

## SECTION 33 30 00 – SANITARY SEWERAGE UTILITIES

## PART 1 GENERAL

- 1.01 DESCRIPTION OF WORK: Furnish and install sanitary sewer system as shown on the Drawings and in accordance with all City of Portland Technical Design Standards. This includes:
- A. Sanitary sewer pipe
  - B. Sanitary sewer service pipe
  - C. Repairs to existing pipe damaged during construction
  - D. Precast manholes and precast concrete structures and their appurtenances
  - E. Sanitary sewer cleanouts
  - F. Insulation and/or concrete encasement as necessary for utility crossings
  - G. Back flow preventers
  - H. Connection to existing systems
- 1.02 REFERENCES:
- A. Specification Sections:
    - 1. Earth Moving: Refer to Section 31 20 00
    - 2. Erosion and Sedimentation Controls: Refer to Section 31 25 13
  - B. State of Maine Department of Transportation “Standard Specification,” latest edition
  - C. State of Maine Department of Transportation “Supplemental Specifications – Corrections, Additions & Revisions to Standard Specifications – Latest Edition”
  - D. City of Portland Technical and Design Standards, latest edition (available online <http://me-portland.civicplus.com/757/Technical-Design-Standards>)
- 1.03 SUBMITTALS:
- A. Manufacturer's product data and installation instructions.
  - B. Certified copies of tests on pipe units.
  - C. Antifloatation calculations for all below grade structures.
  - D. Construction Records: Record depth and location of the following:

1. Sanitary sewer pipe and service locations, cleanouts, bends in services, connection points to sewer main.
2. Repairs to existing pipes.

Record neatly in a permanently bound notebook and submit at Substantial Completion. Provide access to records for ENGINEER at all times. Submit copies to ENGINEER on a weekly basis.

## PART 2 - PRODUCTS

### 2.01 PIPE AND FITTINGS:

- A. General: Provide fittings of same type and class of materials as pipe. Provide commercially manufactured wyes or tee/yses for service connections. Fitting must have single piece gasket.
- B. PVC Non-Pressure Pipe and Services (Sewer): 6-inch Diameter: ASTM D3034 or ASTM D3033, strength requirement SDR 35; push-on joints, ASTM D3212; gaskets, ASTM F477.

### 2.02 PRECAST CONCRETE STRUCTURES

- A. Base Sections: Precast monolithic construction with steps.
- B. Barrel Sections: Precast with steps.
- C. Top Sections: Precast eccentric cone with steps.
- D. Steps: Polypropylene reinforced with steel rod. Meet OSHA requirements, minimum width 16-inches. Cast into concrete.
- E. Pipe to Structure Connections: Connections shall be watertight, expandable pipe sleeve with adjustable expansion ring equal to Press-Boot by Press-Seal Gasket Corp., Fort Wayne, Indiana.
- F. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.
- G. All brick masonry surfaces with mortar shall be waterproofed with one coat of DEHYDRATINE 6 TROWEL MASTIC, DEHYDRATINE 10 SEMI-MASTIC or approved equal.
- H. All poured concrete or precast concrete surfaces shall be waterproofed with two heavy coats of bituminous waterproofing materials. The material shall be MINWAX FIBROUS BRUSH COAT made by the Minwax Company, New York, New York; TREMCO 121 FOUNDATION COATING, made by the Tremco Manufacturing Company, Cleveland, Ohio; INERTOL NO-7 made by Inertol Company, Newark, New Jersey or approved equal. All waterproofing material shall be applied according to the manufacturer's specifications and directions.

### 2.03 FRAMES, COVERS, AND GRATES

- A. Material: Cast iron, ASTM A48 Class 30
- B. Provide frames, covers and grates as identified on the plans

- C. Frames, covers and grates shall be classified as H-20 load rated and shall be manufactured in the United States. Acceptable manufacturers include Neenah Foundry, Etheridge Foundry and East Jordan Iron Works.
- D. Sewer covers shall be clearly marked with the word "SEWER" in 3" high raised letters on the cover.

#### 2.04 MISCELLANEOUS:

- A. Flexible Couplings: Use and location shall be approved by ENGINEER.
  - 1. Type A: Dresser Style 253 as manufactured by Dresser, or approved equal.
  - 2. Type B: Neoprene sleeve with stainless steel bands by Fernco, or approved equal.
- B. Pipe Supports: Saddle type, steel, painted, adjustable, by ITT Grinnell, or approved equal.
- C. Marking Tape: Lineguard III by Tri-Sales, Inc., 2-inch wide, green; detectable with magnetic locators, or approved equal.
- D. Rigid Insulation: Extruded closed-cell rigid foamed polystyrene, 2-inch thickness, width of trench, Styrofoam HI-60, by Dow Chemical, or approved equal.
- E. Frost Barrier: U.V. resistant, high grade polyethylene, minimum thickness six (6) mils.
- F. Joint Sealants:
  - 1. Butyl Rubber Sealant: One (1) inch diameter strips manufactured by Kent Seal, or approved equal.
  - 2. Butyl Rubber Caulking: Conform to AASHTO M-198, Type B.
- G. Sewer Manhole Inverts: Provide inverts as shown on the Drawings. Configuration to be as required by connecting pipes and as shown on Drawings.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF GRAVITY PIPE AND FITTINGS:

- A. Methods: Install in accordance with manufacturer's recommendations. Use a laser beam for line and grade unless otherwise permitted by the ENGINEER. Secure each length of pipe with bedding before placing next length. Plug open ends when work is suspended. Bed pipe as shown on Drawings. A 30-inch minimum cover over the top of PVC pipe and DI pipe should be provided before the trench is wheel-loaded.
  - 1. Backfill under all existing utility pipes crossed by new utility pipes or work with ¾" crushed stone. The crushed stone backfill shall extend continuously from the bedding of the new pipe to the utility pipe crossed, including a 6" thick envelope of crushed stone all around the existing utility pipe(s). The ¾" crushed stone backfill shall stand at its own angle of repose. No "haunching" or "forming" with common fill will be allowed.

- B. Grade and Line:
  - 1. Lay pipe to line and grade shown on the Drawings. If grade is not shown, determine elevations of start and finish points for each run of pipe. Lay pipe to a uniform grade between these points.
  - 2. Line and grade may be adjusted by the ENGINEER as required by field conditions.
- C. Conditions: Lay pipe in the dry. Do not use installed pipe to remove water from work area.
- D. Flush and clean all pipe and remove all debris and materials. Flushing and cleaning methods approved by ENGINEER. Gravity flushing is not acceptable.
- E. Connections to Manholes and Catchbasins: Provide short length of pipe so that joints are located within 3 feet of inside surface of manholes and catch basins for all pipe.
- F. Sanitary Sewer Service Fittings and Leads:
  - 1. Size of service leads 6-inch unless otherwise indicated.
  - 2. Depth and location of service to be determined by ENGINEER in field.
  - 3. Provide tee/wye or wye fittings on main line pipe.
  - 4. Provide clean outs as shown and detailed on Drawings.
  - 5. Plug, or cap, and stake ends of new service. Provide stake which extends from plug or cap to 1-foot above ground surface. Assist ENGINEER in measurement of pipe installed and in obtaining swing ties to ends of leads.

### 3.02 INSTALLATION OF MANHOLES:

- A. Antifloatation Design & Submittal Requirements: The CONTRACTOR shall prepare antifloatation calculations for all below grade concrete structures to identify the need for and design of antifloatation slabs. If a structure requires an antifloatation slab, the CONTRACTOR, under the review and stamp of a Professional Engineer licensed in the State of Maine, shall prepare a design and submit the stamped, signed design for review by ENGINEER. If a structure does not require an antifloatation slab, the CONTRACTOR, under the review and stamp of a Professional Engineer licensed in the State of Maine, shall prepare and submit stamped, signed antifloatation slab calculations indicating that a slab is not required for the structure for review by ENGINEER. The CONTRACTOR shall prepare calculations following these criteria:
  - 1. Groundwater elevation shall be set at rim grade at the structure.
  - 2. Factor of safety shall be 1.1; downward forces from the weight of the structure and soils over slab shall be 1.1 times the buoyant uplift forces.
  - 3. Structure weight shall only include the weight of the structure and slab. The structure shall be considered empty. Calculations shall not consider the weight of pipes, internal water, or internal structure components.
- B. Placement: Place precast bases and structures on compacted bedding material so bottom of structure is plumb and pipe inverts are at proper elevations. Place manhole barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink grout. Construct manhole inverts in accordance with the Drawings.

- C. Joints: Follow manufacturer's instructions for sealing joints between precast sections. Provide two rings of 1 inch diameter butyl rubber sealant. Point joints inside and out with butyl caulk.
- D. Frame and Covers:
  - 1. Set to final grade as shown on the Drawings and as specified. Provide adequate temporary covers to prevent accidental entry until final placement of frame and cover is made.
  - 2. Use two rings of 1 inch diameter butyl rubber sealant between frame and rubber riser. Provide downward force to frame so as to compress the joint, provide a watertight seal, and prevent future settlement. Point compressed joint with butyl rubber caulk sealant.
  - 3. Set manhole frames and covers to final grade only after pavement base course has been applied, or after final grading of gravel roads.
- E. Inverts: As specified in paragraph 2.04G of this section
- F. Steps: Replace any steps that are out of plumb and proper horizontal placement.
- G. Frost Barriers: Wrap each manhole to the maximum excavation depth or not less than 6 feet below grade, with a minimum of four layers of 6 mils each of the polyethylene.
  - 1. Clean manhole exterior of all dirt and remove any protrusions.
  - 2. Apply a 6-inch wide vertical strip of bituminous waterproofing adhesive from the top of manhole to the greatest excavation depth, but not in excess of 6 feet.
  - 3. Start poly wrap at adhesive strip and proceed around manhole continuously, overlapping adhesive strip a minimum of 24 inches on the final layer.
  - 4. Tuck and pleat poly at top in a continuous manner, minimizing size of folds. Extend poly past top of manhole frame and temporarily tuck remainder inside frame, until final backfill and paving.
  - 5. Paved areas: Cut poly flush with manhole rim after pavement is in place.
  - 6. Unpaved areas: Pull loose ends of poly together, remove excess air and tie off end with galvanized wire. Bury with manhole below grade.

### 3.03 UTILITIES TO BE ABANDONED:

- A. Close open ends of abandoned underground utilities which are not indicated to be removed. Provide sufficiently strong closures, such as caps or brick and mortar, acceptable to ENGINEER to withstand hydrostatic or earth pressure which may result after ends of abandoned utilities have been closed. CONTRACTOR may remove abandoned utilities with written permission of ENGINEER.

### 3.04 INSULATION:

- A. Install as shown on Drawings.
- B. Provide 2-inch minimum thickness compacted sand layers for sanitary sewer, directly above and below insulation.

### 3.05 TESTING OF SANITARY SEWERS:

A. General: Test all sanitary sewer pipes after backfilling. Install service leads on main line before testing. Perform tests in presence of ENGINEER. A maximum of 1000 feet of pipe may be installed but not tested at any time.

B. Gravity Sewer Leakage Tests: Use low pressure air test as follows:

1. Plug ends of section to be tested.
2. Supply air slowly to the pipe to be tested until the air pressure inside the pipe is 4.0 psi greater than the average back pressure of any groundwater submerging the pipe.
3. Disconnect air supply and allow a minimum of two minutes for stabilization of pressure.
4. Following stabilization period measure drop in pressure over the test period within the following times:

Nominal Pipe Size (in.)	Test Period (min.)
4	4
6	4
8	6
10	6
12	7
15	8
18	9
21	11
24	13

5. Acceptable drop: No more than 1.0 psi.

C. Deflection Test for PVC Gravity Sewer Pipe: Test 100% of pipe with "GO-NO-GO" gauge allowing maximum deflection per ASTM D3034.

D. TV Inspection: All sewers may be inspected by the OWNER using TV pipe inspection. Defects in materials and/or workmanship found during the inspection shall be corrected by the CONTRACTOR.

E. Repair all pipes not passing tests, using materials and methods approved by the ENGINEER, and retest.

3.06 TESTING OF SEWER STRUCTURES.

A. General: Tests must be observed by the ENGINEER. Manholes must be complete, including backfill, for final test acceptance except for shelf and invert brickwork. Plug all pipes and other openings in the manhole walls prior to test.

B. Exfiltration Test:

1. Plug pipes into and out of MH and secure plugs.
2. Lower groundwater table (GWT) to below MH. Maintain GWT at this level throughout test. Provide means of determining GWT level at any time throughout test.
3. Fill MH with water to top of cone.
4. Allow a period of time for absorption (determined by CONTRACTOR).
5. Refill to top of cone.
6. Determine volume of leakage in an 8 hour (min) test period and calculate rate.

7. Acceptable leakage rate: Not more than 1 gallon per vertical foot per 24 hours.
8. ENGINEER reserves the right to require an infiltration test if he is not satisfied with the exfiltration test.

C. Vacuum Test:

1. Manholes may be vacuum tested in lieu of the exfiltration test. The vacuum tests must be performed prior to backfilling the manhole, filling joints, and constructing the manhole inverts and benches. All pipe connections shall be made prior to the test.
2. Plug pipe openings and securely brace the plugs and pipe.
3. Set the tester onto the top section of the manhole and inflate the compression band to effect a seal between the structure and the vacuum base.
4. Connect the vacuum pump to the outlet port, open the valve, start the motor and draw a vacuum of 10-inch mercury.
5. Close the valve and monitor the vacuum gauge.
6. The test shall pass if the vacuum holds at 10-inch mercury or drops no lower than 9 inches within the following times:

Depth of Manhole (feet)	Time (min.)
0 - 10	3.0
10 - 15	3.5
15 - 20	4.0
20 - 25	4.5
>25	5.0

7. If the vacuum drops in excess of the prescribed rate, the CONTRACTOR shall locate the leak, make proper repairs, and retest the manhole.
8. If the unit fails the test after repair, the unit shall be water exfiltration tested.

END OF SECTION 333000