SECTION 02730 - SANITARY SEWER SYSTEM

PART l - GENERAL

l.01 GENERAL PROVISIONS:

A. Documents affecting Work of this Section include, but are not necessarily limited to, The CONDITIONS OF THE CONTRACT General Conditions, Supplementary Conditions, Addenda and all Sections of Division 1, which are hereby made a part of this Section.

B. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.

C. The "*Standard Specifications*" referred to herein is the book entitled *"Standard Specifications, Highways and Bridges"* published by the State of Maine Department of Transportation (latest date), and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 through 109; numerical index of payment items included in each section.

Those Sections of the aforementioned Standard Specifications which are cited herein are applicable to the Work of this Contract as they may be modified, amplified, or added to by this Section.

D. Reference is made to the Erosion Control Report and Drawings for this project. Strict adherence to this Report and Drawings must be followed in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity.

E. Reference is made to OSHA Safety and Health Standards for the Construction Industry, 29 CFR 1926/1910, 1991 Revision.

F. All Work shall comply with City of Portland standards and, if applicable, U. S. Environmental Protection Agency NPDES Permit requirements, to prevent adverse environmental impacts.

G. All sanitary sewer Work shall be in accordance with Portland Public Works Dept.-Sewer Division standards and these Specifications.

l.02 DESCRIPTION OF WORK:

A. Provide labor, materials, equipment and services necessary for proper and complete installation of sanitary sewer system components as herein Specified:

1. All sanitary sewer system additions and alterations as shown and detailed on the Drawings, including all indicated sanitary manholes and gravity sewer lines.

l.03 QUALITY CONTROL; SUBMITTALS:

A. General: Comply with requirements of Division 1 Sections for Submittals and Quality Control.

B. Shop Drawings: Submit product specification literature and/or Shop Drawings for:

1. Flexible connector for core and seal into existing precast concrete sewer manholes.

2. Cast iron frames and covers for structures.

3. PVC gravity sewer pipe.

5. Connection to existing City of Portland sewer main.

1.04 AS-BUILT DRAWINGS:

A. As-built scale Drawings, accurately showing actual installed locations and inverts of new and relocated underground and surface sewer lines and structures, shall be produced by the Contractor and turned over to the Architect/Engineer at the completion of the project.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Sanitary Sewer Pipe: Extra-strength polyvinyl chloride (PVC) pipe, SDR-35, ASTM D-3034-73. Joints shall meet the requirements of ASTM D-1869-61-T.

B. Bedding Material: 3/4" crushed stone, as specified in Section 02220-Excavation, Backfill and Compaction, (SS 2.01 D).

C. Granular Backfill: Well-graded sand or gravel, as specified in Section 02220-Excavation, Backfill and Compaction, (SS 2.01 C).

D. Precast Concrete Sections for Sanitary Structures: ASTM C478, MDOT *Standard Specifications* Section 712.06. Structures and top pieces in all paved areas shall provide H-20 load bearing capacity. Butyl rubber gaskets shall be installed at all joints between manhole sections.

E. Brick: AASHTO M91, Grade MS or SM; MDOT *Standard Specifications* Section 704.0l.

F. Mortar: One part Portland Cement, Type IIA, two parts mortar sand, and clean water as required; MDOT *Standard Specifications* Section 705.02.

G. Cast Iron Frames and Covers: ASTM A48, Class 35, MDOT *Standard Specifications* Section 7l2.07. Covers shall have the word "Sewer" cast thereon.

1. Sanitary Manholes: Heavy Duty Solid Cover - 24" round opening; M 248S, manufactured by Etheridge Foundry Co.

H. Waterproofing: - All sewer manholes shall be waterproofed with two coats of bituminous sealer applied to the exterior of the manhole by the manufacturer. Waterproofing shall comply with ASTM D449, Type A.

I. Manhole Steps: - Steps shall be Polypropylene Plastic with steel reinforcement, or aluminum conforming to ASTM B221, alloy 6061-T6, a minimum of l4" wide and cast into the sections.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Notify "Dig-Safe" (811 or 1-888-DIG-SAFE) at least 3 days prior to beginning any excavation Work.

B. Accurately locate any existing utilities before beginning excavation; contact local utility companies.

C. Check for conflict with underground utilities or structures. Notify the Architect/Engineer immediately of all discrepancies before proceeding with the affected Work.

D. Fully coordinate with utility companies to insure timely Work by others so as not to hold up construction.

3.02 STRUCTURES:

A. All structures to be located in pavement or driveway areas shall be built or manufactured to provide H-20 load bearing capacity. Construct all manholes and other structures to lines, grades and dimensions shown on Drawings, and in conformance with details and City of Portland specifications.

B. Structure walls: 5 in. thick for precast up to l0 feet depth; 8 in. thick for precast below that depth.

C. Brick inverts for sanitary manholes shall be built to the crown of the pipe for sizes up to eighteen (l8) inches, and to the spring line for larger pipes. See Pre-cast Concrete Manhole Detail on Plans.

D. Cut inlet or outlet pipes flush with inside wall unless otherwise indicated.

E. Set metal or polypropylene fittings, including rungs and frames, in full mortar beds.

F. For sewer manholes located in areas where groundwater is normally present above the elevation of the sewer invert, install a 1/2" diameter capped pipe nipple, approximately 10" long, through the manhole wall above one of the sewer lines, to facilitate pressure testing (See Section 3.04).

3.03 SEWER LINES:

A. Excavate in locations and to depths indicated on Drawings to install sanitary sewer.

B. Place and shape stone at bottom of trench to receive barrel of pipe. Lay pipe at uniform slope between points where changes in grade occur. Keep plug in open end of pipe when installation is not in progress.

C. Gravity sewer pipe shall be laid to the lines and grades shown on the Drawings or as directed by the Architect/Engineer; Contractor shall use a laser instrument in setting grade lines of all gravity sewer pipes. All Work shall conform to City of Portland Department of Public Services, Technical Standards..

D. Lay pipe in an upstream direction and protect open ends of pipe to prevent the entrance of debris while Work is in progress.

E. Joints: shall be made according to the pipe manufacturer's recommendations.

F. All pipe and fittings shall be free of defects. Material found to be defective shall be removed from the site. The Contractor is responsible for inspecting all material to be used prior to its installation. Defective material which has been installed shall be removed and replaced with non-defective material.

G. Bedding and Pipe Cover: After the pipe has been laid, additional crushed stone shall be placed and consolidated evenly around both sides of the pipe, to the top of the pipe. The pipe shall then be covered with clean sand backfill to a depth of 12 inches above the top of the pipe, and the sand compacted with a vibrating plate compactor. Use care when compacting so as not to disturb the true invert of the pipe. Install 2 in. rigid insulation above pipe (see detail) if required in areas having shallow cover (less than 4.5 ft.).

H. The remainder of the trench shall be backfilled as follows:

1. In Roads, Walks, Drives, Etc.

a) The area between a line 12 inches over the top of the pipe and a line at subgrade elevation below finished pavement (see pavement details on plans), shall be carefully backfilled in not over twelve (12) inch layers using suitable material taken from the excavation or approved granular borrow hauled in for the purpose, as approved by the Architect/Engineer. No mud, frozen earth, or stones larger than four (4) inches in diameter is to be used for backfilling.

b) The trench shall be consolidated by tamping, rolling, or other mechanical means, as proposed by the contractor subject to the approval of the Architect/Engineer. The approval by the Architect/Engineer of the proposed method of compaction of the backfill shall in no way be construed as relieving the Contractor of responsibility for settlement of trenches, and any settlement shall be repaired by him at his own cost and expense. If the pipe is displaced from alignment, it shall be re-laid at the contractor's expense.

c) The remaining distance to the top of the trench shall be filled with road subbase and base gravel as specified, hauled in for the purpose and furnished by the Contractor. This gravel shall be placed, graded and compacted in maximum 8-inch layers to the finished surface. (See Section 02230 - Gravel Base Courses) and shall comply with the City of Portland Technical Standards

2. In landscaped areas, etc.

a) Trenches in landscaped and other non-traffic areas shall be filled with material excavated from the trench, unless directed otherwise by the Architect/Engineer. In all other respects, the backfilling operation shall be carried out as specified in 1a. & 1b. above. (See landscaping details on plans for proper sub-grade elevation).

I. Contractor shall test newly installed gravity sewer lines with low-pressure air, in conformance with City of Portland Department of Public Services Technical Standards, to assure line is free from points of infiltration and exfiltration (See Section 3.04B). All Work must be tested and approved by the City Engineer or authority having jurisdiction, prior to final acceptance of the line.

J. After all site Work is completed, including spreading of topsoil and seeding, thoroughly clean the sewer lines and manholes of all silt, stones, and debris.

3.04 LEAKAGE AND LEAKAGE TESTS:

A. General:

Newly installed sewers throughout the entire length of line shall be by tested for water tightness. Testing shall be by internal pressure tests.

The Contractor shall furnish, at his own expense, the necessary facilities for making the tests, including the furnishing and placing of bulkheads, furnishing and placing of water and other necessary materials, labor and equipment.

Under these Specifications a section shall mean a length of sewer between any two manholes, or the building and any manhole.

B. Low Pressure Air Test for Gravity Sewers:

The Contractor shall test the gravity sewers with a low-pressure air test. It shall be conducted in compliance with the following:

After completing backfill of a section of wastewater line, the Contractor shall, at his own expense, conduct a Line Acceptance Test using low pressure air. The test shall be performed using the below stated equipment, according to stated procedures and under the supervision of the Portland Public Works Dept. Sewer Division.

1. Equipment:

Cherne Air-Loc Equipment, as manufactured by Cherne Industrial, Inc., of Edina, Minnesota. Equipment used shall meet the following minimum requirements:

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

All air used shall pass through a single control panel.

Three 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.

2. Procedures:

All pneumatic plugs shall be seal tested before being used in the actual test installation. One 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 plugs shall hold against this 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 air shall be introduced into this sealed line until the internal air 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 (4.0 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 4.0 to 3.0 psig (greater than the average back pressure of any ground water that may be over the pipe) is not less than the time shown for the given diameters in the following table:

Pipe Diameter in Inches	Minutes
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

In areas where ground water is known to exist, the Contractor shall install a one-half inch diameter capped pipe nipple, approximately 10" 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 level 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 of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. 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. This increases the 4.0 psig to 9.0 psig and the 3.0 psig to 8.0 psig. The allowable drop of one pound and the timing remain the same). The Contractor shall furnish all labor, materials and equipment for making infiltration and leakage tests.

THE ATTENTION OF THE CONTRACTOR IS DIRECTED TO THE STRICT REQUIREMENTS RELATIVE TO MAXIMUM RATES OF INFILTRATION AND TO THE IMPORTANCE OF THESE SPECIFICATIONS RELATIVE TO TIGHT JOINTS REQUIRED. SEWERS NOT MEETING THE ABOVE REQUIREMENTS SHALL BE REPAIRED AS NECESSARY AT THE CONTRACTOR'S EXPENSE.

END OF SECTION