

## 822 - PIPE UNDERDRAIN

### 822.1 DESCRIPTION

At the locations determined by the engineer, underdrain shall be constructed in accordance with the plans and Section 822 of the Standard Specifications except as otherwise modified herein. All materials shall meet the requirements of Section 1907 of the Standard Specifications, except as otherwise modified herein. Under no circumstance shall Type H Pipe be installed within the same underdrain system as Type T Pipe.

### 822.2 MATERIALS

#### a. Pipe Underdrain

Pipe underdrain shall be Type H, PVC Corrugated Sewer Pipe with smooth interior and fittings in accordance with ASTM F 949, or, Type T, Polyethylene Drainage Pipe in accordance with AASHTO M252, Type SP.

#### b. Outlet Pipe

Outlet pipe shall be Type K, PVC Sewer Pipe with smooth interior and fittings in accordance with ASTM F 891.

#### c. Joints

All joints shall be installed in accordance with the manufacturer's instructions. The contractor shall submit certified test results that the mechanical joints with elastomeric seals meet the requirements of ASTM D 3212 and ASTM F 477.

#### d. Perforations

Type H pipe shall be perforated in accordance with ASTM F 949. Type T pipe shall be perforated in accordance with AASHTO M252, Type SP with Class 2 perforations.

#### e. Prefabricated Edge Underdrain

The Contractor may, at his option and the approval of the engineer, use prefabricated edge drain for "Pipe Underdrain" at locations not shown on the plans as being under paved areas. Prefabricated edge drain shall be a corrugated panel drain conforming to the requirements for Class B Geocomposite as defined in ASTM D7001-06. This geocomposite product shall be composed of a flat pipe design consisting of a full circumference polyethylene core wrapped with a nonwoven Class II geotextile.

##### (1) Materials

Drainage core material shall be manufactured from polymers having a high resistance to deterioration by pavement deicing salts, petroleum based materials and naturally occurring soil chemicals. The core shall have sufficient flexibility to withstand bending and handling without damage or significant weakening.

Polyethylene edge drain materials shall conform to the requirements of the minimum cell classification of 424420C as defined and described in ASTM D3350. The compound ingredients may consist of lubricants, stabilizers, nonpoly (ethylene) resin modifiers, and pigments essential for processing, property control, and coloring.

##### (2) Workmanship and Visible Defects

The panel type pipe and fittings shall be free of foreign inclusions and visible defects. Ends shall be cut squarely and cleanly so as not to adversely affect joining. Cracks, creases, unpigmented or non uniformly pigmented pipe are not permissible.

(3) Dimensions

The nominal sizes of the panel type pipe shall be 12 inches or 18 inches wide and 1 inch thick. The inside and outside dimensions and tolerances for the pipe are as follows:

Outside Dimensions:

Nominal Size	Width	Thickness
12 inches	13 inches $\pm$ 3%	1.5 inches $\pm$ 3%
18 inches	18 inches $\pm$ 3%	1.6 inches $\pm$ 3%

Inside Dimensions:

Nominal Size	Width	Thickness
12 inches	12 inches $\pm$ 3%	0.750 inches + 3%/-1.5%
18 inches	17.25 inches $\pm$ 3%	0.830 inches + 3%/-1.5%

Length shall be as approved by the Engineer, and shall not be less than 99 percent of the stated quantity.

(4) Perforations

When perforated, the perforations shall be cleanly cut so as not to restrict the inflow of water and uniformly spaced on each long side of the panel type pipe. For 12 inch wide panels, four (4) rows of slots shall be uniformly spaced in every corrugation valley on each face. For 18 inch wide panels, six (6) rows of slots shall be uniformly spaced in every corrugation valley of each face. The length of slots shall not exceed 1 inch. The width of slots shall not exceed 0.150 inches. The water inlet area shall be a minimum of 5 square inches per foot per side for a 12 inch panel; 7.5 square inches per foot per side for a 18 inch panel.

(5) Conditioning

**Condition the specimen prior to test at 21 to 25° C for not less than 40 hours in accordance with procedure A in ASTM D618 for those tests where conditioning is required, and unless otherwise specified.**

(6) Conditions:

**Conduct all tests at a laboratory temperature of 21 to 25° C unless otherwise specified herein.**

(7) Compressive Strength

The panel type pipe shall have a minimum of 40 psi. at 20% deflection when tested in accordance with these specifications. Further, the panel type pipe shall retain 50% of the minimum compressive strength when tested at 50 degrees from the normal plane.

To test for compressive strength, select a minimum of three (3) specimens and test for compressive strength as described in ASTM D2412, except for the following: (1) the test specimens shall be a minimum length equal to the nominal size of the panel type pipe; (2) the sample must lie flat on the plate within 1/8 inch and may be straightened by hand bending at room temperature to accomplish this; (3) crosshead speed shall be 0.50 +/- 0.02 inches per minute; (4) loading plates must be larger than the sample size; (5) the deflection indicator shall be readable and accurate to +/- 0.001 inch; (6) project the linear portion of the load/deflection curve between 0 and 10% deflection until it intersects the deflection axis. The point shall be considered as the origin of the load deflection curve. This test must be repeated using loading plates at 50 degrees from vertical and the results reported as above.

(8) Environmental Stress Cracking

There shall be no cracking of the pipe when tested in accordance with these specifications.

Sections shall be tested for environmental stress cracking in accordance with ASTM D1693, except for the following modifications: (1) Three samples shall be tested; (2) each specimen shall consist

of a 180 degree arc length taken from the ends of the panel type pipe; (3) Bend the specimens to shorten the inside radius length 20 +/- 1 percent and retain in this position using a suitable holding device; (4) Place the bent specimen in a container of suitable size and cover completely with a preheated wetting agent at 122 degrees F +/- 3.6 degrees F. Maintain this temperature for 24 hours, and then remove the sample and inspect immediately. The wetting agent used in this test is 100 percent Igepal CO-630, a trade name for Nonylphenoxy Poly (Ethyleneoxy) Ethanol.

(9) Brittleness

Samples shall not crack or split when tested accordance with these specifications. Five non-failures out of six impacts will be acceptable.

Test sections shall be tested in accordance with ASTM D2444. There shall be a minimum of three test specimens, each having a minimum length of 3 feet. The specimens shall be conditioned at a temperature of 25 degrees F for a period of 24 hours. Conduct the test within 60 seconds of removal from this environment. Use Tup B weighing 5.5 lbs. and drop height of 1.8 feet. The center of the falling tup shall strike on a corrugation crown on the narrow ends of the drain panel.

(10) In-Plane Flow

The panel type pipe shall have minimum hydraulic transmissivity of 17.5 gallons per minute per foot when tested in accordance with these specifications.

In-plane flow tests shall be performed in accordance with ASTM D4716 with the following exceptions: (1) test samples shall be full width and 12 inches long; (2) a hydraulic gradient of 0.1 shall be used; (3) samples shall be loaded to a minimum applied load of 10 psi. for 100 consecutive hours prior to testing; (4) transmissivity shall be recorded in gallons per minute per foot of sample width.

(11) Fittings

The fittings shall not reduce or impair the overall integrity or function of the pipe line. Standard fittings include in-line couplings, end outlets, side outlets, and end caps. Fittings shall not reduce the inside open flow area of the panel type pipe. Couplings shall be corrugated to match corrugations of the panel type pipe and shall provide sufficient longitudinal strength to assure alignment and prevent separation at the joints. Couplings shall not depend on tape or staples to maintain closure.

Joint integrity shall be tested by assembling in-line coupling fittings to panel type pipe sections in accordance with the manufacturer's recommendations. Using pipe sections at least 6 inches in length, an assembled test sample shall be suspended with its longitudinal axis vertical. A load consisting of a tare weight of 100 lbs. shall be hung from the lower end of the specimen, without separating.

Alignment shall be tested by assuring that the assembly or joint is correct and complete. Lay the assembly on join on a flat surface and verify that it will accommodate straight line flow.

(12) Marking

All panel type pipe shall be clearly marked at intervals of not more than 10 feet, and fittings shall be clearly marked with (1) the manufacturer's name or trademark, and (2) nominal size.

(13) Quality Assurance

A manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification, together with a report of the test results, and the date each test was completed, shall be signed by a person authorized by the manufacturer.

(14) Geotextile Wrap

The geotextile shall be tightly stretched over the core in such a manner that sagging of the geotextile will not reduce the core flow area more than 15% under a test with a compressive load of 6,000 psf applied through 6 inches of a No. 30 - 50 sieve size sand.

Sewing of the geotextile will be allowed provided it conforms to the following: (1) Seams shall be either "J" or "butterfly" type and shall utilize a lock stitch; (2) Seams shall conform to the tensile strength requirements for the geotextile when tested across the seam; (3) The thread for seaming shall be of equal or greater durability than the geotextile itself.

### **822.3 MEASUREMENT AND PAYMENT**

The Engineer will measure pipe underdrains and outlet pipes of the specified type and size by the linear foot.

Payment for "Pipe Underdrain" and "Outlet Pipe" at the contract unit prices bid is full compensation for the specified work. No measurement shall be made of excavation, disposal of surplus excavated materials, aggregate for underdrain, geotextile, or connections to structures. Such work shall be considered subsidiary to "Pipe Underdrain" and "Outlet Pipe".