

**SECTION 33 46 13  
SUBDRAINAGE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. subdrainage system adjacent to walls and 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 REFERENCES**

- 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):
  - 1. M252 Corrugated Polyethylene Drainage Tubing
  - 2. M278 Class PS 50 Polyvinyl Chloride (PVC) Pipe
  - 3. M288 Geotextile Specification for Highway Applications
  - 4. M294 Corrugated Polyethylene Pipe, 12- to 24-in. Diameter
- C. American Society for Testing and Materials (ASTM):
  - 1. C1173 Specifications for Flexible Transition Couplings for Underground Piping System
  - 2. D448 Standard Classification for Sizes of Aggregate for Road and Bridge Construction
  - 3. D1621 Test Method for Compressive Properties of Rigid Cellular Plastics
  - 4. D1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
  - 5. D2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and fittings
  - 6. D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
  - 7. D2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
  - 8. D2729 Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - 9. D2729 Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - 10. D2751 Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings

11. D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
12. D4716 Test Method for Constant Head Hydraulic Transmissivity (in-Plane Flow) of Geotextiles and Geotextile Related Products
13. F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
14. F656 Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
15. F1336 Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings

D. Caltrans Standard Specifications:

1. Section 68 Subsurface Drains
2. Section 88 Engineering Fabrics

**1.4 SUBMITTALS**

- A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
- B. Product data for the following:
  1. Perforated pipe and fittings.
  2. Solid pipe and fittings.
  3. Geotextile fabrics.
- C. Samples:
  1. Drainage Fill.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe-fittings, and seals from dirt and damage.
- C. Protect permeable material from contamination by other materials.

**PART 2 - PRODUCTS**

**2.1 PERFORATED WALL AND SOLID WALL PIPE**

- A. PE Pipe and Fittings (HDPE): 4-inch through 10-inch, AASHTO M252 Type S (Solid wall.) or SP (Perforated wall.), smooth interior and corrugated exterior. Bell and spigot joints.
  1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
  2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.
  3. Perforation Size, Location, and Spacing: AASHTO M 252, Class 2.
- B. PVC Pipe and Fittings:

1. Pipe: 4-inch through 15-inch, ASTM D 3034, SDR 35. Bell and spigot joints.
2. Perforation Size, Location, and Spacing: ASTM D 2729.
3. Fittings: ASTM F 1336.
4. Joint Gasket: Elastomeric seal, ASTM F 477.

## **2.2 SPECIAL PIPE COUPLINGS**

- A. Description: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

## **2.3 DRAINAGE FILL MATERIAL**

- A. Caltrans Permeable Material: Class 2 conforming to Section 68-1.025 of Caltrans Standard Specifications, Class 2.

## **2.4 GEOTEXTILE FILTER FABRIC**

- A. Where indicated on plans, use nonwoven geotextile filter fabric for encasing permeable drainage material.
  1. Caltrans Filter Fabric: Section 88-1.02B of Caltrans Standard Specifications.
  2. ASTM D6707.
- B. The geotextile shall be manufactured with fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins or polyesters.
- C. Survivability shall be Class 3.
- D. Apparent opening size shall be No. 70.
- E. Permittivity shall be 0.5 per second, minimum.

## 2.5 IMPERMEABLE GEOMEMBRANE LINER

- A. Where indicated on plans, use impermeable geomembrane for lining turf subdrainage materials.

Property	Thickness 30 mil	Test Method
Thickness, % Tolerance	±5	ASTM D 5199
Tensile Strength, lbs/in width	73	ASTM D 882, Method B
Modulus at 100% Elongation, lbs/in	30	ASTM D 882, Method B
Ultimate Elongation, %	380	ASTM D 882, Method A
Tear Resistance, lbs	8	ASTM D 1004
Low Temperature Impact, °F	-20	ASTM D 1790
Volatile loss, % max.	0.7	ASTM D 1203, Method A
Pinholes, No. per 10 sq. yds. max.	1	N/A
Bonded Seam Strength, % of tensile strength	80	N/A

## 2.6 FILTER FABRIC

- A. When required, use filter fabric for encasing permeable material around subdrains.

1. Caltrans Filter Fabric: Section 88-1.02B of Caltrans Standard Specifications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Install only after unsatisfactory conditions have been corrected.

### 3.2 PIPING APPLICATIONS

- A. Refer to Plans for location, size, and material designation for individual subdrains.

### 3.3 INSTALLATION OF PERFORATED PORTIONS OF SUBDRAINS

- A. Excavation: Section 6 of ASTM D 2321 and as indicated.
- B. Subdrain Bedding: Place supporting layer of drainage fill over compacted subgrade to compacted depth indicated. If drainage fill requires encasement in filter fabric, lay filter fabric in trench and overlap trench sides before installing drainage fill.
- C. Piping Installation: Install pipe in accordance with Section 7 of ASTM D 2321. Install piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert. Excavate recesses for bottoms of bell ends of pipe. Lay pipe with bells facing upslope and with spigot end centered fully into adjacent bell. Bed piping with full pipe bearing in drainage fill material. Lay perforated pipe with perforations down. Install gaskets, seals, sleeves, and couplings in accordance with manufacturers written instructions. Use increasers, reducers, and couplings made for different sizes of materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- D. Initial Subdrain Backfill: After installing drainage piping, add drainage fill up to top of pipe to perform tests.

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- E. Testing Subdrain: After installing drainage fill to top of pipe, test drain piping with water to ensure free flow before backfilling with drainage fill. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.
- F. Subsequent Subdrain Backfill: After satisfactory testing, cover piping with drainage fill to width and height indicated. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed. If filter fabric is required complete the filter fabric encasement by bringing fabric to top and closing the encasement.
- G. Fill to Grade: Place native fill material over compacted drainage fill to thickness indicated. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish elevations unless otherwise specified on the plans.

### **3.4 INSTALLATION OF NON-PERFORATED PORTIONS OF SUBDRAINS**

- A. Conform to Section 33 40 00 - Storm Drainage Utilities.

### **3.5 JOINING PIPE**

- A. Join PVC pipe and fittings with elastomeric seals according to ASTM D 2321.
- B. Special pipe couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and that fit both pipe materials and dimensions.

### **3.6 CLEANING**

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

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