

SECTION 02732

SANITARY SEWER FORCE MAINS

PART 1 GENERAL

1.01 RELATED WORK

- A. Section 02225 - Earthwork for Utilities
- B. Section 02750 – Protection, Relocation, and Restoration of Existing Utilities
- C. Section 03300 - Concrete

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. American Water Works Association (AWWA).
- C. American National Standards Institute (ANSI).

1.03 QUALITY ASSURANCE

Each pipe shall be clearly marked as required by governing ASTM standard specifications to show its class, date of manufacture, and name or trademark of manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

- A. DEVELOPER/CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into the WORK.
- B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.
 - 1. Pipe shall not be unloaded by rolling or dropping off trucks.
 - 2. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.
- C. Unload material at site of work, near place where it will be placed in trench.
 - 1. Materials shall be placed for least interference with traffic.
 - 2. Provide signs, lights, and barricades as necessary to protect public.
- D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.
 - 1. Keep interior of pipe, fittings and valves, free of dirt or foreign matter at all times.
 - 2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.01 GENERAL

All force mains shall be ductile iron only.

2.02 DUCTILE IRON PIPE

- A. Shall conform to latest requirements of AWWA C151.
- B. Shall be painted green.
- C. Shall be cement mortar lined in accordance with AWWA C104 standard thickness.
 - 1. Unless otherwise specified, pipe shall have push-on compression type joints conforming to AWWA C111 or AWWA C153 (Latest Editions).
 - 2. Minimum pressure class shall be 350 psi.
- D. Ductile iron pipe for minor creek crossings shall be connected with restrained joints.
- E. Ball-Joint Pipe- Major Creek and River Crossings
 - 1. Shall be manufactured for river crossing applications.
 - 2. Joints shall be boltless.
 - 3. Joints shall be restrained.
 - 4. Joint shall provide up to 15° deflection.

2.04 POLYVINYL CHLORIDE PIPE (PVC)

PVC pipe is not permitted for the installation of sewer force mains.

2.05 CAST AND DUCTILE IRON FITTINGS

- A. Fittings for ductile iron pipe shall be cast or ductile iron and shall conform to requirements of AWWA C110 or AWWA C153 and shall be cement mortar lined in accordance with AWWA C104 standard thickness.
- B. Joints shall conform to AWWA C111.
- C. Fittings shall be mechanical joint unless otherwise specified on Drawings.

2.06 RESTRAINED JOINTS-DIP

- A. Push-on application-Restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket” by U. S. Pipe.
- B. Mechanical joint restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, MJ Field-Lok by U.S. Pipe, or approved equal.
- C. Joint preparation and installation shall be in accordance with manufacturer’s recommendations.

2.07 PLUG VALVES

- A. All plug valves shall be of the tight closing, resilient faced plug type and shall be of the bi-directional eccentric seating so that the opening movement of the plug results in the plug rising off the body seat contact. Valves shall be bubble tight at 175 psi and shall be as manufactured by Pratt, DeZurik, or equivalent.
- B. Valve bodies shall be constructed of cast iron ASTM A-126 Class B, and shall have integrally cast mechanical joint ends or flanged ends. End connections shall meet the following specifications: 125# ANSI B16.1 flange drilling, mechanical joint per AWWA C-111. Mechanical joint connections shall be used unless otherwise specified in the drawings.
- C. Thrust bearing shall be provided at the top and bottom faced surfaces of the plug. Thrust bearings shall be stainless steel.
- D. Handwheel actuators shall be provided for valves larger than six (6) inches in diameter.

2.08 AIR RELEASE VALVES

- A. Air Release valves for sewage applications shall be Golden Anderson Industries, Fig. 925 Standard Sewage Air Release Valve, or equivalent.
- B. The valve shall be supplied with flushing attachments consisting of: bronze shut off and flushing valves, quick-connect couplings, and 5 feet of rubber hose, for backwashing with clean water.
- C. The valve shall be float operated and shall employ a compound lever mechanism to enable the valve to automatically release air and gases from a sewage pipeline while the system is pressurized and operating.
- D. The valve shall close drip-tight, incorporating an adjustable Buna-N orifice button. All internal metal parts shall be stainless steel. The linkage/lever mechanism shall have the capability of being removed from the valve without disassembly of the mechanism. The float shall be stainless steel and capable of withstanding a 1,000 psi test pressure.
- E. Body and cover shall be of cast iron conforming to ASTM A126 Class B. Inlet connection shall be 2" or 3" NPT, or 4" flanged as required. Outlet connection shall be 1/2" NPT.

2.09 AIR/VACUUM VALVES

- A. Air/Vacuum valve shall be Golden Anderson Industries, Fig. 935 Sewage Service Air/Vacuum Valve, or equivalent.
- B. The valve shall be supplied with flushing attachments consisting of: bronze shut off and flushing valves, quick-connect couplings, and 5 feet of rubber hose, for backwashing with clean water.
- C. The valve shall automatically exhaust large quantities of air and gasses while the pipeline or system is being filled and allow air to reenter during draining or when negative pressure exists.
- D. The valve shall be float operated and shall close drip tight against a renewable rubber seat. All internal metal parts shall be made of stainless steel.
- E. Body and cover shall be of cast iron conforming to ASTM A126 Class B. Inlet shall be NPT to 3" size, or 125# flange in 4" and larger as required. Outlet shall be NPT.

2.10 DETECTION TAPE AND WIRE

- A. Detector marking tape shall be non-metallic and shall be installed minimum 2 feet above the pipe. Tape for sewer shall be highly visible green and minimum 2 inches wide. Lettering shall read "Caution: Buried Sewer Line".
- B. Detection wire shall be size #12 AWG solid copper, installed the entire length of the piping. For each joint of pipe, wire shall be looped around pipe a minimum of three (3) times and properly connected to fittings and valves so line can be relocated with a pipe finder after burial. All splices shall be connected with waterproof connectors.

PART 3 EXECUTION

3.01 PIPE LAYING

- A. Excavation and bedding shall be as specified in Section 02225 (Earthwork for Utilities).
- B. Each piece of pipe and each fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in trench. Pipe laying shall begin at the discharge end and proceed toward the Pump Station with the bell ends pointing upstream.
- C. Bell holes shall be sufficient size to allow ample room for making pipe joints properly. Bell holes shall not be cut out more than ten joints ahead of pipe laying. The bottom of trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length as shown on the Development Drawings. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe to avoid sudden offsets or inequalities in flow line.
- D. Water shall not be allowed to run or stand in trench while pipe laying is in progress, before

the joints are completely set, or before trench has been backfilled.

- E. No joints shall be made where pipe or joint materials have been soiled by earth in handling until such soiled surfaces are thoroughly cleaned by wire brushing and wiping until all traces of earth are removed.
- F. Interior of all pipes shall be kept thoroughly clean. After each line of pipe has been laid, it shall be carefully inspected and all dirt, trash, rags and other foreign matter removed from interior.
- G. Backfilling of trenches shall be started immediately after the pipe has been installed. Backfill shall be deposited and compacted as provided under the Section 02225 (Earthwork for Utilities).
- H. Force mains shall be installed so that a minimum grade of 1.0% is always maintained downhill away from a sewage air release valve. If this grade is maintained, entrapped air will always accumulate at the air release valve, and air locking of the force main will be avoided.
- I. Thrust blocking shall be made of Class "D" (2500 psi) concrete as defined in Section 03300 (Concrete).
- J. Full length of each section of pipe shall rest solidly upon the bedding.
 - 1. Any pipe that has its alignment, grade or joints disturbed after laying shall be taken up and relaid.
 - 2. Minimum cover shall be 48 inches. WORK within the Department of Transportation or railroad right-of-ways may have to be deeper than 48 inches according to their minimum requirements.
- K. Lay pipe with bell ends facing in direction of laying against direction of flow.
 - 1. Where pipe is laid on a grade of 10 percent or greater, laying shall start at bottom and shall proceed upward with bell ends of pipe upgrade.
- L. Contractor shall verify that no sewer is being installed in the same trench as a water main or within 10 lateral feet or 18 vertical inches of an existing waterline. Where crossings do occur, the sewer pipe is to be located so that both joints are as far from the water main as possible. If it is impossible to obtain proper horizontal and vertical separation, both the water and sewer shall be constructed complying with requirements for water supply piping and shall be pressure tested to 150 psi to assure water tightness before backfilling. The sewer should also be encased in watertight carrier pipe or concrete, extending 10 feet on both sides of the crossing. See the latest edition of the Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of State Public Health and Engineering Managers, Section 38.3.

3.02 SETTING VALVES AND FITTINGS

- A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for

cleaning, laying and joining pipe.

- B. Valves shall be set plumb and a valve box shall be provided for every buried valve. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.
- C. Backfill around valve shall be carefully tamped in 6-inch layers for full depth of trench with valve box in place.
- D. Provide concrete pad at surface.

3.03 JOINT CONSTRUCTION

All joints for the various types of pipes shall be installed according to pertinent AWWA, ASTM, and manufacturer's specifications. Any defective work will be removed and replaced if it can not be corrected in accordance with the above mentioned specifications.

3.04 ANCHORAGE

- A. Plugs, caps, tees, bends, and valves, unless otherwise specified, shall be provided with "restrained joints in accordance with Part 2 and reaction blocking.
- B. Concrete reaction blocking shall conform to these specifications and the applicable standard details.
- C. Reaction blocking shall be concrete, having a compressive strength of not less than 3,000 psi after 28 days. "Sackcrete" shall not be used.
- D. Blocking shall be placed between solid, unexcavated earth and fitting to be anchored; area of bearing on pipe and on ground in each instance shall be that shown on DRAWINGS.
- E. Blocking shall, unless otherwise shown or directed, be so placed that pipe and fitting joints will be accessible for repair.
- F. Metal harness of tie rods or clamps of adequate strength to prevent movement may be used to compliment concrete blocking if approved by the TOWN.
- G. Steel rods or clamps shall be galvanized or bituminous coated.

3.05 STREAM and UTILITY CROSSINGS

- A. Pipe shall be placed beneath streambeds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.
 - 1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.
 - 2. Provide minimum of 48 inches under streambeds or ditches, unless approved by

Engineer in writing.

3. Provide minimum of 6 inch earth or sand cushion between proposed water line and any other utility or structure or as indicated on drawings.
- B. Where force mains are installed below free flowing streams, the DEVELOPER is responsible for adequate pipeline design of each crossing on a case by case basis subject to the TOWN's review. The Developer's Engineer shall consider the soils, creek flow, pressure, topography, thrust restraint, construction techniques allowed, etc. in order to design and specify appropriate layout and pipe joints.
- C. The DEVELOPER shall be responsible for all and any necessary permitting by the all authorities having jurisdiction for stream crossings or crossing of state waters including but not limited to EPD, County, and the Army Corps of Engineers.

3.06 HYDROSTATIC TESTS

- A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600 and or C605.
- B. General Procedure
1. Furnish and install corporation stops at high points on line to release air as line is filled with water.
 2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.
 3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not be less than 150 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.
 - a) Test pressures shall be as directed by the TOWN.
 - b) Test shall be conducted for a minimum of 2 hours.
 - c) Pressure shall not vary by more that 5 psi during test.
 4. Testing Allowance.
 - a) The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain ± 5 psi of the test pressure.
 - b) The maximum allowable makeup water shall be based on the following

formula:

$$L = \frac{S \times D \times (P^{0.5})}{133,200}$$

Where L is the testing allowance of makeup water in gallons per hour; S is the test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.

- c) No pipe installation shall be accepted if the amount of make up water required exceeds the amount determined in the formula above.
- 5. Locate, remove, and replace any defective pipe, valves, fittings, or hydrants.
- 6. Repeat tests until results are satisfactory to the TOWN.

END OF SECTION