

SECTION 02730

SANITARY SEWER SYSTEMS

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SECTION 02730

SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

Furnish labor, materials, services, equipment, and other necessary items required for accompanying the construction of the sanitary systems. This shall include, but not be limited to, the following:

Sanitary sewer drainage piping, Fitting and Accessories, Cleanouts, and Bedding.

Set lines, elevations, and grades for sanitary sewer system work and control system for duration of work, including careful maintenance of benchmarks, property corners, monuments, or other reference points. Comply and instruct personnel in the procedures to be used in the event of a sewer overflow in accordance with the City of Saco's Sewer System Overflow Response Plan.

1.02 RELATED SECTIONS

- A. Section 02220 - Excavation, Backfill, and Compaction.
- B. Section 02605 - Manhole and Catch Basin Structures.
- C. Construction Drawings.
- D. Local governing authority and code requirements.
- E. All necessary construction permits.

The public utility for the sewer is the City of Saco Public Works Department. All materials, installation, and workmanship will comply with the requirements specified in this section, the requirements of the City. Where a more stringent standard exists, the more stringent standard shall apply.

1.03 REFERENCE

- A. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.
- B. ANSI/ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.
- C. ANSI/ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- D. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- E. ANSI/ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- F. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- G. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12 inch (304.8 mm) Drop.
- H. ANSI/ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- I. ASTM A746 - Ductile Iron Gravity Sewer Pipe.

- J. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- K. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
- L. ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- M. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- N. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 SUBMITTALS

A copy of all submittals shall be formatted to the City of Saco Department of Public Works for additional approvals prior to commencing work.

- A. Product Data: Provide catalog materials indicating pipe, pipe accessories, and fittings.
- B. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.
- C. Manufacturer's Certificate: Certify that products meet or exceed ASTM designations.

1.06 APPLICABLE CODES

The City of Saco Sewer Ordinance applies to this Section.

PART 2 - PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. Polyvinyl Chloride Sanitary Sewer: PVC pipe is acceptable except in the following locations:
 - Where the horizontal separation to a water main is less than 10 feet;
 - When the vertical separation is less than 18”;
 - Where sheeting is used;
 - Where peat or soft clay is encountered.
 - Where permanent exposure to sunlight will occur.
- 1. Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
- 2. Pipe joints shall be integrally molded bell ends per ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.
- 3. Corrugated Polyvinyl Chloride sewer pipe and fittings shall comply with ASTM F 949. Pipe must be marked with manufacturers name, pipe size, cell classification and ASTM F 949. Pipe must be marked with manufacturer's name, pipe size, cell classification and ASTM F 949 Classification. Pipe must be installed per the manufacturers installation requirements.

Acceptable manufacturer: CONTECH, INC. "A-2000" PVC sewer pipe or Owner-approved equivalent.

- B. Ductile Iron Sanitary Sewer: Pipe and fittings shall comply with requirements of ductile iron pipe described under "Section 02660, Water Distribution Systems."
- C. Polyvinyl Chloride Pressure Sewer:
 - 1. Pipe and fittings shall comply with ASTM D 2241, rated SDR 18 and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 2241 classification.
 - 2. Joints shall be integral gasketed joints formed on a continuous pipe length, utilizing elastomeric seal such as "Ring Tite" as manufactured by Johns Manville Company.
- D. Manholes (Refer to Section 02605).

2.02 CLEANOUTS

- A. Lid and Frame: Heavy duty cast iron construction, manufactured by Mueller: Lid Design: Closed Lid.
- B. Shaft Construction: Cast iron shaft of internal diameter as specified on plans with 2,500 psi concrete collar for cleanouts located in paved areas.
- C. Base Pad: Cast-in-place concrete, 2,500 psi leveled top surface to receive cast iron shaft sections, sleeved to receive sanitary sewer pipe sections.

2.03 PIPE AND VALVING ASSOCIATED WITH STRUCTURES

- A. All pipe and valving shall be cast/ductile iron with 125 lb ANSI standard flanges.
- B. All pipe to be cement lined.
- C. Air and vacuum valve shall be Crispir Model A141.
- D. Paint with epoxy paint in accordance with 10 State Standards and/or TR-16 manual "Guides for the Design of Wastewater Treatment Works."

2.04 PIPE INSULATION

Two inch HI-60 insulation as manufactured by Dow Chemical or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION - GRAVITY AND PRESSURE SEWERS

- A. Pipe Laying: Gravity and pressure sewer pipe laying shall comply with the requirements of pipe laying described under "Storm Sewer System" Section 02720 and the PVC pipe ASTM D2321, Standard Practice for Underground Installation of Flexible Sewer Pipe, latest revision.
- B. All service leads shall have a temporary cap placed to permit testing as outlined in Part 4 of this specification.
- C. All service leads shall have cleanouts installed in accordance with Part 1 of the State Plumbing Code.

PART 4 - FIELD QUALITY CONTROL

4.01 TESTING OF SANITARY SEWER SYSTEM (GRAVITY MAIN)

- A. Testing of a section of sewer between manholes shall be performed using the below stated equipment according to stated procedures and under the observation of the inspecting Engineer and the City of Saco Department of Public Works.
 - 1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 - 2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 - 3. All air used shall pass through a single control panel.
 - 4. Three (3) individual hoses shall be used for the following connections:
 - a. From control panel to pneumatic plugs for inflation.
 - b. From control panel to sealed line for introducing the low pressure air.
 - c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

Procedures: All pneumatic plugs shall be seal tested before being used in the actual test installation. One (1) length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against the pressure without bracing and without movement of the plugs out of the pipe.

After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure reaches 4 psig greater than the average back pressure of any ground water that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

Diameter (inches)	Minimum Allowable Pipe Minutes to Decrease from 3.5 - 2.5 psig Pressure In
4	2.0
6	3.0
8	4.0
10	5.0
12	6.0
15	7.5
18	9.0
21	10.5

- B. In areas where ground water is known to exist, the Contractor shall install a one-half (1/2) inch diameter capped pipe nipple, approximately ten (10) inches long, through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the ground water shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple.

The hose shall be held vertically, and a measurement of the height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same.)

- C. If installation fails to meet the above requirements for the air test, the Contractor shall correct the pipeline until an acceptable test is achieved.
- D. The Contractor shall provide as required the proper plugs, weirs, and other equipment required to perform all tests. Testing of each section of sewer installed shall include the portions of service connections that are to be installed under the Contract.
- E. Where ground water is confirmed to be high, the Engineer at his option may elect to accept infiltration measurements in lieu of air testing.
- F. These tests shall be conducted at all times in the presence of the Engineer. Should a line which has previously been tested indicate any water infiltration, or otherwise appear suspect to the Engineer, the Contractor shall conduct confirmation air tests on the line at no additional costs.

4.02 DEFLECTION TESTING

- A. Deflection tests shall be performed on all flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days.
- B. No pipe shall exceed a deflection of 5 percent.
- C. If the deflection test is to be run using a right ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

---END OF SECTION 02730---

Table 1

Allowable Leakage for Mechanical-Joint or Push-On Joint Pipe in 18-ft. Nominal Lengths*

Avg. Test Pressure (psi)	Pipe Size - inches															
	2	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
Allowable Leakage per 1,000 ft-gph																
250	0.48	0.71	0.95	1.42	1.90	2.38	2.85	3.33	3.80	4.28	4.75	5.70	7.13	8.55	9.98	11.40
225	0.45	0.68	0.90	1.35	1.80	2.25	2.70	3.15	3.60	4.05	4.50	5.40	6.76	8.11	9.46	10.81
200	0.42	0.64	0.85	1.27	1.70	2.12	2.55	2.97	3.40	3.82	4.25	5.10	6.37	7.61	8.92	10.19
175	0.40	0.60	0.79	1.19	1.59	1.99	2.38	2.78	3.18	3.58	3.97	4.77	5.96	7.15	8.34	9.54
150	0.37	0.55	0.74	1.10	1.47	1.84	2.20	2.58	2.94	3.31	3.68	4.41	5.52	6.62	7.72	8.83
140	0.36	0.53	0.71	1.07	1.42	1.78	2.13	2.49	2.84	3.20	3.55	4.26	5.33	6.40	7.46	8.53
130	0.35	0.51	0.69	1.03	1.37	1.71	2.06	2.40	2.74	3.08	3.42	4.11	5.14	6.16	7.19	8.22
120	0.33	0.49	0.66	0.99	1.32	1.64	1.98	2.30	2.63	2.96	3.29	3.95	4.93	5.92	6.91	7.89
110	0.31	0.47	0.63	0.94	1.26	1.58	1.89	2.21	2.52	2.83	3.15	3.78	4.72	5.67	6.61	7.56
100	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.40	6.31	7.21
90	0.28	0.43	0.57	0.86	1.14	1.42	1.71	1.99	2.28	2.56	2.85	3.42	4.27	5.13	5.98	6.84
80	0.27	0.40	0.54	0.80	1.08	1.34	1.61	1.88	2.15	2.42	2.69	3.22	4.03	4.84	5.64	6.45
70	0.25	0.38	0.50	0.75	1.00	1.26	1.51	1.76	2.01	2.26	2.51	3.01	3.77	4.52	5.28	6.03
60	0.23	0.35	0.46	0.70	0.93	1.16	1.39	1.63	1.86	2.09	2.32	2.79	3.49	4.19	4.89	5.58
50	0.21	0.32	0.42	0.64	0.85	1.06	1.28	1.49	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.10
40	0.19	0.28	0.38	0.57	0.76	0.95	1.14	1.33	1.52	1.71	1.90	2.28	2.85	3.42	3.99	4.56

* The allowable leakage for a pipeline is calculated by multiplying the leakage per hour per 1,000 feet at the average test pressure and for the diameter of pipe tested as obtained from the above table by the duration of the test in hours and the total length of the line being tested divided by 1,000. If the line under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.