

SECTION 33 46 13

FOUNDATION DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. 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 RELATED WORK

- A. Safety requirements: Section 01 00 00, GENERAL REQUIREMENTS, Article, ACCIDENT PREVENTION.
- B. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- D. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- E. Section 31 20 00, EARTH MOVING.

1.3 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, fitting, and any other Product indicated.
- C. Product Data: Certifications from the manufacturers attesting that materials meet specification requirements for each Product indicated.

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):
HB17 Standard Specifications for Highway Bridges
- C. American Society for Testing and Materials (ASTM):
D448 Standard Classification for Sizes of Aggregate for Road
and Bridge Construction

D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D2737	Standard Specification for Polyethylene (PE) Plastic Tubing
D4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
D4832	Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F758	Standard Specification for Smooth-Wall Poly (Vinyl Chloride)(PVC)Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.
F2306	Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow
F2648	Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage

PART 2 - PRODUCTS

2.1 MATERIALS

- A. 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.
- B. Perforated Drainage Pipe:
 - 1. Dual wall corrugated high-density polyethylene (HDPE) drainage pipe with smooth interior and annular exterior corrugations, per ASTM F2648 with perforations.
 - 2. Pipe shall be joined using bell and spigot joint meeting ASTM F2648. The joint shall be soil-tight and gaskets meeting requirements of ASTM F477. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly. Fittings shall conform to ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F2306.
 - 3. Perforations shall be AASHTO Class II Perforation
- C. Cleanout Extension: Per 33 46 00, STORM SEWER UTILITIES.
- D. Filter Fabric
 - 1. Non-Woven Filter fabric shall be a pervious sheet of polyethylene or polypropylene filaments formed into a uniform pattern with distinct and measurable openings. The filter fabric shall provide an equivalent

opening size (AOS) no coarser than the US Standard Sieve No. 80. AOS is defined as the number of the US Standard sieve having openings closest in size to the filter fabric openings. Permittivity shall be minimum 1.5/second and water flow rate shall be minimum 110 gpm/ft². The filaments shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure with minimum UV Resistance of 70% retained at 500 hours. The fabric shall have a minimum grab tensile strength of 200 pounds when tested in accordance with ASTM D4632. Grab elongation shall be 50 percent. Puncture strength shall be 110 pounds when tested in accordance with ASTM D4833. Mullen burst value shall be minimum 350 psi. Trapezoidal tear shall be minimum 80 lb when tested in accordance with ASTM D4533. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.

- E. Drainage Material:
 - 1. Bedding: Drainage fill per Section 31 20 00, EARTH MOVING.
 - 2. Fill: Drainage fill per Section 31 20 00, EARTH MOVING.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Trenching and Excavation
 - 1. Perform required trenching and excavation in accordance with Section 31 20 00, EARTH MOVING. Keep trenches dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends or as otherwise indicated. Use wye fittings at intersections.
- B. Bedding
 - 1. Place filter fabric as indicated and required.
 - 2. Place graded bedding, minimum 4 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 plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. 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 COR. Invert elevation of drain pipe shall not be higher than the bottom of the adjacent preplaced crypts unless otherwise indicated. Lay drain lines and firmly bed in granular material a minimum of 4 inches below invert to top of pipe to true grades and alignment with bells facing upgrade, and to slope uniformly between elevations shown on Drawings. Keep trenches dry until pipe is in place and granular material backfill is completed to 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."
 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. Install cleanout extensions where shown on the Drawings.
 6. Prior to backfilling, check drain lines to assure free flow. Remove obstructions and recheck lines until satisfactory.
- D. Jointing
1. Perforated and porous types of drain pipes shall be laid with closed joints.
- E. Backfilling: Place granular material, hand tamped, as indicated on the Construction Documents. Remainder of backfill shall be comparable to existing adjacent soils.
1. Filter fabric shall be installed per the Drawings.
 2. 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.

END OF SECTION