

Part II
Division 33

Utilities

SECTION 33 30 00

SANITARY SEWERAGE UTILITIES

1 PART 1 GENERAL

DRAFT

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing sanitary sewerage utilities.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.
 - 2. Section 33 40 00, Storm Drainage Utilities

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. The Contractor shall submit the following information with sets of As-Built Drawings:
 - a. Shop Drawings of pipe and precast units.
 - b. Provide data on pipe materials, pipe fittings and accessories.
 - c. Manufacturer's information of joint sealants, gaskets and waterproofing.
 - d. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - e. Sewerage pipe. Pipe of the same manufacturer shall be used throughout the project.
 - f. Source and gradation reports for soil materials.
 - g. Manufacturer's information of physical, filtration/hydraulic and mechanical properties of geotextile fabrics.
 - h. Drainage stone source and gradation analysis report.
 - i. Structural fill source and gradation analysis report.
 - j. Project Record Documents: Record actual locations of piping mains, valves, connections; thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities. Complete as built record documents shall be provided to owner.

- k. All materials including pipe, valves, hydrants, etc., shall be subject to approval by project landscape architect, project engineer or designated authority.

1.3 DELIVERY:

- A. Exercise care when handling pipe to prevent damage to pipe and finish. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto.
- B. Immediately remove damaged materials and replace at no additional cost to the Owner.
- C. Store materials above ground on platforms, skids, or other adequate supports.
- D. Place no pipe within pipe of larger size.
- E. Protect geotextiles from ultraviolet light in accordance with manufacturer's requirements.

1.4 TESTS, PERMITS, INSPECTIONS AND CODES

- A. Sewer lines shall be tested before use.
- B. Utility installations shall comply with all applicable local and state codes and with requirements of local sewer districts.
- C. All utility installations shall be inspected and approved by the utility company inspectors, local code enforcement, City Engineer where applicable and Engineer or Owner's authorized representative before being backfilled.
- D. The Contractor shall obtain and pay for any permits required for this portion of the work.

2 PART 2 PRODUCTS

2.1 MATERIALS:

- A. The Contractor shall contact and coordinate with the City of Portland Public Services Department before beginning installation of sanitary sewer system.
- B. Polyvinyl Chloride (PVC) Sanitary Sewer
 - 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. PVC Pipe Joints: PVC shall be supplied with the coupling or coupling integrally molded to the pipe barrel. All joints shall be bell and spigot. Fittings and couplings shall be of the "O" ring push on type as required for non-pressure sewer pipe. "O" rings shall conform to ASTM Designation D 1869 - Latest revision.
 - 3. Fittings for PVC Sewer Pipe: Where fittings such as tee and wyes are required for service taps, "O" ring, PVC fittings shall be used. The material for the PVC fittings shall be compatible to the pipe material in characteristics.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe Jointing and Pipe Laying: Sanitary Sewer

1. Pipe Jointing - All joints shall be made in a dry trench and in accordance with the manufacturer's recommendations and the best practices for class of pipe laid. The ends of the pipe shall be wiped clean before making the joint.
2. Pipe Laying - The pipe shall be accurately laid to the line and grades to the satisfaction of the Engineer or the Owner's Representative. Sewer pipe shall be placed on six (6) inches of specified crushed material. The line and grade may be adjusted by the Engineer or Owner's Representative and or City of Portland Public Services representative from that shown on the Drawings to meet field conditions and no extra compensation shall be claimed therefore. Whenever the nature of the material excavated is such as to render it unsuitable for bedding, the Contractor shall furnish suitable material as otherwise provided in these Specifications.
3. The interior of each length of pipe shall be swabbed and wiped clean before laying the next length. No length of pipe shall be laid until the previous length has had specified material placed and tamped around it to secure it firmly in place to prevent any disturbance. Bell ends shall be laid uphill. Whenever the work is stopped temporarily for any reason whatever, the end of the pipe shall be carefully protected against dirt, water or other extraneous material.
4. The pipe shall be cut as necessary. Sufficient short lengths of pipe shall be furnished so that pipe shall not be more than four (4) feet in length at points of connection with other piping.
5. Inspection - Pipe installation shall be subject to inspection by the Engineer, City of Portland Public Services inspector and/or Owner's Representative for quality, adherence to line and grade, jointing and proper backfill. Any joint not satisfactory to the Inspector shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved. All work must conform to the City of Portland standards for the sanitary installation.
6. Safety regulation of the State of Maine and the Department of Labor, Occupational Safety and Health Administration (OSHA) as applicable shall be followed in regards to work in trenches and trench excavations.

- B. Manhole Connection: Neatly cut off main flush with inside of existing manhole where they enter structure walls, and point up irregularities and rough edges with nonshrinking grout. Shape inverts for smooth flow across structure floor as shown on Drawings. Use concrete and mortar to obtain proper grade and contour and finish surface with fine textured wood float.
- C. Excavation for trenches for the placing of water mains, valves, and fittings must be of sufficient width to permit the work to be done in the manner and to the depths specified or as shown on the plans. The trench shall be dug to the required level, and the bottom shaped by hand to conform to the shape of the pipe or appurtenances being installed.

D. Pipe Laying:

1. All pipe shall be laid to line as indicated on the Drawings. Pipes shall be laid with a minimum of 5 1/2 feet of cover over the pipe. This depth of cover shall be measured from finished grade. Pipe, fittings and valves shall be carefully handled to avoid damage.
2. Suitable equipment shall be provided by the Contractor for handling the pipe. Any damage to the pipe in handling or laying shall be at the Contractor's expense. Poured concrete thrust blocks shall be provided for all fittings shown on the Drawings and in accordance with the manufacturer's recommendations.
3. The Contractor shall install a warning tape in the water main trench that is detectable with an inductive type metal detector. The tape shall be blue and have printing that warns of a water line below. The tape shall be Allen Detectatape, as manufactured by Allen Systems, Inc., of Wheaton, Illinois or approved equal and have a 3" width.
4. Depth of installation shall be one to two feet below grade. The tape shall be detectable with an inductive type metal detector. Splicing of the tape shall be accomplished with manufacturer furnished metal clips. Where required by the Project Engineer, No. 9 gauge copper wire shall be clipped to the tape and brought to the ground surface or attached to other metal risers.

E. Vertical Separation From Sanitary Sewer: Whenever water mains must cross sewer, lay at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirements, center one full length of water main over the sewer so that both joints will be as far from the sewer as possible.

F. Backfilling shall be done with approved materials free from roots, frozen pieces, rubbish, large clods or stones. Backfill materials shall be placed in trenches evenly and carefully around and over the pipe in layers. Each layer shall be thoroughly and properly compacted.

G. Interference:

1. The Contractor shall be responsible for maintaining proper clearance between adjacent pipes and between pipes and structures. If an interference situation arises, any proposed new routing shall be approved by the Engineer or Owner's Representative.
2. If, during the process of this work, utilities in place are damaged, they shall be restored to their proper condition at no added cost to the Owner.

3.2 INSPECTION:

- A. The manufacturer shall certify to the Owner that all pipe and fittings furnished under this contract conform to these Specifications.
- B. Acceptability of pipe shall be determined by results of strength tests and by inspection at point of delivery to determine whether pipe conforms to Specifications in design and freedom from defects. Rejection on results of field inspection may be made on account of any of the following:

1. Variations in any dimensions exceeding permissible variations.
2. Visible cracks, holes, foreign inclusions or other injurious defects.
3. Any pipe or fittings showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from work.
4. Variation of more than 1/16 inch per linear foot in alignment of pipe intended to be straight.
5. Insecure attachment of spurs or branches.

C. TESTING

1. Whenever practical, before the trench has been backfilled or the joints covered, the pipe shall be tested for leaks. The test may also be made with one foot of backfill placed on the pipe, or the pipe may be completely backfilled. All leaks above the allowable maximum shall be repaired, however regardless of when tests are made. The Contractor shall provide all necessary equipment including but not limited to an appropriate pump, water container, pressure gauge, valve, hydrant connection and corporation stop connection, and he shall perform all work required in connection with the test.
2. Each section tested shall be slowly filled with water, care being taken to expel all air from the mains and service lines, if installed. If necessary, the pipes shall be tapped at high points to vent the air. All foreign material shall then be flushed from the main. If possible, a flushing velocity of 2.50 fps shall be run through the mains until clean.
3. The portion to be tested shall be placed under constant 150 percent of working pressure or 100 psi whichever is greater as designated by the project engineer, all leaks shall be repaired, additional tests instituted and continue the process until all major leakages are eliminated. The test pressure shall be at the minimum pressure at highest point in the water line. Further, line test pressure shall not exceed 15% of the pressure rating at the lowest point.
4. Allowable maximum leakage shall be determined, as follows $L = (ND / P) / 7400$, where L = allowable leakage in gallons per hour, N if the total length tested divided by the standard length of pipe, D is the nominal diameter of the pipe in inches and P is the test pressure specified above.
5. A complete approved pressure test of a minimum of two hour duration will be accomplished prior to disinfection. Obtaining water at the site for testing shall be the Contractor's responsibility.

3.3 CLEANUP:

- A. Upon completion of the installation of the sanitary sewers, appurtenant structures, water distribution system and any other work incidental thereto, the Contractor shall remove from the project all equipment, surplus construction materials and debris of any type resulting from the work and shall leave the area in as good or better condition as prior to construction.

...END OF SECTION 33 30 00

SECTION 33 40 00

STORM DRAINAGE UTILITIES

1 PART 1 GENERAL

DRAFT

1.1 DESCRIPTION:

- A. Bidding requirements, conditions of the contract and pertinent portions of sections in Division One of these specifications, apply to the section as fully as though repeated herein.
- B. Work under this section includes furnishing and installing pipes, manholes and catchbasins.
- C. Related work:
 - 1. Section 31 05 12, Site Earthwork.
 - 2. Section 32 12 16, Asphalt Paving.

1.2 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. The Contractor shall submit the following information with sets of As-Built Drawings:
 - a. Shop Drawings of pipe and pre-cast units, catch basins manholes, and field inlets.
 - b. Manufacturer's information of joint sealants, gaskets and waterproofing.
 - c. Storm drain pipe. Pipe of the same manufacturer shall be used throughout the project.
 - d. Source and gradation reports for soil materials.
 - e. Manufacturer's information of physical, filtration/hydraulic and mechanical properties of geotextile fabrics.
 - f. Drainage stone source and gradation analysis report.
 - g. Structural fill source and gradation analysis report.

1.3 DELIVERY:

- A. Exercise care when handling pipe to prevent damage to pipe and finish.
- B. Immediately remove damaged materials and replace at no additional cost to the Owner.
- C. Store materials above ground on platforms, skids, or other adequate supports.
- D. Protect geotextiles from ultraviolet light in accordance with manufacturer's requirements

1.4 QUALITY ASSURANCE:

- A. It is the intention of this Section that the catch basins, manholes and other structures, including all component parts, have adequate space and strength considered necessary for the intended service. Space requirements and configurations shall be as shown on the Drawings.
- B. Catch basins and manholes shall be an assembly of pre-cast sections with or without steel reinforcement, with approved jointing. In any approved structures, the complete structure shall be of such material and quality as to withstand loads of eight (8) tons (H-20 loading) without failure, continuously for the life of the structure. Assume a period in excess of 25 years for all structures.

2 PART 2 PRODUCTS

2.1 MANUFACTURER:

- A. Catch basin and Manhole structures listed as follows as provided by Superior Concrete, Oldcastle Precast, Inc., 982 Minot Avenue, Auburn, ME 04212-3719. Phone: (207) 784-9144 Fax: (207) 784-9647, or equal. Product of other manufacturers may be considered subject to compliance with the requirements as judged by the Engineer and or Owner's Representative.

2.2 MATERIALS:

- A. Catch basin and Manhole Sections: Structures shall be pre-cast concrete structures, 4 foot interior diameter, unless otherwise specified, with T & G joints and rubber ring or asphalt filler seals.
 - 1. Bases – Pre-cast sumps conforming to ASTM C478. Holes for pipes cast into the base section shall have a three (3) foot minimum clear distance between the inside bottom of the base section and the pipe invert.
 - 2. Barrels – Pre-cast sections of correct height, conforming to ASTM C478 or solid concrete barrel blocks conforming to ASTM C-139.
 - 3. Cones – Pre-cast, hunched type, conforming to ASTM C478.
 - 4. Pipe to Catch-basin and Field Inlet Joints: Only as approved by the Engineer or Owner's Representative and, in general, will depend on water-tightness upon a rubber boot either cast-in-place or press-wedged in place.
 - 5. Frames and Grates to conform to AASHTO M-105, Class 30, of gray cast iron by Etheridge Foundry. Refer to Drawings for type and size.
 - 6. Each section of the pre-cast structure shall have two holes for the purpose of handling and setting. The holes shall be tapered and shall be plugged with nonshrink mortar or grout in combination with concrete plugs after installation. Note: For storm drain sections that serve as cutoff drains for groundwater, provide 1/4 inch perforations along the top of pipe. Refer to project details and plans.

- B. Storm Drain Pipe: PVC Pipe, Reinforced Concrete Pipe or Corrugated Polyethylene Pipe (refer to Drawings). Furnish as indicated on Drawings and of size shown. Provide couplings and special bends or elbows as shown or required by the work.
1. Polyvinyl Chloride (PVC) Pipe: 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. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.
 2. Reinforced Concrete Pipe (RCP): Comply with requirements of ASTM C 76, Class III unless another class type is indicated on Drawings, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M-198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.
 3. Corrugated Polyethylene Pipe (CPP) Smooth Interior: Conform with AASHTO Designations M 294 and M252. Pipe must be installed in accordance with pipe manufacturer's installation Guidelines for Culvert and Other Heavy-Duty Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. (ADS) N-12) & Hancore, Inc. (Hi-Q smooth interior).
 4. Underdrains:
 1. Perforated PVC pipe having a SDR of 35 or equivalent. Perforations shall consist of 3/8 inch diameter holes.
 2. Perforated Polyethylene Pipe (cpp) Smooth Interior: Conform to ASSHTO Designations M252 Type S.
- C. Brick: Comply with the ASTM Standard Specifications for Sewer Brick, Designation C32, for Grade SS, hard brick.
- D. Cement: Shall be Type II. Concrete shall have a minimum strength of 3,000 psi at 28 days.
- E. Drainage Stone: M.D.O.T. 703.22 Type C. 3/8 - inch, pea stone or 3/4- inch crushed stone.
- F. Geotextiles: Shall be Mirafi 160 N or equivalent for filtration fabric or equivalent.

3 PART 3 EXECUTION

3.1 INSTALLATION:

- A. Catch basins and manholes
1. After the excavation has been done and leveled, six (6) inches of bedding material shall be put in the bottom of the excavation, leveled and thoroughly compacted.
 2. Pre-cast concrete sections shall be set so as to be vertical and with section in true alignment, 1/4-inch maximum tolerance to be allowed.

3. Invert channels of manholes may be formed in 3,000 psi concrete or using brick. When brick is used, use Portland cement, ASTM C 150, Type II. Masonry cements shall not be used. The top shelf shall slope to drain towards the flowing through channel.
 4. The top of the pre-cast reinforced concrete unit shall be set at a grade that will allow a minimum of two (2) courses and a maximum of three (3) courses of brick and mortar before setting the cast-iron frame. Mortar for brick masonry shall be Portland cement, Type II, mixed in the proportion of one part cement to two parts sand, worked to the proper consistency.
 5. The inside and outside of the masonry work of all catch basins shall be plastered with 1:2 Portland cement mortar. The thickness of the mortar shall be one-half (1/2) inch and the mortar shall be carefully spread and thoroughly troweled, leaving a smooth, substantially waterproof surface. The mortar shall be extended to completely cover the outside and inside surfaces of all masonry work. To enhance proper curing, completed masonry shall be covered with a polyethylene plastic sheet or other appropriate means for a minimum of 24 hours before backfilling. The inside and outside of each horizontal joint in the pre-cast manholes shall be filled with joint mortar and troweled smooth.
 6. Backfilling shall be done in a careful manner in 6"-12" lifts and compacted with a vibratory compactor, bringing the fill up evenly on all sides.
 7. If any leaks appear in catch basins, manholes or field inlets the Contractor shall uncover the structure and disassemble the sections and reconstruct the catch basin, or perform other acceptable repairs approved by the Engineer or Owner's Representative so as to secure a watertight structure. The Contractor shall install the pre-cast units and pipeline connectors in a manner that will result in a watertight joint.
 8. Catch basins, manholes or field inlets, shall be constructed as the sections of the pipelines between them are completed, and unless this is done, the Engineer or Owner's Representative shall have the authority to stop trenching and pipe laying until manhole construction is brought up properly. All ground water shall be kept away from any newly placed concrete or freshly laid masonry work until cement has properly set and until a watertight job is obtained.
- B. Catch basin and manholes, frames and grates
1. Catch basin, manholes and frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface, or as directed.
 2. Frames shall be set concentric with the top of the masonry and in full bed of mortar so that the space between the top of the masonry and the bottom flange of the frame shall be completely filled and made watertight.
 3. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on top of the bottom flange. Mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
 4. Manholes and catch basin grates shall be left in place in the frames on completion of the other work at the manholes and catch basins.

C. Drain pipes

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
2. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade, without high spots. Do not drive the pipe down to grade by striking it with a shovel handle, timber, hammer, or any other unyielding object. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawing. Take all necessary precautions to prevent floatation of the pipe in the trench.
3. Temporary Plugs - When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated. Do not use the pipelines as conductors for trench drainage during construction.
4. Jointing - Connect pipe in accordance with the latest manufacturer's instructions and recommendations. Clear each pipe length, coupling and fitting of all debris and dirt before installing. Provide and use coupling pullers for jointing the pipe. Provide gasket feeler gauges for use by the pipe layer for checking the position of the rubber gaskets in the completed joints.
5. Shove home each length of pipe against the pipe previously laid and hold securely in position. Do not pull or cramp joints. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay, or soil of any description entering the pipeline at the joints.
6. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
7. Pipe Cutting - Cut in accordance with manufacturer's recommendations. Cut the pipe with a hand saw, metal-inserted abrasive wheel or pipe cutter with blades (not rollers). Examine all cut ends for possible cracks caused by cutting.

D. Under drain pipe

1. Bed all under drains in Drainage Stone, wrapped in Mirafi 160 N geotextile filter fabric or approved equal, as shown on the drawings.
2. Shape subgrade to drain outlets as shown on the grading and drainage plan.
3. Install geotextile stabilization fabric between subgrade and road subbase gravel, as determined by the Engineer or Owner's Representative.

E. Pipe insulation

1. Install two (2) inch thick by four (4) feet wide styrofoam SM insulation as manufactured by Dow Chemical Co., or approved equal, as shown on Detail Drawing.
2. Install over and along the sides of the pipe when there is less than four (4) feet of cover between the top of pipe and original ground grade.

3.2 INSPECTION:

- A. Pipe installation shall be subject to inspection by the Engineer or Owner's Representative for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the Engineer or Owner's Representative shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved by the Engineer or Owner's Representative.

...END OF SECTION 33 40 00