# SEWER MAIN ON BRIDGE

**From Barre Town BRF 6100(7)

xx. DESCRIPTION. This work shall consist of the installation and testing of a sanitary sewer main on a bridge within the limits indicated on the Plans.

The work under this Section shall be performed in accordance with these provisions, the Plans, and Section 628 of the Standard Specifications.

xx. REFERENCE STANDARDS. Information and requirements contained in these provisions are based on the most recent version of the following standards:

(a) AWWA/ANSI Standard C104/A21.4 for Cement-Mortar Lining for Ductile Iron Pipe and Fittings.

(b) AWWA/ANSI Standard C110/A21.10 for Ductile Iron Fittings.

(c) AWWA/ANSI Standard C111/A21.11 for Rubber Gasket Joints for Ductile Iron Pipe and Fittings.

(d) AWWA/ANSI Standard C150/A21.50 for the Thickness Design of Ductile Iron Pipe.

(e) AWWA/ANSI Standard C151/A21.51 for Ductile Iron Pipe, centrifugally cast.

(f) AWWA/ANSI Standard C153/A21.53 for Ductile Iron Compact Fittings.

(g) AWWA Standard C600 for Installation of Ductile Iron Pipe and appurtenances.

xx. SUBMITTALS. The Contractor shall submit the following information prior to beginning the work:

(a) Manufacturers' certified data for each pipe type to be used on the project, including: dimensions, specifications of pipe material, gasket material, pipe class/pressure rating, coatings, and linings.

(b) Manufacturers' certified data for each fitting type to be used on the project, including: dimensions, specifications of fitting material, gasket material, fitting class/pressure rating, coatings, linings, and joint restraints.

(c) Manufacturers' certified data for the bridge mounted pipe support, insulation system, and appurtenances.

xx. QUALITY ASSURANCE. The Contractor shall be thoroughly trained and experienced in the skills and equipment required for installation and testing of wastewater piping.

The Contractor shall protect wastewater piping materials before, during, and after installation. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

Upon direction of the Engineer, the Contractor shall remove, replace, and/or rework all wastewater piping that does not meet the requirements of this Section. The Contractor shall perform all remedial measures at no additional cost to the Owner.

(a) Forcemain Wastewater Piping Testing. Forcemain wastewater piping testing shall be subject to the following requirements:

(1) Engineer and Owner shall witness all testing.

(2) Flush all piping prior to performing pressure testing.

(3) Provide proper thrust restraint for all fittings and valves.

(4) Test equipment shall have pressure relief valves so that wastewater system components are not over-pressurized.

(5) The pressure and leakage test shall include all services. The Contractor shall provide temporary "tails" as necessary to allow air to be bled from each service to above grade. After the system has passed the necessary tests and prior to weather below freezing temperatures, the Contractor shall dig up each service, and as appropriate for the project, either connect the new service to the existing service, or turn off the curb stop and install a short stub of service piping out of the curb stop with a compression cap, a minimum of 5½ feet below grade.

(6) The pressure and leakage tests shall be performed as a combined hydrostatic test with duration of two hours, at 150% of the normal operating pressure in the piping at the lowest elevation or 200 psi, whichever is greater. The test pressure shall not exceed manufacturer recommendations for any portion of the system.

(7) No wastewater system components will be accepted if the test pressure cannot be maintained within 5 psi of the required pressure for the entire test period.

(8) Leakage is defined as the quantity of water that must be supplied into the piping to maintain the test pressure after the pipe has been filled with water and the air expelled.

(9) No wastewater system components will be accepted if the leakage is greater than that determined by the following formula:

L = (SD/P)/(144,800) where

L = the allowable leakage in gallons per hour;
S = the length of pipe being tested;
D = the nominal diameter of the pipe in inches;
P = the average test pressure in psi (gauge).

(10) The Contractor shall make all repairs or replacements necessary to obtain passing test results, at no additional expense to the Owner.

(11) The maximum length of pipe to be pressure and leakage tested at one time shall not exceed 1,200 feet. The Contractor shall provide all necessary temporary connections, valves, and piping to allow proper expulsion of air and connection of test equipment, at no additional cost to the Owner.

(b) Gravity Wastewater Piping Testing. Gravity wastewater piping testing shall be subject to the following requirements:

(1) Engineer and Owner shall witness all testing.

(2) Visual Inspection. The Engineer and the Contractor shall lamp the new piping to check for a full moon to determine if accurate line was maintained.

(3) Mandrel Test of PVC Piping.

a. Mandrel testing shall not be completed until at least 30 days after installation of piping to be tested, or as required by the Engineer.

b. Flush all piping prior to performing mandrel testing.

c. Testing for deflection shall be done by pulling a properly sized “go, no-go” mandrel through all installed gravity wastewater piping. The mandrel shall be constructed so that it will only pass through piping with deflections of less than 5%. No mechanical pulling devices shall be used. Provisions shall be used during testing to allow mandrel to be “backed out”.

d. Piping exceeding the 5% allowable deflection shall be replaced at no additional cost to the Owner.

(4) Exfiltration Test.

a. Flush all piping prior to performing exfiltration testing.

b. Testing shall not be performed until all service connections are installed, but before they are connected.

c. The Table below indicates minimum test times for various pipe sizes.

| Diameter (inches) | Time (sec./100 ft) |
|---|---|
| 3 | 10 |
| 4 | 18 |
| 6 | 40 |
| 8 | 70 |
| 10 | 110 |
| 12 | 158 |
| 15 | 248 |
| 18 | 356 |
| 21 | 485 |
| 24 | 634 |

d. All pipe outlets shall be plugged with test plugs. Brace all plugs securely.

e. Test equipment shall have pressure relief valves so that piping is not over-pressurized.

f. Slowly increase air pressure in section of piping being tested until it reaches 4.0 psi greater than the average back pressure of any groundwater that may submerge the pipe.

g. Allow the air temperature to stabilize for 2 minutes.

h. When pressure decreases to 3.5 psi greater than the average back pressure of any groundwater that may submerge the pipe, begin timing test.

i. Determine the amount of time required for the air pressure to drop to 2.5 psi greater than the average back pressure of any groundwater that may submerge the pipe.

j. If the time required for the pressure to drop from 3.5 psi to 2.5 psi is less than the minimum time required, the test fails.

k. The Contractor shall make all repairs or replacements necessary to obtain passing test results, at no additional expense to the Owner.

l. Do not remove plugs until internal line pressure is completely released.

xx. MATERIALS.

(a) Wastewater Piping.

(1) Pipe material and size for different applications shall be as indicated on the Plans, meeting applicable reference standards and the following requirements, as applicable:

a. Ductile Iron Wastewater Pipe shall meet the referenced standards and the following requirements, as applicable:

1. Pipe shall be Pressure Class 350.

2. Pipe and fittings shall be cement mortar lined and seal coated.

3. Pipe and fittings shall be coated on the outside with bituminous coating. Pipe and fittings inside buildings shall have rust inhibitive primer outside coating.

4. Mechanical Joint pipe, where indicated on the Plans, shall be installed with mechanical joint restraints.

5. Restrained Push-On Joint pipe, where indicated on the Plans, shall be "Field Lock" Gasket System restrained push-on joint type, as manufactured by U.S. Pipe & Foundry Co.

6. Pipe shall be furnished in 18 to 20 foot laying lengths.

7. Pipe shall be manufactured by Atlantic States Pipe Company, Clow, U.S. Pipe, Griffin, or McWane Pipe Company.

(2) Each pipe length and fitting shall be clearly marked with the manufacturer's name or trademark, nominal pipe size, material designation, dimension ratio, pressure class, and ASTM designations.

(b) Fittings.

(1) Provide all necessary fittings, couplings, and accessories, whether or not specifically shown on the

Plans.

(2) Ductile Iron mechanical joint fittings shall be Class 350 compact style as manufactured by Tyler Pipe.

(3) All mechanical joints and fittings for DI and PVC pipe shall have Mega-Lug mechanical joint restraints as manufactured by EBAA Iron Sales, Inc., or "Uni-Flange Wedge Action" mechanical joint restraints as manufactured by Ford Meter Box Co., of the proper style for the pipe type being restrained.

(4) Couplings for joining proposed non-pressure pipes to existing pipe of different diameters and/or materials shall be Fernco flexible sewer couplings. Couplings and gaskets shall be of appropriate style and size for the pipes being connected.

(5) Provide all necessary equipment, gauges, piping, pumps, and personnel required for testing.

(6) Thermal expansion joints shall be EBAA Iron Works "Extend 200 #208-M1," the equivalent manufactured by Ford Meter Box, or approved equal.

(c) Pipe Insulation.

(1) The pipes shall be insulated with a factory installed, void free, urethane insulation process, with an integral conduit for electrical heat trace cable and a factory applied jacket by Urecon Pre-Insulated Pipe, the equivalent manufactured by Insul-Tek, or approved equal. System Service Temperature Range: $-49^{0}$F to $+185^{0}$F.

(2) Pipe insulation shall be 2 inch thick urethane insulation. Insulated pipe shall be installed with a 0.175 inch, UV resistant, high density polyethylene (Type III, Category 5, Class C, Grade P34 resin) jacket as supplied and installed by the insulation manufacturer.

(3) Form fitting insulation/jacket kits shall be used to field insulate bends and other fittings, according to manufacturer's recommendations.

(4) Insulated pipe joints shall be completed with the use of pre-fabricated urethane half shells and a pre-rolled sheet stock of the same material and gauge as the outer jacket.

(5) Bearing plates, as recommended by the insulation manufacturer, shall be installed at all pipe hangers.

(d) Material Storage and Handling. Material storage and handling shall be performed in accordance with the following requirements:

(1) Furnish slings, straps, and other devices to support pipe and fittings when lifted. Do not drop or drag pipe or fittings from trucks onto the ground or into the trench.

(2) Handle and transport pipe and fittings to insure they are in sound, undamaged condition and to prevent damage to coating and lining.

(3) Examine all pipe and fittings before installing. Defective or damaged materials shall be rejected.

(4) Pipe or fittings with damaged coatings and/or linings shall be rejected.

(5) Cracked or chipped pipe or fittings shall be rejected.

(6) If defective pipe or fittings are discovered after installation, the Contractor shall remove and replace the defective piece(s) at no additional cost to the Owner.

(7) Plastic pipe and fittings shall be protected from direct sunlight for prolonged periods, to avoid deterioration of the material.

(8) Extra care shall be taken when handling plastic pipe and fittings in freezing conditions, due to the reduced impact resistance and flexibility.

xx. GENERAL CONSTRUCTION REQUIREMENTS.

(a) Control of Grade and Alignment. Control of grade and alignment shall be performed in accordance with the following requirements:

(1) Levels and transits shall be used to establish line and grade for wastewater piping.

(2) Pipe lasers shall be used to maintain gravity wastewater piping on line and grade.

(3) Pipe and fittings shall be laid accurately to the lines, grades, and locations indicated on the Plans.

(b) Installation. Installation shall be performed in accordance with the following requirements:

(1) Wastewater piping, building services, and appurtenances shall be installed according to the Plans.

(2) Pipe shall be laid accurately to the lines and grades indicated on the Plans.

(3) All pipe shall be assembled per the manufacturer's recommendations.

(4) All field cut pipe ends shall be chamfered to avoid damage to the gasket and facilitate assembly. When cutting of pipe is required, the cutting shall be done with power saws. Cut ends shall be smooth and at right angles to the pipe. Cut pipe ends shall be beveled and de-burred on interior and exterior.

(5) Do not join pipe or fittings under water.

(6) Open ends of pipe shall be temporarily plugged or capped to keep deleterious material out. When pipe laying is not in progress, the open ends of the pipe shall be closed with a water tight plug.

(7) Install fittings, bends, service connections, and couplings as necessary. All fittings shall be adequately supported to prevent undue strain on the pipe, fittings, gaskets, and bolts.

(8) Plant batched, poured in place, concrete thrust blocks shall be provided at all directional changes of the main, when restrained pipe joints cannot be used (i.e. connections to existing systems) in compliance with the Plans. Thrust blocks shall not be backfilled within ½ hour of being poured to allow sufficient time for setting of the concrete. Onsite mixed concrete is not acceptable.

(9) Check pipe for alignment and grade before placing initial backfill material.

(10) Test pipe and fittings as specified.

(11) Where wastewater piping are required to cross water mains, the installation shall comply with the following requirements:

a. Water and sewer pipes shall have a minimum vertical clearance of 18 inches.

b. Water and sewer pipe joints shall be located as far apart as possible.

c. The Contractor shall provide structural support for exposed water and sewer lines.

(12) The minimum horizontal clearance between water and sanitary sewer piping is 10 feet, and the minimum horizontal clearance to storm sewers is 5 feet.

(13) In the event that the minimum vertical or horizontal clearances between water and sewer piping cannot be

maintained, the sewer piping must be upgraded and tested to water pipe standards.

(14) Pipe insulation shall be installed on the wastewater piping as shown on the Plans. All overlaps at the joints and fittings shall be 2 inch minimum and shall be field positioned in such a way as to shed water. All exposed ends of insulation shall be coated with an approved waterproofing sealant, as recommended by the supplier, after field cutting or trimming has been carried out.

xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Sewer Main on Bridge) to be measured for payment will be on a unit basis for each sewer main installation on a bridge performed in the complete and accepted work.

xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Sewer Main on Bridge) will be paid for at the Contract lump sum price. Payment will be full compensation for furnishing, transporting, handling, and installing the materials specified; all appurtenant work and materials necessary for a complete installation, including but not limited to pipe, fittings, joint restraints, expansion joints, insulation, jacket, pipe supports, and testing the sewer main system; for making all necessary connections; for making the required submittals; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made as follows:

A payment of 10% of the Contract lump sum price will be made when all required submittals have been made and have been approved by the Agency and the Owner.

An additional payment of 80% of the Contract lump sum price will be made when the new sewer main has been installed on the bridge, all necessary adjustments have been made, all tests have been successfully completed, and the sewer main has been placed in service to the satisfaction of the Engineer and the Owner.

The remaining 10% of the Contract lump sum price will be paid once the new sewer main has provided continuous trouble-free service for a period of 30 calendar days as determined by the Engineer.

Payment for maintaining wastewater flows during construction will be made separately under Contract item 900.645 Special Provision (Maintenance of Wastewater Flows).

Payment will be made under:

| Pay Item | Pay Unit |
|---|---|
| 900.645 Special Provision (Sewer Main on Bridge) (X MM) (X”) | Lump Sum |