

**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 storm sewer.

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):
 - HB17-02.....Standard Spec for Highway Bridges, Div II, Section 36.4.2.4, Joint Properties.
 - M6-03.....Fine Aggregate for Portland Cement Concrete
 - M86/M86M-06.....Concrete Sewer, Storm Drain, and Culvert Pipe
 - M175/M175M-05.....Perforated Concrete Pipe
 - M288-06.....Geotextile Specification for Highway Applications
 - T281-06.....Vitrified Clay Pipe

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

- A74-05.....Standard Specification for Cast Iron Soil Pipe and Fittings
- A746-03.....Standard Specification for Ductile Iron Gravity Sewer Pipe
- C14/C14M-05aStandard Specification for Non-reinforced Concrete Sewer, Storm Drain, and Culvert Pipe
- C118/C118M-05a.....Standard Specification for Concrete Pipe for Irrigation or Drainage
- C443/C443M-05a.....Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- C444/C444M-03.....Standard Specification for Perforated Concrete Pipe
- D448-03a.....Standard Classification for Sizes of Aggregate for Road and Bridge Construction
- D2321-05.....Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- D2729-03.....Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- D2737-03.....Standard Specification for Polyethylene (PE) Plastic Tubing
- D3034-06.....Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- D4216-03.....Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds
- F477-02e1.....Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F758-95(2000)Standard Specification for Smooth-Wall Poly (Vinyl Chloride)(PVC)Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Underslab Header:

1. ASTM A74 or ASTM A746 cast-iron soil pipe and fittings in NPS 4 to NPS 15 (DN 100 to DN 375). Joints shall be hub-and-spigot, gasket type.
 2. PE drainage tubing and fittings per ASTM D2737, in NPS 4 to NPS 10 (DN 100 to DN 250). Joints shall be coupling type.
 3. PE pipe and fittings per ASTM D2737, in NPS 12 to NPS 36 (DN 300 to DN 900). Joints shall be coupling type.
 4. PVC sewer pipe and fittings per ASTM D3034, in NPS 4 to NPS 15 (DN 100 to DN 375). Joints shall be bell-and-spigot. ASTM F477, elastomeric seal gaskets shall be used.
- B. Perforated Drainage Pipe:
1. Perforated, PE pipe and fittings per ASTM D2737, in NPS 4 to NPS 6 (DN 100 to DN 150). Joints shall be coupling type.
 2. Perforated, PE pipe and fittings per ASTM D2737, in NPS 8 to NPS 24 (DN 200 to DN 600). Joints shall be coupling type.
 3. Perforated, PVC sewer pipe and fittings per ASTM D2729, in NPS 4 (DN 100) only. Joints shall be bell-and-spigot, loose type.
 4. Perforated, clay pipe and fittings per AASHTO T281 in NPS 3 to NPS 24 (DN 80 to DN 600). Joints shall be socket-and-spigot, closed type.
 5. Perforated, concrete pipe and fittings per AASHTO M175/M175M, standard strength or ASTM C444/C444M, Type 1, and applicable requirements of ASTM C14/C14M, Class 2, in NPS 4 to NPS 24 (DN 100 to DN 600). Joints shall be socket-and-spigot type. ASTM C443/C443M rubber gaskets shall be used.
- C. 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.
- D. 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 NPS 4 (DN 100) pipe.
 3. Fittings shall be PVC with NPS 4 (DN 100) outlet connection.
 4. Couplings shall be PVC.
- E. 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:

- F. Drainage Mat: Formed three dimensional polyethylene or high-impact polymeric core or compression-resistant nylon matting of open three-dimensional construction.
- G. Drainage Material:
 - 1. Bedding: Crushed stone, 20 mm (3/4 inch) to No. 4 per ASTM D448.
 - 2. Fill to 300 mm (1 foot) above pipe: Crushed stone, 20 mm (3/4 inch) to No. 4 per ASTM D448.
- H. Concrete Sand: AASHTO M6.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Laying: Prior to installation of bedding materials or piping, examination of excavation and subgrades are to be observed by the Resident Engineer. 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.
 - 1. 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. Concrete piping shall be per ASTM C14/C14M, AASHTO M86/M86M, and ASTM C118/C118M.
 - c. PE joint construction shall be per ASTM D2737 and AASHTO HB17, Division II, Section 26.4.2.4, "Joint Properties."
 - d. PVC joint construction shall be per ASTM D3034 with elastomeric seals gaskets per ASTM D2321.
 - e. Perforated PVC joint construction shall be per ASTM D2729, with loose bell and spigot joints.
 - f. Perforated concrete joint construction, including fittings and gaskets, shall be per ASTM C443/C443M.

2. 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.
 3. 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.
 4. For underslab subdrainage, install piping pitched down in direction of flow, at a minimum slope of 0.5 percent.
 5. Install cleanout extensions where shown on the Contract Documents.
 6. Prior to backfilling, check drain lines to assure free flow. Remove obstructions and recheck lines until satisfactory.
- B. 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 // pit run sand and gravel with a maximum plasticity index of 6 // drainage material from site excavation // 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.
- C. Filter fabric may be substituted for sand layer.
- D. Vertical drainage mat in conjunction with geotextile may be substituted for sand and drainage material.
- E. 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.

- - -E N D - - -