
Standard Specification for Concrete Drain Tile

AASHTO Designation: M 178M/M 178-23¹

Technically Revised: 2023

Technical Subcommittee: 4a, Concrete Drainage Structures

ASTM Designation: C412M-19 and C412-19



American Association of State Highway and Transportation Officials
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1. SCOPE

- 1.1. This specification covers concrete drain tile with internal diameters from 100 mm (4 in.) to 900 mm (36 in.) that is intended to be used for surface and subsurface drainage.
- 1.2. This specification is applicable for orders in either SI units (M 178M) or in inch-pound units (M 178). SI units and inch-pound units are not necessarily equivalent. Inch-pound units are shown in brackets in the text for clarity, but they are the applicable values when the material is ordered to M 178.

Note 1—This specification is a manufacturing and purchase specification only and does not include requirements for bedding, backfill, or the relationship between field load condition and the strength classification of drain tile. However, experience has shown that the successful performance of the product depends on the proper selection of the class of drain tile, type of bedding and backfill, and care that the installation conforms to the construction specifications. The owner of the reinforced concrete pipe specified herein is cautioned that the field requirements must be correlated with the class of pipe specified and provide inspection at the construction site.

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- < M 6, Fine Aggregate for Hydraulic Cement Concrete
 - < M 80, Coarse Aggregate for Hydraulic Cement Concrete
 - < M 85, Portland Cement
 - < M 157, Ready-Mixed Concrete
 - < M 240M/M 240, Blended Hydraulic Cement
 - < M 262, Concrete Pipe and Related Products
 - < M 295, Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 - < M 302, Slag Cement for Use in Concrete and Mortars
 - < T 280, Concrete Pipe, Manhole Sections, or Tile
- 2.2. *ASTM Standards:*
- < C1116/C1116M, Standard Specification for Fiber-Reinforced Concrete

3. TERMINOLOGY

- 3.1. *Definitions*—For definitions of terms relating to concrete pipe, see M 262.

4. CLASSIFICATION

- 4.1. *Drain tile manufactured according to this specification shall be of the following four classes:*
- 4.1.1. *Standard-Quality Concrete Drain Tile*—Intended for land drainage of ordinary soils where the tiles are laid in trenches of moderate depths and widths. Standard-Quality concrete drain tiles are not recommended for use where internal diameters in excess of 300 mm [12 in.] are required.
- 4.1.2. *Extra-Quality Concrete Drain Tile*—Intended for land drainage of ordinary soils where the tiles are laid in trenches of considerable depths or widths, or both.
- 4.1.3. *Heavy-Duty Extra-Quality Concrete Drain Tile*—Intended for land drainage of ordinary soils where the tiles are laid in trenches of large depths or widths, or both.
- 4.1.4. *Special-Quality Concrete Drain Tile*—Intended for land drainage where special precautions are necessary for concrete tile laid in soils that are markedly acid or contain unusual quantities of sulfates (Section 7), and where the tile are laid in trenches of considerable depths or widths, or both.
- 4.1.4.1. Where the calculated loads are in excess of the crushing strengths prescribed in the physical requirements for Extra-Quality and Special-Quality concrete drain tile, tile strengths must be specified in advance by the owner.

5. BASIS OF ACCEPTANCE

- 5.1. The acceptability of drain tile shall be determined by (1) the results of the physical tests as specified in Section 8, and in T 280; (2) measurements and inspection to ascertain whether the tile conform to the requirements regarding dimensions, shape, and freedom from visible defects; and (3) the manufacturer's certification in writing that the tile have been made in accordance with any special provisions, such as strength, absorption, permeability, type of cement, admixture, curing conditions, etc.
- 5.2. The owner shall specify in writing the class or classes of concrete tile to be supplied, whether Standard-Quality, Extra-Quality, Heavy-Duty Extra-Quality, or Special-Quality. Unless Extra-Quality, Heavy-Duty Extra-Quality, or Special-Quality concrete drain tile have been specified, Standard-Quality drain tile shall be accepted.

6. MATERIALS

- 6.1. *Concrete*—The concrete shall consist of cementitious materials, mineral aggregates, and water.
- 6.2. *Cementitious Materials:*
- 6.2.1. *Cement*—Cement shall conform to the requirements for portland cement of M 85 or shall be portland blast-furnace slag cement, portland-limestone cement, or portland-pozzolan cement conforming to the requirements of M 240M/M 240, except that the pozzolan constituent in the Type IP portland-pozzolan cement shall be fly ash.

- 6.2.2. *Fly Ash*—Fly ash shall conform to the requirements of M 295, Class F or Class C.
- 6.2.3. *Slag Cement*—Slag Cement shall conform to the requirements of Grade 100 or 120 of AASHTO M 302.
- 6.2.4. *Allowable Combinations of Cementitious Materials*—The combination of cementitious materials used in the concrete shall be one of the following:
- 6.2.4.1. Portland cement only,
- 6.2.4.2. Portland blast-furnace slag cement only,
- 6.2.4.3. Portland-pozzolan cement only,
- 6.2.4.4. Portland-limestone cement only,
- 6.2.4.5. A combination of portland cement or portland-limestone cement and fly ash,
- 6.2.4.6. A combination of portland cement or portland limestone-cement and ground granulated blast-furnace slag, or
- 6.2.4.7. A combination of portland cement or portland-limestone cement, fly ash, and slag cement, or
- 6.2.4.8. A combination of portland-pozzolan cement and fly ash.
- 6.3. *Aggregates*—Aggregates shall conform to M 6 and M 80, except that the requirement for gradation shall not apply.
- 6.4. *Admixtures and Blends*—Admixtures and blends shall be used only with the approval of the owner.
- 6.5. *Synthetic Fibers*—At the owner's option, collated fibrillated virgin polypropylene fibers are not prohibited from being used as a nonstructural manufacturing material. Only Type III synthetic fibers designed and manufactured specifically for use in concrete and conforming to the requirements of ASTM C1116/C1116M shall be used.
- 6.6. *Water*—Mix water shall conform with M 157, Section 4.1.4, with a maximum limit of 0.15 percent chloride.

7. CHEMICAL REQUIREMENTS

- 7.1. *Acid and Sulfate Resistance:*
- 7.1.1. The owner is not prohibited from specifying special requirements in order to increase the durability of the drain tile in cases where the soils, soil waters, or drainage waters are markedly acid (Section 7.1.1.1) or contain moderate or severe quantities of soil sulfates (Section 7.1.1.2). Without a specific agreement in advance, no drain tile shall be rejected by reason of its composition as determined later by chemical analyses.
- 7.1.1.1. Soils or drainage water with a pH of 6.0 or lower shall be considered to be markedly acid.
- 7.1.1.2. Where the sulfates are chiefly sodium or magnesium, singly or in combination, from 400 to 2000 ppm in the soil or drainage water, samples shall be considered to constitute moderate sulfate quantities, while in excess of 2000 ppm shall be considered to be severe sulfate quantities.