SECTION 02400

SITE DRAINAGE

1 PART 1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

B. Geotechnical Report Site Environmental Phase 1 and Existing Building Environmental Phase 1 - Section 00300

C. Site Earthwork - Section 02200

D. Site Utilities - Section 02420

E. Construction Drawings

1.2 QUALITY ASSURANCE

A. It is the intention of this Section that the catchbasins, manholes, field inlets 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. Catchbasins and manholes shall be an assembly of precast 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.

1.3 SUBMITTALS

A. The Contractor shall submit the following information with sets of As-Built Drawings:

(1) Shop Drawings of pipe and precast units, catchbasins, manholes and field inlets.

(2) Manufacturer's information of joint sealants, gaskets and waterproofing.

(3) Storm drain pipe. Pipe of the same manufacturer shall be used throughout the project.

(4) Frame and grate for all structures, frame and grate for structures within the public right of way shall conform to the City of Portland Technical Design Standards and Guidelines, latest edition.

(5) Source and gradation reports for soil materials.

(6) Manufacturer’s information of physical, filtration/hydraulic, and mechanical properties of geotextile fabrics.

(7) Drainage stone source and gradation analysis report.

(8) Structural fill source and gradation analysis report.

1.4 DELIVERY, STORAGE AND HANDLING

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.

2 PART 2. PRODUCTS

2.1 MATERIALS

A. Catchbasin and Manhole: All structures shall conform to the City of Portland Technical and Design Standards and Guidelines - Latest Edition. Structures shall be precast concrete structures, 4 foot interior diameter, unless otherwise specified, as manufactured by Superior Concrete or approved equal with T & G joints and rubber ring or asphalt filler seals.

(1) Bases - Precast 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 - Precast sections of correct height, conforming to ASTM C478 or solid concrete barrel blocks conforming to ASTM C-139.

(3) Cones - Precast, haunched type, conforming to ASTM C478.

(4) Pipe to Catchbasin Joints: Only as approved by the Landscape Architect 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 precast 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.

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. Note: Pipe in public right of way shall conform with the City of Portland Technical Standards and Guidelines, latest edition.

(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) Foundation Drains and Underslab Drains: Pipe shall be perforated PVC pipe having a SDR of 35 or equivalent. Perforations shall consist of 3/8 inch diameter holes.

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. Structural Fill for foundation drain backfill - M.D.O.T. 703.06, (a), Type C.

F. Drainage Stone: M.D.O.T. 703.22 Type C. 3/8 - inch, pea stone or 3/4- inch crushed stone

G. Geotextiles: Shall be Mirafi 160 N or equivalent for filtration fabric or equivalent.

3 PART 3. EXECUTION

3.1 CATCHBASINS, MANHOLES, AND FIELD INTLETS

A. 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.

B. Precast concrete sections shall be set so as to be vertical and with section in true alignment, 1/4-inch maximum tolerance to be allowed.

C. 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.

D. The top of the precast 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.

E. The inside and outside of the masonry work of all catchbasins, manholes and field inlets 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 precast manholes shall be filled with joint mortar and troweled smooth.

F. 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.

G. If any leaks appear in catchbasins, the Contractor shall uncover the structure and disassemble the sections and reconstruct the catchbasin, or perform other acceptable repairs approved by the Landscape Architect so as to secure a watertight structure. The Contractor shall install the precast units and pipeline connectors in a manner that will result in a watertight joint.

H. Catchbasins and manholes shall be constructed as the sections of the pipelines between them are completed, and unless this is done, the Landscape Architect 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.

3.2 CATCHBASIN, MANHOLE, AND FIELD INLETS FRAMES AND GRATES

A. Catchbasin, manhole and field inlet frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface, or as directed.

B. 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.

C. 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.

D. Manhole covers, catchbasin grates and field inlet shall be left in place in the frames on completion of the other work at the manholes, catchbasins and field inlets.

3.3 DRAIN PIPES

A. 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.

B. 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.

C. 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.

D. 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.

E. 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. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.

F. 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.

G. Inspection - Pipe installation shall be subject to inspection by the project Landscape Architect or Owner's representative, for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the project Landscape Architect or Owner's respresentative 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 Landscape Architect.

3.4 FOUNDATION DRAIN PIPE

A. Bed all foundation drains in Drainage Stone, wrapped in Mirafi 160 N geotextile filter fabric or approved equal, as shown on the drawings.

B. Shape subgrade to drain outlets as shown on the grading and drainage plan.

C. Install geotextile stabilization fabric between subgrade and pavement subbase gravel, as determined by the geotechnical engineer or Owner's Representative.

3.5 PIPE INSULATION

A. 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.

B. 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.