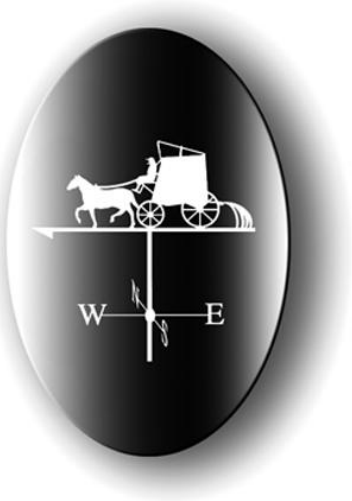
SECTION V: Work Associated With Sewer Construction



A. GENERAL

1. PROJECT COORDINATION

The District provides wastewater collection, interception, and treatment services under a Charter and/or Agreements with its Member Municipalities. In general, the District will accept additional sewerage infrastructure when designed in accordance to State/Local Code, general engineering practice, and published District Standards and Details. This specification includes limited District standards intended to convey the general nature and quality of acceptable infrastructure.

All project submittals shall include a detailed design documenting the basis for the selection, sizing, and general design of the infrastructure. This shall include, at a minimum, the number of units and expected flows, factors and assumptions used in sizing sewers, force mains, pump stations, and other infrastructure.

All project submittals shall include a detailed project schedule that clearly identifies the dates or timeframes associated with Planning Committee Submittals and Approvals, construct start dates, testing and start-up of infrastructure, acceptance by the District, and expected commissioning of systems.

The District reserves the right to recover costs associated with the review of any submittals, analysis of capacity to serve, inspection, and field-testing and start-up. Any fees will be in accordance with the fee schedule published in Part II – Work Associated with Water Line Construction A. 1.

The District will not accept or operate any infrastructure until the project has been completed and tested in accordance with any submittals and District Standards and Details. As-built drawings must be provided before any infrastructure will be accepted or operated by the District.

2. INSPECTION

An inspector from the District, a consultant working for the District, or an inspector retained by the local municipality (with responsibility for the oversight of sewerage infrastructure to be installed) will be assigned to each project to ensure that all work is completed and materials are installed in compliance with all submittals and these specifications. During the course of the work the inspector will report to the Engineering Supervisor on the progress of the work. The District, or its representative, before incorporation into the work, must approve any deviation from the approved plans or specifications.

The Contractor shall schedule with the District for inspection services a minimum of 3 working days prior to construction. The District cannot guarantee an inspector for the project without this notice. Start-up and acceptance testing of systems will require a 14 working day notice.

B. DESIGN CRITERIA

In general, the District will accept additional sewerage infrastructure when designed in accordance to State/Local Code, general engineering practice, and published District Standards and Details. This specification includes limited District standards intended to convey the general nature and quality of acceptable infrastructure.

C. STANDARD SPECIFICATIONS AND DETAILS

1. SEWERS AND DRAINS

PART 1 GENERAL

1.01 This section shall define the standards associated with the following:

a. Sanitary sewer pipe

b. Forcemain pipe
c. House service pipes
d. Storm sewer pipe

1.02 RELATED WORK:

1.03 SUBMITTALS:

A. Manufacturer's product data and installation instructions.

B. Certified copies of tests on pipe units.

C. Construction Records: Record depth and location of the following:

1. House service capped ends, cleanouts, bends in house service, connection points to sewer main.
2. Bends, thrust blocks in force mains.
3. Repairs to existing pipes.

Record neatly in a permanently bound notebook and submit at Substantial Completion. Provide access to records for the District at all times. Submit copies to the District 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/wyes for service connections. Fitting must have single piece gasket.

B. PVC Non-Pressure Pipe and House Services (Sewer): 4" through 12” Diameter: ASTM D3034 or ASTM D3033, strength requirement SDR 35; push-on joints, ASTM D3212; gaskets, ASTM F477.

C. PVC Pressure Pipe (Forcemain):

1. Less than 3” Diameter: Must be approved by PWD prior to approval

2. Less than 4” Diameter: ASTM D2441, strength requirement SDR 21; push-on joints, ASTM D3139; gaskets, ASTM F477.

3. 4” Diameter and Larger: ASTM D2241, Class 150, strength requirement DR 18, with cast iron pipe outside diameters; push-on joints, ASTM D3132; gaskets, ASTM F477. All fittings to be ductile iron mechanical joint, AWWA C110 with 250 psi minimum pressure rating.

D. Storm Sewer Pipe: Polyethylene drainage pipe with corrugated exterior and smooth wall interior, highway grade, AASHTO M252, ASTM F405, by American Drainage Systems, or approved equal.

E. Reinforced Concrete Pipe: ASTM C76; Class IV, O-ring gasket joints with rubber gaskets, meeting MDOT specifications.

F. Ductile Iron Pipe: AWWA C151; thickness Class 52 AWWA C150; double cement lined, AWWA C104; push-on joints or mechanical joints with rubber gaskets, AWWA C111; fittings, AWWA C110.

G. Underdrain: Perforated, corrugated polyethylene pipe with smooth wall interior, AASHTO M252, ASTM F405, by American Drainage Systems, or approved equal.

2.02 MISCELLANEOUS:

A. Flexible Couplings: Use and location shall be approved by the District.

1. Type A: Dresser Style 53 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. Geotextile Fabric: Propex 4508 by Amoco Fabrics Co., or approved equal.

D. Forcemain Marking Tape: Lineguard III by Tri-Sales, Inc., 2" wide, green; detectable with magnetic locators, or approved equal.

E. Rigid Insulation: Extruded closed-cell rigid foamed polystyrene, 2 inch thickness, width of trench, Styrofoam HI-60, by Dow Chemical, or approved equal.

F. Air and Vacuum Valves:

1. Construction: Cast iron body and cover, ASTM A126; Stainless steel concave float, ASTM A240 T304; Stainless steel float stem, ASTM A581 T303; Buna-N needle and seat; Brass plug, ASTM B124. Operating pressure from 0 to 150 psi.

2. Outlet: 1-inch diameter. Provide a short nipple and a return elbow with piping as shown on the Drawings.

3. Inlet: 2-inch diameter. Provide taps, piping and valves as shown on the Drawing.

4. Coating: Red oxide phenolic primer paint.

5. Model: ACO 443 Sewage Combination Air Valve as manufactured by Valve and Primer Corporation, or approved equal.

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 District. 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 DIP pipe should be provided before the trench is wheel-loaded.

B. Grade and Line:

1. Grade and Line shall be sufficient to provide minimum velocities of 2.0 fps. Lay pipe to line and grade shown on the Drawings as reviewed and approved by the District. 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 as approved by the District, when 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 shall be in accordance to District Standards and approved by the District. Gravity flushing is not acceptable.

E. Connections to Manholes and Catch Basins: Any connections shall be in accordance with District Standards. Connections to existing wastewater manholes and catch basins shall be performed under PWD Inspection. Connections shall be cored as opposed to being drilled/chiseled. Connections to existing structures must not result in additional infiltration. Any joints shall be located within 3 feet of inside surface of manholes and catch basins.

F. House Service Fittings and Leads:

1. Size of service leads 4" unless otherwise indicated.

2. Depth and location of service to be determined in field, as approved by the District.

3. Provide tee/wye or wye fittings on main line pipe. Extend services to a edge of Right-of-Way as determined by the District.

4. Provide clean outs as required.

5. Plug, or cap, and stake ends of new service. Provide stake that extends from plug or cap to 1 foot above ground surface. Provide the District with measurements of pipe installed and in obtaining swing ties to ends of leads.

6. All service connections must be shown on as-built drawings.

7. No residential service connections shall be allowed to tie into District owned sewer force mains.

3.02 INSTALLATION OF FORCEMAINS AND PRESSURE PIPE:

A. Grade and Line: Lay pipe to line and grade as approved by the District. Do not allow positive-negative grade discontinuities. See Article 3.01 B above.

B. Methods, Conditions, and Connections to Manholes: See Articles 3.01 above.

C. Install warning tape continuously from the pump stations to the end of each force main. At ends of rolls and repairs, splice tape with 3-foot overlap connected with duct tape. Supply the District with one full roll for future repairs. Extend to grade of each manhole and at pump stations.

D. Thrust Protection: Provide thrust protection at all bends in forcemains in accordance with Standards and as approved by the District.

E. Terminus: Forcemains shall terminate in manholes prior to connecting to District owned sewer mains.

3.03 UTILITIES TO BE ABANDONED: Close open ends of abandoned underground utilities that are not indicated to be removed. Provide sufficiently strong closures, such as caps or brick and mortar, acceptable to the District to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed. CONTRACTOR may remove abandoned utilities with written permission of the District or Town.

3.04 INSULATION:

A. Install as shown on approved Drawings.

B. Provide 2-inch minimum thickness for sewer, forcemain, and water main, compacted sand layers directly above and below insulation.

3.05 TESTING OF SANITARY SEWERS:

A. General: Test all sanitary sewer pipes after backfilling. Install all house service leads on main line before testing. Perform tests in presence of the District. 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. Forcemain and Pressure Sewer Tests: Use hydrostatic test as follows:

1. Fill section of pipe with water and expel all air.

2. Pressurize to 1.5 times the normal operating pressure but not less than 60 psi.

3. Measure leakage over a 2-hour test period.

4. Acceptable leakage: Less than 10 gallons per day per inch diameter per mile of pipe tested.

D. Deflection Test for PVC Gravity Sewer Pipe: Test 100% of pipe with "GO-NO-GO" gauge allowing maximum deflection per ASTM D3034, Appendix X1, Table X1.1.

E. TV Inspection: All sewers and drains shall be inspected by an approved CONTRACTOR using TV pipe inspection. Defects in materials and/or workmanship found during the inspection shall be corrected by the CONTRACTOR.

F. Repair and/or replace all pipes not passing tests, using materials and methods approved by the District, and retest.

2. MANHOLES/PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 This section defines the standards associated with the following:

1. Precast Manholes
2. Drop Manholes
3. Precast Wet Well and Valve Pit
4. Catch Basins
5. Inverts
6. Risers
7. Frames, Covers, and Grates

1.02 RELATED WORK:

1.03 QUALITY ASSURANCE:

A. General: Provide complete manhole and precast concrete structures capable of supporting AASHTO H20 loading. All precast concrete shall comply with ASTM C913 "Standard Specification for Precast Concrete Water and Wastewater Structures."

B. Precast Manhole and Catch Basin Components: Comply with ASTM C478.

C. Antifloatation Slab Design Certificate: The CONTRACTOR may provide the precast structures requiring antifloatation slabs as one complete unit. If provided as a monolithic unit, submit a certificate of design signed by a Professional Engineer registered in the State of Maine, certifying that the structure including the slab has been designed to withstand all forces including soil, traffic and hydrostatic in accordance with all applicable laws, regulations, rules and codes.

1.04 SUBMITTALS:

A. Shop Drawings: Submit for precast manholes and all precast concrete items. Show components to be used, elevations of top of precast sections, base and pipe inverts, location of pipe penetrations, steps, for each manhole. Verify finish grade elevation at each proposed manhole location in the field.

B. Product Data: Submit manufacturers' product data and installation instructions for frames, covers, grates, precast items, manhole sleeves, joint sealants, and frost barrier.

PART 2 - PRODUCTS

2.01 MANHOLES (INCLUDES WET WELL):

A. Base Sections: Precast monolithic construction with steps (no steps in wet well).

B. Barrel Sections: Precast with steps (no steps in wet well).

C. Top Sections: Precast eccentric cone with steps. Use flat cover for wet well, if shown on Drawings or approved by the District.

D. Steps: Polypropylene reinforced with steel rod. Meet OSHA requirements, minimum width 16". Cast into concrete.

E. Pipe to Manhole Connections:

1. Pipe diameter 6" or larger: Flexible manhole sleeves shall be CP series manufactured by Interpace Corp., or approved equal. Size to fit diameter and type of pipe without use of gaskets.

2. Pipe diameter less than 6": Thermoplastic pipe sleeve shall be Link-Seal Century Line Model CS100 by Thunderline Corp. with sleeve seal equal to "Link-Seal" by Thunderline Corp., or approved equal.

F. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.

2.02 DROP AND VALVE MANHOLES:

A. General: Conform to requirements for manholes. Provide pipe and accessories as shown on Drawings.

B. Riser Support Bracket: 10 gauge, Type 304, No. 3 finish stainless steel.

2.03 CATCH BASINS:

A. Base Sections: Precast monolithic construction.

B. Barrel Sections: Precast monolithic construction.

C. Top Sections: Precast eccentric cone. Use flat cover for wet well, if shown on Drawings or approved by the District.

D. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.

2.04 INVERTS:

A. 180 Degree Straight Through Manholes: One piece molded fiberglass invert with integral pipe connections that are factory precast integral with the manhole base, "Fiberliner 2000 Invert System" as manufactured by Fiberliner 2000 New England, Inc, Tel. (508) 349-7401; or approved equal.

B. Non Straight Through Manholes: One-piece plastic composite invert, "Reliner" as manufactured by Reliner – Duran, Inc. Tel. (860) 434-0277; or approved equal. Provide concrete backfill with brick table.

1. Concrete: 3000 psi..

2. Sewer Brick: ASTM C32, Grade SS, hard brick.

3. Mortar: Type M, ASTM C270. Use Type II portland cement, Type S lime. Proportions for Mortar: 1 part portland cement, 1/4 part hydrated lime, 3 to 3 3/4 parts sand.

2.05 RISERS:

A. General: Rubber riser rings are preferred.

1. Rubber adjustment riser rings manufactured from a rubber fibrepolyurethane prepolymer composite, "Infra-Riser" as manufactured by GNR Technologies Inc., Tel. (514) 366-6116; or approved equal.

2. No more than 3 courses of brick may be used. Any work must be acceptable to the District.

2.06 FRAMES, COVERS, AND GRATES:

A. Material: Cast iron, ASTM A48 Class 30.

B. Manhole Frames and Covers: For manholes 6' or more in vertical height, use minimum 24" diameter opening. For manholes 6' or less in vertical height , use a min. 28" diameter opening. Weight of 350 pounds, labeled with "SEWER" in 3" high raised letters on cover for sewer manholes. Standard frames and covers shall be Model M267S by Etheridge Foundry, or approved equal.

C. Hatches: Hatches shall be equipped with heavy forged brass hinges, stainless steel hinge pins, spring operators, automatic hold open arm with release handle, 1/4" diamond plate cover and locking mechanism. Single leaf with grab bar Bilco Type J and double leaf with grab bar Bilco Type JD, or approved equal. Sizes as indicated on Drawings as approved by the District.

2.07 FLOOR BOXES: Floor boxes to be cast-in-place. Floor boxes to be constructed of cast iron with bronze bushings to preserve stem alignment, Clow Model F-5695, or approved equal.

2.08 MISCELLANEOUS:

A. Manhole Cover Lifting Tools: Provide two (2) cover lift lifting tools by Etheridge Foundry, or approved equal, compatible with manhole covers provided.

B. Frost Barrier: U.V. resistant, high grade polyethylene, minimum thickness six (6) mils.

C. 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.

D. Sewer Manhole Inverts: Provide inverts as specified or as shown. Configuration to be as required by connecting pipes and as shown on Drawings.

PART 3 - EXECUTION:

3.01 INSTALLATION OF MANHOLES/PRECAST STRUCTURES:

A. 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 specifications.

B. Joints: Follow manufacturers 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.

C. 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.

D. Inverts: As specified.

E. Steps: Replace any steps that are out of plumb and proper horizontal placement.

F. 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.

3.02 LEAKAGE TESTING - MANHOLES:

A. General: Tests must be observed by the District. Manholes must be complete, including backfill, for final test acceptance except for shelf and invert. 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. The District reserves the right to require an infiltration test if the District is not satisfied with the exfiltration test.

C. Vacuum Test:

1. Manholes may be vacuum tested in lieu of the exfiltration test. The vacuumtests 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" mercury.

5. Close the valve and monitor the vacuum gauge.

6. The test shall pass if the vacuum holds at 10" mercury or drops no lower than 9" 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.

3.03 REPAIRS:

A. Determine causes of all leaks and repair them. Perform earthwork required if manhole has been backfilled.

B. Perform repairs using methods and materials approved by the District. Remove and replace or reconstruct manhole if necessary. Remove and replace defective sections if required by the District.