

SECTION 443 FRENCH DRAINS

443-1 Description.

Construct French Drains, utilizing one of the authorized types of pipe, with coarse aggregate, or ballast rock when specified, and filter fabric.

443-2 Materials.

443-2.1 Pipe: Unless a particular type is specified in the plans, pipe furnished may be any of the following types:

(1) Concrete Pipe (Bell & Spigot): Slotted or perforated concrete pipe may be used. Meet the requirements of Section 449 for concrete pipe. Use the class of pipe specified on the Design Standards, Index No. 205. Do not use gaskets. Fully insert the spigot in the bell, and bring home. Conform to Design Standards, Index No. 285 for slotted pipe. Use perforated pipe having perforations equally located 360 degrees around the pipe. Use pipe having not less than 30 round perforations, 3/8 inch each, per square foot of inside pipe surface. Extend perforations to within 6 inches of the bell or spigot area. The Engineer will permit other perforations not less than 5/16 inch nor more than 3/8 inch in the least dimension if they provide an opening area not less than $3.31 \text{ in}^2/\text{ft}^2$ of pipe surface.

(2) Corrugated Aluminum Alloy Culvert Perforated Pipe: Meet the requirements of Section 945. Use perforated pipe having perforations equally located 360 degrees around the pipe. Locate perforations either on the inside crests or on the neutral axis of all corrugations except that perforations are not required within 4 inches of each end of each length of pipe or in a corrugation where seams are located.

Provide pipe having not less than 30 round perforations, 3/8 inch each, per square foot of pipe surface. The Engineer will permit other perforations not less than 5/16 inch nor more than 3/8 inch in the least dimension if they provide an opening area not less than $3.31 \text{ in}^2/\text{ft}^2$ of pipe surface.

(3) Corrugated Steel Perforated Pipe: Meet the requirements of Section 943. Space the perforations and meet the requirements as specified in (2) above.

(4) Bituminous Coated Corrugated Steel Perforated Pipe: Meet the requirements of Section 943. Space the perforations and meet the requirements as specified in (2) above. Place the perforations prior to the bituminous coating. The Engineer will accept the minimum opening of not less than $3.31 \text{ in}^2/\text{ft}^2$ of pipe if 50% of the opening area is maintained after coating.

(5) Corrugated Polyethylene Pipe: Meet the requirements of 948-2.3. Space the perforations and meet the requirements as specified in (2) above.

(6) Polyvinyl Chloride (PVC) Pipe: Meet the requirements of 948-1.7. Space the perforations and meet the requirements as specified in (2) above.

443-2.2 Coarse Aggregate: Meet the requirements of 901-1.4 for No. 4 stone.

443-2.3 Select Fill: Use select fill, unless otherwise called for, consisting of well-graded limerock or limerock and sand fill. Sand, or fill having a high proportion of sand, will not be accepted as select fill. Prior to placing select fill, obtain the Engineer's approval.

443-3 Excavating Trench.

Excavate the trench in accordance with Section 125 unless specific trench excavation procedures are described in the plans.

Carefully excavate the trench to such depths as required to permit the filter fabric, coarse aggregate and the pipe to be placed in accordance with the details shown on the plans.

443-4 Laying Pipe.

Lay all pipe conforming with the lines and grades specified in the plans and in accordance with these Specifications. Unless otherwise specified in the plans, set the pipe with a 36 inch minimum cover and a maximum cover of 66 inches.

443-5 Placing Coarse Aggregate and Backfilling.

After the pipe placement has been approved, carefully place the coarse aggregate or ballast rock, without disturbing the pipe, around and over the pipe to a depth shown on the plans. Then fold the filter fabric over the coarse aggregate or ballast rock as shown on the plans, and fill the portion of the trench above the coarse aggregate with select fill material placed in layers not to exceed 6 inch compacted thickness. After placing the pipe, carefully place the coarse aggregate, without disturbing the pipe, around the pipe to a depth shown in the plans. Fold the filter fabric over the coarse aggregate. Backfill and compact as described below.

443-5.1 French Drains Under Pavement: Fill the area above the coarse aggregate with select fill material meeting the requirements of this Section. Place and compact the select fill according to the requirements for pipe as specified in Section 125. The Department will allow use of additional coarse aggregate over the top of the pipe instead of select fill material. In this case, the top of the coarse aggregate shall not be higher than the bottom of the base, unless shown in the plans. The Department will not pay additional costs associated with substituting coarse aggregate for select fill.

443-5.2 French Drains not Under Pavement: Fill and compact the area above the coarse aggregate according to the requirements for pipe in Section 125, unless specific procedures are described in the plans as specified in Section 125.

443-6 Method of Measurement.

The quantity of French Drains to be paid for under this Section will be the length in feet, measured in place, completed and accepted or paid for separately under the several related pay items as specified on Design Standards, Index No. 285 for French Drains with a significantly different cross-section.

443-7 Basis of Payment.

The quantities determined as provided above will be paid for at either (1) the Contract unit price per foot for French Drains or (2) separately under the several related pay items as defined in 443-6. Such prices and payments will be full compensation for all the work specified in this Section and will include all materials and all excavation, and will also include sheeting or shoring, if required, the disposal of surplus material, pavement restoration, backfilling and tamping, but will not include payment for items paid for elsewhere in the specifications.

Payment shall be made under:

Item No. 430- 72-	Slotted or Perforated Pipe Culvert - per foot.
Item No. 443- 70-	French Drains - per foot.
Item No. 443- 71-	Ballast Rock - per cubic yard.
Item No. 514- 71-	Plastic Filter Fabric - per square yard.

