

**Item No. 551
Pipe Underdrains**

551.1 Description

This item shall consist of pipe underdrains embedded in filter material, constructed at such places as indicated and in accordance with lines and grades established by Engineer. This item shall also consist of any pumping, bailing, drainage and Item No. 509S, "Excavation Safety Systems" for trench walls, when indicated.

551.2 Materials

(1) Pipe

The following materials will be permitted as alternates unless type is indicated. Size indicated shall be inside diameter. Pipe shall meet the following requirements:

Type 1 Vitrified Clay or Concrete Pipe

Pipe may be either thoroughly and perfectly burned or glazed vitrified clay or non-reinforced concrete conforming to ASTM C 14. Vitrified clay pipe shall be of first quality hub and spigot style, sound, without warps or cracks or other imperfections and shall be sufficiently tough so that it may be cut with a chisel and hammer.

Type 2 Clay Drain Tile

Standard clay drain tile shall conform to specifications of AASHTO M 179.

Type 3 Concrete Drain Tile

Butt end concrete drain tile shall conform to ASTM C 412. Tongue and groove concrete drain tile shall conform to ASTM C 118.

Type 4 Porous Concrete Pipe

Porous concrete pipe shall conform to AASHTO M 176.

Type 5 Perforated Clay Pipe

Perforated clay pipe shall conform to specifications for standard strength perforated clay pipe of AASHTO M 65 except that extra strength clay pipe may be substituted for standard strength clay pipe.

Type 6 Perforated Corrugated Metal Pipe

Perforated helically corrugated metal pipe shall be fabricated from corrugated galvanized sheets and shall conform to AASHTO M 36 or corrugated aluminum alloy sheets and shall comply with AASHTO M 196.

Type 7 Perforated Corrugated Metal Pipe (Bituminous Coated)

Pipe shall conform in all particulars to requirements specified above for perforated corrugated metal pipe. Steel pipe shall be uniformly coated inside and out with a bituminous coating to a minimum thickness of 0.05 inch.

Bituminous material used to coat pipe shall meet the following requirements when tested in accordance with TxDOT Test Method Tex-522-C:

| | |
|-------------------------|--------------|
| Solubility, % by wt. in | |
| Trichloroethylene | 99.5 minimum |
| Brittleness Test | Pass |
| Flow, inches | 0.25 maximum |

Type 8 Perforated Concrete Pipe

Perforated concrete pipe shall conform to ASTM C 444, “Standard Strength Perforated Nonreinforced Concrete Underdrain Pipe”, except that “Extra Strength Perforated Nonreinforced Concrete Underdrain Pipe” may be substituted for standard strength pipe.

Type 9 ABS Perforated Pipe

ABS pipe shall be extruded and fittings molded from virgin ABS plastic material conforming to ASTM D 1788, Type 4, except that minimum heat deflection temperature is 180°F. Contractor shall furnish certified test reports as evidence that material used for project meets ASTM requirements. Dimensions of ABS pipe shall be as shown in Table I. Fittings shall conform to manufacturer's standard for particular size of pipe required.

TABLE I

| Nominal Size, Inches | Inside Diameter Inches, Minimum | Thickness of Barrel Inches, Minimum |
|----------------------|---------------------------------|-------------------------------------|
| 4 | 3.82 | 0.19 |
| 6 | 5.70 | 0.28 |

Perforations shall conform to requirements for Type 5 pipe underdrains. Crushing strength of ASB pipe shall meet or exceed minimum values in Table II when tested in accordance with flat-plate loading method as outlined in ASTM Designation: D 2412.

TABLE II

| Nominal Size, Inch | Minimum Strength, lb. Inch |
|--------------------|----------------------------|
| 4 | 179 |
| 6 | 604 |

Pipe shall withstand at least 35 percent vertical deflection without rupture of pipe wall and stiffness shall equal or exceed valves at 5 percent deflection. Vertical deflection shall be computed as follows:

$$\text{Percent Deflection} = \frac{\text{Reduction Vert. I.D.}}{\text{Nominal I.D.}} \times 100$$

Ends of ABS pipe, couplings and fittings shall be perpendicular or square to longitudinal axis of main body within a maximum angle of 3 degrees. Outer and inner surface of pipe shall be free from blisters, voids and discontinuities.

Type 10 Preformed Corrugated Polyethylene Plastic Tubing

Tubing shall comply with AASHTO M 252.

Type 11 Perforated Polyvinyl Chloride Pipe

Pipe shall be Schedule 40 and conform to ASTM D 1785. Unless otherwise specified, the perforated pipe shall have two rows of holes 13 mm (1/2 in.) in diameter on 125-mm (5 in.) centers, with allowable tolerances of ± 1 mm (1/16 in.) on the diameter and +6, -0 mm (+1/4, -0 in.) on the spacing, and the rows shall be parallel to the axis of the pipe and $120 \pm 5^\circ$ apart.

(2) Filter Material

(a) Aggregate

Filter material for use in backfilling trenches under, around and over underdrains shall consist of hard, durable, clean, washed gravel or crushed stone, ranging in size from 5/8 to 1 inch and shall be free from organic matter, clay balls or other deleterious matter.

(b) Geotextile

Geotextile shall conform to Item No. 620S, "Filter Fabric".

551.3 Construction Methods

Excavation of each trench shall begin at its outlet and proceed toward its upper end. Trench must not be excavated below proposed grade line and shall be located as indicated or as directed by Engineer and true to line and grade. Trench shall be dressed with a tile hoe or shovel in such manner that will facilitate placement of underdrain. Closed joints shall be coupled with bands, solvent weld couplings or integral joints. Perforated ABS pipe shall be jointed by couplers or solvent welding according to manufacturer's recommendation. No tar paper strips shall be used.

Approved plugs shall be placed in upper ends of pipes and exposed ends of underdrains shall be covered with 1/2 inch galvanized hardware cloth and filter fabric.

When indicated, concrete riprap or headwalls of dimensions indicated shall be constructed at outlet ends of pipe underdrains. Concrete materials and proportions shall conform to requirements specified for Class B Concrete conforming to Item No. 403S, "Concrete for Structures".

When perforated metal pipe is used and trench is founded in pervious material, a thin layer of tamped impervious material shall be placed on bottom of trench as indicated or as directed by Engineer. Sections shall be jointed with band couplers.

When clay or concrete pipe is used and trench is founded in pervious material, a bottom course of specified filter material shall be placed and tamped to a uniform depth of 2 inches.

Pipe shall then be firmly embedded in filter material, hub upgrade and spigot firmly centered into adjacent hub end or in the case of butt end type drains with an open joint of approximately 3/8 inch. Open joints shall then be covered with approved 2 ply tar paper strips not less than 6 inches in width and of sufficient length to permit ends being turned outward and laid flat on bottom course of filter material of each side for a distance of 3 inches. When trench is founded in impervious material, the 2 inch bottom course of filter material shall be omitted, pipe laid directly in trench and filter material placed in trench to a depth of 2 inches on each side of pipe. Two ply tar paper strips shall then be placed as specified above.

551.4 Measurement

Work and accepted materials for "Pipe Underdrains" shall be measured by the linear foot of pipe measured along slope and shall include clearing, excavation, filter material, filter fabric, pipe, length of elbows, wyes, tees and other branches and backfill.

551.5 Payment

Work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price bid per linear foot of "Pipe Underdrains" of type and size specified, which price shall be full compensation for furnishing and placing materials, for underdrain excavation and backfill, for filter materials, for plugs and screens and for labor, tools, equipment and incidentals necessary to complete the work.

Any riprap, headwalls or Trench Safety System indicated will be measured and paid for in accordance with provisions of Item No. 403S, "Concrete for Structures", Item No. 410, "Concrete Structures", Item No. 509S, "Excavation Safety Systems" and Item No. 591S, "Riprap for Slope Protection".

Payment will be made under:

Pay Item No. 551: Pipe Underdrains, ___In. - Per Linear Foot.

End

Ref: 403S, 410, 509S, 591S, 620S