

**Standard Specifications Manual: SERIES 500 - PIPE AND APPURTENANCES**

**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 nonreinforced 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 180F. 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 ABS 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 values 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.)~~ **9.4 mm (3/8 in.)** in diameter on ~~125 mm (5 in.)~~ **150 mm (6 in.)** centers, with allowable tolerances of  $\pm 1$  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~~ **rounded, river gravel** ~~or crushed stone~~, ranging in size from ~~5/8 to 1 inch~~ **one-half (0.5) to one and one-half (1.5) inch** and shall be free from organic matter, clay balls or other deleterious matter.

#### **(b) Geotextile**

Geotextile shall conform to Item No. 620 – Table 2, "High Flow Filter Fabric".