as an elbow, to connect to existing pressurized lines, the CONTRACTOR shall use a wide range restrained coupling, ROMAC ALPHA Restraint Coupling or approved equal. Product shall be a Mechanical Joint Restraint: Integral, full circumferential, extended range, stab-fit, segmented, and serrated mechanical restraint system to provide a fully restrained and pressure rated connection on plain end pipe(s). Connection shall maintain a restrained, bubble tight seal under applied operating pressure(s), without the need for continuous bolt torque. For multipurpose use on similar or dissimilar pipe diameters on a variety of acceptable pressure class pipe materials; DI, CI, PVC (C900, C909 & IPS) and HDPE (DR 9 thru 17 pipe stiffeners not required). Center Ring, End Ring(s), Bolt Guide(s) and Grippers are cast ductile iron, meeting or exceeding ASTM A536, Grade 65-45-12. Center Ring is Romacoat fusion bonded epoxy certified and listed to ANSI/NSF 61 & 372. End Ring(s) and Bolt Guide(s) are Romabond polyester. Segmented grippers are machine sharpened, heat treated, and Xylan 1424 coated. Gaskets are SBR (or optional NBR) compounded for water and sewer service to ASTM D2000, certified & listed ANSI/NSF 61 & 372. Draw Hooks, Bolt(s) and Nut(s) are Type 304 stainless steel (or optional 316 B&N), with heavy hex nut(s) E-Coat epoxy. Ramp Runners are Nylon 66, Black, 14% Glass filled.
 - 3. Flared Couplings
- B. Clamps
 - 1. Gridded gasket
 - 2. Full gasket coverage
 - 3. Stainless steel hardware

4. Stainless steel material

PART 3 EXECUTION

3.1 EXCAVATION

- A. The CONTRACTOR shall excavate to locate all existing connection points, and shall verify existing water line location, depth, size, and material type prior to starting construction. Immediately notify the ENGINEER of any discrepancies.
- B. Excavate trenches as specified in Section 31 20 00.02. Provide at least 4 ft. of cover from the top of the pipe to the finished grade elevation.
- C. The CONTRACTOR shall exercise great care to not create unvented high points. The CONTRACTOR shall install water line piping not on the basis of offset (depth) based upon existing grade, but on the basis of preventing the creation of unvented high points.

3.2 PIPE BEDDING

- A. Provide bedding as shown on Contract Drawings.
- 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.

3.3 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. Lubricate pipe and gaskets 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.
- 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.
 - 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 degrees apart, alternately. Torque Required:

<u>Bolt Size, Inches</u>	<u>Torque, Ft. - Lbs.</u>
5/8	45 - 60
3/4	75 - 90
1	100 - 120

3.4 CUTTING

- A. Saw cut pipe full depth without damaging pipe or lining.
- B. Grind cut ends and rough edges smooth. Bevel end for push-on joints.

3.5 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits as follows, unless approved by ENGINEER:
 1. Ductile Iron Pipe: <12" dia. - 5° maximum deflection per joint.
>12" dia. - 3° maximum deflection per joint.
 2. PVC Pipe: 4 degree maximum deflection per joint.

3.6 THRUST RESTRAINT

- A. Restrain all valves, tees, bends, caps, plugs or any other changes in direction on pressurized lines. The primary method of restraint shall be mechanical. Concrete thrust blocks shall not be acceptable as the primary or sole means of joint restraint. CONTRACTOR shall furnish and install EBAA MEGALUG or similar products by EBAA for joint restraint on pressurized pipe lines. No other products shall be considered to be suitable, by the ENGINEER. B. All fittings, valves, etc., shall be ductile iron, mechanical joint, with mechanical restraints. All shall be fully-restrained.

3.7 SPECIAL CONDITIONS

- A. Connections to existing facilities:
 1. The CONTRACTOR shall verify pipe material and size. The CONTRACTOR shall provide a shop drawing of connection to existing line.
 2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the ENGINEER.

3.8 COMPLETION

- A. Test and disinfect water mains as specified in Section 33 11 16.03.

3.9 SURFACE RESTORATION

- A. Restore unpaved areas in accordance with Section 31 20 00.02.
- B. Restore other areas in accordance with Section 32 13 13.02.

END OF SECTION