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American Association State
Highway and Transportation Officials Standard
AASHTO No.: M189-81I

Standard Specification for Asbestos-Cement Underdrain Pipe[1]

This standard is issued under the fixed designation C508/C508M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers asbestos-cement perforated and plain pipe intended for use in the conveyance of drainage water for the subsurface drainage of highways, airports, farms, foundations, and other similar drainage work.

1.2 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C150/C150M Specification for Portland Cement

C458/C458M Test Method for Organic Fiber Content of Asbestos-Cement Products

C500/C500M Test Methods for Asbestos-Cement Pipe

C595/C595M Specification for Blended Hydraulic Cements

C608 Standard Method of Test for Brittle Ring Tensile Strength of Chemically Setting Silicate and Silica Chemical-Resistant Mortars (Withdrawn 1983)[3]

C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

D2946 Terminology for Asbestos and Asbestos–Cement Products

2.2 *Federal Standard:*

No. 123 Marking for Shipment Civil Agencies[4]

2.3 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[4]

2.4 *Other Standards:*

Uniform Freight Classification Rules[5]

National Motor Freight Classification Rules[6]

3. Terminology

3.1 *Definitions:*

3.1.1 *coupling, n*—component made from a larger diameter pipe of the same type or class, or of Type II and a higher class, or produced otherwise to yield at least equal performance, for joining asbestos-cement pipe that when properly installed, forms a silt-tight joint, allows alignment corrections and slight changes in direction, and provides an assembled joint equivalent in serviceability and strength to the pipe sections.

3.1.2 *lot*—each 400 m [1300 ft] of pipe or less of a given type and size manufactured on each machine during a 24-h period.

3.2 Additional terminology is given in Terminology D2946.

4. Sizes and Types

4.1 Asbestos-cement underdrain pipe furnished under this specification shall be known as "asbestos-cement underdrain pipe." It shall be furnished in nominal inside diameters of 10, 15, 20, 25, and 30 cm [4, 6, 8, 10, and 12 in.]. The types of pipe

[1] This specification is under the jurisdiction of ASTM Committee C17 on Fiber-Reinforced Cement Products and is the direct responsibility of C17.03 on Asbestos - Cement Sheet Products and Accessories.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[5] Available from the Uniform Classification Commission, Room 1106, 222 S. Riverside Plaza, Chicago, IL 60606.

[6] Available from National Motor Freight Inc., 1616 P. St., N.W., Washington, DC 20036.

shall be known as Type I and Type II corresponding to the chemical requirements given in Section 9.

NOTE 1—To assist the purchaser in choosing the type of pipe most suitable for his use, guidelines for the definition of aggressiveness of water and of soil environments for selection of the proper type of asbestos-cement pipe are covered in the appropriate sections of Test Methods C500/C500M.

5. Materials and Manufacture

5.1 Asbestos-cement underdrain pipe shall be composed of an intimate mixture of portland cement or portland blast-furnace slag cement described in Specification C150/C150M or portland blast-furnace slag or pozzolan cements described in Specification C595/C595M and asbestos fiber with or without fine silica or additives containing such silica meeting Specification C608 that is capable of reacting completely to yield calcium silicate reaction products upon autoclaving; and asbestos fiber. The mixture shall not contain more than 0.2 % of nondeleterious organic matter as determined by Test Method C458/C458M. The material shall be of laminar construction, formed under pressure to a homogeneous structure, and cured to meet the physical and chemical requirements of this specification.

6. Crushing Strength

6.1 Crushing tests shall be conducted before shipment. Pipe of 30 cm [1 ft lengths] cut from unmachined portions of the pipe shall have the minimum crushing strength prescribed in Table 1 when tested in accordance with the Procedure section of Test Methods C500/C500M, except that when the perforated underdrain pipe is tested, the sample shall contain four circumferential rows of holes with the first row 4 cm [1.5 in.] from the end. The specimen shall be tested with the line of symmetry of the rows facing downward, with the rows of holes being in the lower two quadrants.

6.2 In case a specimen fails to meet the crushing test requirement, refer to 13.3.

7. Couplings

7.1 Each standard, short, or random length of pipe shall be provided with a coupling for the purpose of maintaining alignment and to ensure close joints.

8. Fittings

8.1 Asbestos-cement underdrain pipe fittings shall be suitable in size, type, crushing strength, and design for the pipe with which they will be furnished.

TABLE 1 Crushing Strength

Nominal Size		Min Crushing Load	
cm	[in.]	kNm	[lbf/ft]
10	[4]	15	[1000]
15	[6]	16	[1100]
20	[8]	19	[1300]
25	[10]	20	[1400]
30	[12]	22	[1500]

TABLE 2 Perforations

Nominal Size		Rows of Perforations
cm	[in.]	
10	[4]	4
15	[6]	4
20	[8]	4
25	[10]	6
30	[12]	6

9. Chemical Requirements

9.1 When tested in accordance with the Procedure section of Test Methods C500/C500M, the amount of uncombined calcium hydroxide shall not exceed 1.0 % for Type II pipe.

NOTE 2—There are no chemical requirements for Type I Pipe.

9.2 If the uncombined calcium hydroxide exceeds 1 %, refer to 13.4.

10. Sizes and Dimensions

10.1 The nominal standard length for asbestos-cement underdrain pipe shall be either 3 or 4 m [10 or 13 ft]. A maximum of 15 % of the total footage of any one size and type for any order may be furnished, at the manufacturer's option, in pipe lengths shorter than specified nominal, but not shorter than 2 m [7 ft]. These shall be termed random lengths.

10.2 A tolerance of 25 mm [1 in.] shall apply to nominal standard lengths, and 152 mm [6 in.] shall apply to random lengths. For billing purposes, random lengths shall be classified to 150-mm [6-in.] increments, allowing a tolerance of + 125 and – 25 mm [+ 5 and – 1 in.].

10.3 The average inside diameter of the pipe shall not be less than nominal by 6 mm [0.25 in.] or 1½ %, whichever is greater.

11. Perforations

11.1 Perforations, when required, shall be circular holes, 6 ± 1.5 mm [0.25 ± 0.05 in.] in diameter, arranged in rows parallel to the axis of the pipe. Perforations shall be approximately 75 mm [3 in.] center-to-center, along the rows. Rows shall be arranged in two equal groups on either side of the vertical center line of the pipe, and the total number of rows shall be as shown in Table 2. The lowermost rows of perforations in each group shall be separated by an arc of 1.6 rad [90°] and the upper most rows of perforations in each group shall be separated by an arc of 2.8 rad [160°]. The spacing of rows between these limits shall be uniform. Holes are not prohibited from appearing at the ends of short and random lengths.

12. Sampling

12.1 All material tested under this specification shall be in a normal processed condition and at moisture equilibrium with the atmosphere.

12.2 For crushing tests, select one full length of pipe from each lot of each size and type of pipe. Cut one test specimen 30 cm [12 in.] long from the unmachined portion of the selected length of pipe. (**Warning—**When cutting asbestos-cement

products minimize the dust that results. Prolonged or frequent breathing of significant airborne concentrations of silica or asbestos dust is hazardous. When such dusts are generated, effective measures shall be taken to prevent inhalation. Refer to approved techniques.[7])

12.3 When uncombined calcium hydroxide tests are requested (Section 9), one sample shall be taken from each lot of pipe. The sample to be tested shall be taken from any one of the specimens selected for the crushing test.

13. Inspection and Rejection

13.1 All material furnished under this specification shall conform to the requirements stated herein and shall be subjected to the factory inspection and tests prescribed in this specification. When requested by the purchaser on his order, the manufacturer shall notify the purchaser of the time that the inspection and testing will take place so that the purchaser shall arrange for witnessing such tests and inspections at his own expense. In lieu of such inspection, when requested, the manufacturer shall be prepared to certify that his product conforms to the requirements of this specification.

13.2 Each pipe and coupling shall be inspected by the manufacturer before shipment for compliance with the standards for dimensions, tolerances, and workmanship and finish (see Section 10).

13.3 Failure of any specimen tested for crushing strength to withstand 75 % of the load specified in Section 6 shall be cause for rejection of the lot from which the test specimen was taken. When any specimen tested for crushing strength withstands over 75 % but under 100 % of the load specified in Section 6, one specimen shall be cut from each of two additional pipes of the same lot. Failure of either of these additional specimens to meet the strength requirements of Section 6 shall be cause for rejection of the entire lot from which the original sample was taken.

13.4 If the results of the uncombined calcium hydroxide test show the sample failed to meet the specification requirements, two additional specimens shall be selected and sampled for test. The failure of one of these two additional samples to meet the specification requirements of Section 9 shall be cause for rejection of the lot.

14. Marking and Shipping

14.1 *Standard and Random Lengths*—Each standard or random length of pipe shall be marked clearly on the outside surface with the trade name, nominal inside diameter, type, and date of manufacture in alkali resistant ink or indelible paint.

14.2 All pipe and couplings, unless otherwise specified, shall be prepared for standard commercial shipment.

15. Keywords

15.1 asbestos-cement; drainage; perforated; pipe; subsurface; underdrain

[7] Available from Asbestos International Association, 1235 Jefferson Davis Highway, PMB 114, Arlington, VA 22202.

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply when material is supplied under this specification for U.S. Government procurement.

S1 Packaging

S1.1 Unless otherwise specified in the contract, the material shall be packaged in accordance with the producer's standard practice which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification Rules or National Motor Freight Classification Rules. Marking for shipment of such material shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD-129 for military agencies.

S2. Responsibility for Inspection

S2.1 Unless otherwise specified in the contract or purchase order, the producer is responsible for the testing of all material to assure compliance with the requirements specified herein. Except as otherwise specified in the contract or order, the producer shall use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to assure that material conforms to prescribed requirements.