SECTION 33 46 13
FOUNDATION DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies foundation drainage system, including installation, backfill, and cleanout extensions, to place of connection to municipal storm sewer or onsite facilities.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: For each type of filter fabric, pipe, and fitting indicated

C. Product Data: Certifications from the manufacturers attesting that materials meet specification requirements.

1.3 RELATED WORK

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Safety requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.

C. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

D. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by basic designation only.

B. American Association of State Highway and Transportation Officials (AASHTO):

M006-08-UL.....Standard Specification for Fine Aggregate for Hydraulic Cement Concrete, Single User Digital Publication

M252-08-UL.....Corrugated Polyethylene Drainage Pipe

M288-06-UL.....Geotextile Specification for Highway Applications

C. American Society for Testing and Materials (ASTM):

D448-08.....Standard Classification for Sizes of Aggregate for Road and Bridge Construction

D2321-08.....Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D2751-(2005).....Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings

D2729-03.....Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D2737-03.....Standard Specification for Polyethylene (PE) Plastic Tubing

D3034-08.....Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D4216-06.....Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds

F477-08.....Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F758-95(2000)e1 .....Standard Specification for Smooth-Wall Poly (Vinyl Chloride)(PVC)Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.

F949-(2006a).....Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

PART 2 - PRODUCTS

2.1 MATERIALS

Pipe for foundation drainage system shall be of the type and size indicated. Appropriate transitions, adapters, or joint details shall be used where pipes of different types or materials are connected.

A. Perforated Drainage Pipe:

1. Perforated, PE pipe and fittings per ASTM D2737, in DN 100 to DN 150 (NPS 4 to NPS 6). Joints shall be coupling type.
2. Perforated, PE pipe and fittings per ASTM D2737, in DN 200 to DN 600 (NPS 8 to NPS 24). Joints shall be coupling type.

B. Cleanout Extension: ASTM A74, cast iron pipe or ASTM A746 ductile iron. Gravity Sewer pipes shall have a neoprene gasket joints and long sweep elbow fittings.

C. Drainage Conduit:

1. Pipe, fittings, and couplings shall be perforated and smooth PVC complying with ASTM D4216 and ASTM D2729.
2. Pipe size shall be 200 mm (8 inches) and have a high minimum flow rate equal to a DN 100 (NPS 4) pipe.
3. Fittings shall be PVC with DN 100 (NPS 4) outlet connection.
4. Couplings shall be PVC.

D. Geotextile:

Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:

E. Drainage Material:

1. Bedding: Crushed stone, 20 mm (3/4 inch) to 25 mm (No. 4) per ASTM D448. Less than 5% P200 by washing.
2. Fill to 300 mm (1 foot) above pipe: Crushed stone, 20 mm (3/4 inch) to 25 mm (No. 4) per ASTM D448.

G. Concrete Sand: AASHTO M006.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Trenching and Excavation

Perform required trenching and excavation in accordance with Section 31 00 00 EARTHWORK. Keep trenches dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Use wye fittings at intersections.

B. Bedding

Place graded bedding, minimum 6 inches in depth, in the bottom of trench for its full width and length compacted as specified prior to laying of foundation drain pipe. Each section shall rest firmly upon the bedding, through the entire length, with recesses formed for bell joints. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.

C. Pipe Laying

1. Lay drain lines to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Clean interior of pipe thoroughly before being laid. When drain lines are left open for connection to discharge lines, the open ends shall be temporarily closed and the location marked with wooden stakes. Perforated pipe shall be laid with perforations

facing down. Any length that has had its grade or joints disturbed shall be removed and relaid at no additional cost to the Government. Perforated corrugated polyethylene drainage tubing and plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. Tubing and piping with physical imperfections shall not be installed.

2. Prior to installation of bedding materials or piping, examination of excavation and subgrades are to be observed by the COTR. Invert elevation of drain pipe shall not be higher than top of lowest floor elevation nor lower than a 45 degree line projected from bottom of any adjacent footing. Lay drain lines and firmly bed in granular material a minimum of 75 mm (3 inches) below invert to top of pipe to true grades and alignment with bells facing upgrade, and to slope uniformly between elevations shown on foundation drainage drawings. Keep trenches dry until pipe is in place and granular material backfill is completed to 300 mm (1 foot) above top of pipe, unless otherwise noted.
3. Install gaskets, seals, sleeves, and couplings according to manufacturers written instructions and per the applicable standard:
   a. PE and PVC pipe installation shall be per ASTM D2321 and ASTM F758.
   b. PE joint construction shall be per ASTM D2737 and AASHTO HB17, Division II, Section 26.4.2.4, “Joint Properties.”
   c. PVC joint construction shall be per ASTM D3034 with elastomeric seals gaskets per ASTM D2321.
   d. Perforated PVC joint construction shall be per ASTM D2729, with loose bell and spigot joints.
4. Lay perforated pipe with perforations down. Lay plain end pipe with closed joints held in place with two No. 9 spring steel wire clips at each joint or by standard clay collars.
5. For foundation subdrainage, install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 900 mm (3 feet), unless otherwise indicated.
6. For underslab subdrainage, install piping pitched down in direction of flow, at a minimum slope of 0.5 percent.
7. Install cleanout extensions where shown on the Contract Documents.
8. Prior to backfilling, check drain lines to assure free flow. Remove obstructions and recheck lines until satisfactory.

D. Jointing

Perforated and porous types of drain pipes shall be laid with closed joints.

E. Backfilling: Place a minimum of 300 mm (12 inches) of granular material, hand tamped, extending in width a minimum of 600 mm (2 feet) from building wall. Then place a minimum of 150 mm (6 inches) of concrete sand, well tamped. Continue backfill with concrete sand to within 900 mm (3 feet) of finished grade in planting areas. Remainder of backfill shall be comparable to existing adjacent soils. In bituminous and concrete paving areas, backfill to the bottom of the base course with pervious material. Where foundation drain is within 600 mm (2 feet) of finished grade, one-half of fill shall be made with crushed stone.

1. Filter fabric may be substituted for sand layer.
2. Vertical drainage mat in conjunction with geotextile may be substituted for sand and drainage material.
3. When drain lines are left open for connection to discharge line, the open ends shall be temporarily closed and their location marked with wooden stakes.

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