



Designation: C 296 – 9800

Standard Specification for Asbestos-Cement Pressure Pipe¹

This standard is issued under the fixed designation C 296; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers asbestos-cement pressure pipe for use in supply lines and distribution systems that carry water under pressure. The specification also covers asbestos-cement pressure pipe for use in sewer force mains which carry sewage under pressure.

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

1.3 The values stated in SI units are to be regarded as the standard. The values stated in parentheses are for information only.

1.3.4 *This standard does not purport to address all of the safety problems, 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:*

C 150 Specification for Portland Cement²

¹ This specification is under the jurisdiction of ASTM Committee C-17 on Fiber-Cement Products and is the direct responsibility of C17.03 on Asbestos-Cement Sheet Products and Accessories.

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C 458 Test Method for Organic Fiber Content of Asbestos-Cement Products³

C 500 Test Methods for Asbestos-Cement Pipe³

C 595M Specification for Blended Hydraulic Cements²

C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete⁴

D 1869 Specification for Rubber Rings for Asbestos-Cement Pipe⁵

D 2946 Terminology for Asbestos and Asbestos-Cement Products³

2.2 Federal Standard:

Fed. Std. No. 123 Marking for Domestic Shipment (Civilian Agencies)⁶

2.3 Military Standard:

MIL-STD-129 Marking for Shipment and Storage⁶

2.4 Other Documents:

AWWA C401 Standard Practice for the Selection of Asbestos-Cement Water Pipe⁷

Uniform Freight Classification Rules⁸

Motor Freight Classification Rules⁹

3. Terminology

3.1 Definitions:

3.1.1 *coupling*—section for joining asbestos-cement pipe that, when properly installed with the proper accessories, develops a joint equivalent in strength and serviceability to the pipe sections.

3.1.2 *lot*—for pipe sizes 525 mm (21 in.) in diameter and smaller, each 300 lengths of pipe or less, of identical class and size manufactured on each machine during a 24-h period. For pipe larger than 525 mm (21 in.) each 300 lengths of pipe or less, of identical class and size manufactured on each machine during a period of consecutive working days not exceeding seven days.

3.2 Definitions for the following terms are presented in Terminology D 2946: accessories, crushing strength, cure, flexural strength (in pipes), free lime, hydrostatic strength, organic fiber content, purchaser, silica, supplier, and uncombined calcium.

4. Classification

4.1 Asbestos-cement pipe furnished under this specification shall conform to Classes 100, 150, and 200. These nominal designations in psi are equivalent to nominal SI units of 7, 10, and 14 kPa, respectively.

NOTE 1—The purchaser shall determine the proper class of pipe to be used under the installation and operation conditions anticipated. For this purpose refer to Standard Practice AWWA C401 – 83.

4.2 The types of pipe shall be known as Type I and Type II corresponding to the chemical requirements in Section 10 of this specification.

NOTE 2—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 Test Methods C 500.

5. Materials and Manufacture

5.1 Asbestos-cement pressure pipe shall be composed of an intimate mixture of portland cement conforming to Specification C 150, or portland slag cement or pozzolan cement conforming to Specification C 595M, and asbestos fiber, with or without finely divided silica or minerals containing such silica conforming to Specification C 618, that is capable of reacting during autoclaving to form calcium silicate reaction products in the ratio of cement:silica equal to 3:2. The mixture shall contain no more than 0.2 % of nondeleterious organic additives as determined by Test Method C 458. 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. Rubber Rings

6.1 The rubber rings used to seal the joints of the asbestos-cement pipe shall conform to the requirements of Specification D 1869.

7. Hydrostatic Strength

7.1 Each standard, random or short length of pipe (Section 12) and each coupling sleeve shall be hydrostatically tested by the manufacturer prior to shipment and shall have sufficient strength to withstand the internal hydrostatic pressure prescribed in Table

² Annual Book of ASTM Standards, Vol 04.01.

³ Annual Book of ASTM Standards, Vol 04.05.

⁴ Annual Book of ASTM Standards, Vol 04.02.

⁵ Annual Book of ASTM Standards, Vol 09.02.

⁶ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁷ Available from American Water Works Association, 6666 West Quincey Avenue, Denver, CO 80235.

⁸ Available from the Uniform Classification Commission, Room 1106, 222 S. Riverside Plaza, Chicago, IL 60606.

⁹ Available from National Motor Freight Inc., 1616 "P" St. NW, Washington, DC 20036.

1, when tested in accordance with Test Methods C 500.

7.2 From each lot which has passed the routine hydrostatic proof test, one length shall be selected by the inspector. Each selected length shall be hydrostatically tested in accordance with Test Methods C 500 to a pressure of four times the rated working pressure for the class of pipe, maintaining such pressure for not less than 5 s. In case of failure under pressure, refer to 15.5. Each pipe so tested shall be retested in accordance with 7.1 of this specification.

8. Flexural Strength

8.1 Each length of pipe in sizes 100, 150, and 200 mm (4, 6, and 8 in.) shall have sufficient flexural strength to withstand, without failure, the total load prescribed in Table 2, when tested in accordance with Test Methods C 500. In case of failure under load, refer to 15.4.

9. Crushing Strength

9.1 When specifically requested by the purchaser in his order, crushing tests shall be conducted before shipment at the purchaser's expense. A 30-cm (1-ft) length of pipe for each lot cut from an unmachined portion of the pipe shall have sufficient strength to resist the minimum crushing load prescribed in Table 3, when tested in accordance with Test Methods C 500.

9.2 In case of failure under the crushing load, refer to 15.4.

10. Chemical Requirements

10.1 When uncombined calcium hydroxide tests are requested, one sample shall be taken from each lot of pipe and tested in accordance with Test Methods C 500. The sample to be tested ~~may~~ shall be taken from one of the specimens selected for the crushing test. The amount of uncombined calcium hydroxide shall not exceed 1.0 % for Type II pipe.

NOTE 3—There are no chemical requirements for Type I pipe.

10.2 In case a specimen fails to meet the 1 % limit, refer to 15.6.

11. Sampling

11.1 All pipe and couplings tested under this specification shall be in a normal air-dried condition in equilibrium with atmospheric moisture.

12. Sizes and Dimensions

12.1 Couplings and coupling areas of pipe shall be machined or otherwise finished to such dimensions as will provide tight joints when assembled with proper accessories and put into service for which the pipe is intended.

12.2 Pipe shall be manufactured with nominal inside diameters of 102, 152, 203, 254, 304, 356, 406, 457, 508, 610, 762, and 914 mm (4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 30, and 36 in.) in Classes 100, 150, and 200 as defined in Section 3. The average diameters of standard and random lengths shall be less than the nominal by not more than 5.0 %, when measured approximately 75 mm (3 in.) from the end.

12.3 The standard length shall be 3960 ± 25 mm (13 ft \pm 1 in.). Alternative lengths shall be 3050 ± 25 mm (10 ft \pm 1 in.) for 100 and 200 mm (4 and 6 in.) pipe and 4880 ± 25 mm (16 ft \pm 1 in.) for 360 mm (14 in.) and larger pipe. At least 85 % of the combined total length of pipe of any one class, type, and size, excluding short lengths, shall be furnished in standard lengths. The remaining 15 % ~~may~~ shall be in random lengths of not less than 2 m (7 ft). Short lengths, when specifically ordered, shall not exceed 2 m (7 ft).

13. Workmanship and Finish

13.1 Machined ends of the pipe that receive the coupling shall be free of dents and gouges that will affect the tightness of the joint.

13.2 Each pipe shall be free of bulges, dents, and tears in the inside surface that result in a variation in diameter of more than 5 mm (0.2 in.) from that obtained on adjacent unaffected portions of the surface.

13.3 Each length of pipe shall not vary in straightness by more than 0.04 mm/m (0.05 in./ft) of length when the variation is measured in accordance with Test Methods C 500.

14. Marking and Shipping

14.1 Each standard and random length of pipe shall be marked by the manufacturer with the trade name, nominal size, class, hydrostatic proof pressure, and date of manufacture. Each coupling sleeve, if made of the same material as the pipe, shall be

TABLE 1 Applied Hydrostatic Proof Pressures

Class (nominal psi)	Applied Pressure	
	MPa	(psi)
100	2.4	(350)
150	3.6	(525)
200	4.8	(700)

TABLE 2 Applied Flexural Proof Loads

Nominal Size		Total Applied Load, kN (lbf)		
mm	in.	Class 100	Class 150	Class 200
100	4	5.3(1200)	6.6(1470)	8.4(1870)
150	6	12.5(2800)	16.5(3700)	21.8(4900)
200	8	25.9(5330)	33.8(7600)	45.1 (10130)

TABLE 3 Minimum Crushing Loads per Unit Length

Nominal Size		Crushing Strength, kN/m (lbf/ft)					
		Class 100		Class 150		Class 200	
mm	in.	kN/m	(lbf/ft)	kN/m	(lbf/ft)	kN/m	(lbf/ft)
00	4	60	(4100)	79	(5400)	127	(8700)
150	6	58	(4000)	79	(5400)	131	(9000)
200	8	58	(4000)	80	(5500)	136	(9300)
250	10	64	(4400)	102	(7000)	161	(11000)
300	12	76	(5200)	111	(7600)	172	(11800)
360	14	76	(5200)	126	(8600)	197	(13500)
410	16	85	(5800)	134	(9200)	225	(15400)
460	18	95	(6500)	147	(10100)	254	(17400)

marked by the manufacturer with the nominal size, class, and the letter “T” to indicate that it has been hydrostatically tested.

14.2 Pipe and couplings shall be prepared for commercial shipment so as to ensure acceptance by common or other carriers.

15. Inspection and Rejection

15.1 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 in his order, the supplier shall notify the purchaser of the time that the inspection and testing will take place so that the purchaser ~~may~~ shall arrange for witnessing such tests and inspections at his own expense. Instead of such inspection, when requested, the supplier shall certify that his product conforms to the requirements of this specification.

15.2 Each pipe and coupling shall be inspected by the supplier, before shipment, for compliance with the standards for dimensions, tolerances, and workmanship and finish (see also Section 11).

15.3 Failure of any specimen tested for crushing strength to withstand 75 % of the load specified in Section 8 shall be cause for rejection of the lot from which the test specimen was taken.

15.4 When any specimen tested for crushing strength withstands over 75 % but under 100 % of the load specified in Section 9, one specimen shall be cut from each of two additional pipes of the same lot and be tested. Failure of either of these additional specimens to meet the strength requirements of Section 9 shall be cause for rejection of the entire lot from which the original sample was taken.

15.5 If any pipe subjected to the hydrostatic test described in Test Methods C 500 fails to withstand the higher pressure specified in 7.2, two additional lengths of the same size and class shall be selected from the pipe manufactured during the same shift and shall be subjected to the higher hydrostatic test. The failure of one of these additional lengths to withstand the specified pressure shall be cause for rejection of the entire lot of that size and class manufactured during the same shift as the test lengths.

15.6 If the results of the uncombined calcium hydroxide test show that 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 8 shall be cause for rejection of the lot.

16. Keywords

16.1 asbestos-cement; pipe; pressure pipe

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 Rules⁸ or National Motor Freight Classification Rules.⁹ 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 supplier 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 supplier 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.

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 It is suggested to the purchaser, without being made a part of this specification, that the purchaser shall request inclusion of the following information in his order or agreement for purchase of the pipe:

- X1.1.1 Any tests, in addition to those prescribed by this specification, as the special circumstances shall require,
- X1.1.2 The place or places where any additional tests are to be made,
- X1.1.3 Description of the additional testing facilities,
- X1.1.4 Who shall bear the expense of such additional tests,
- X1.1.5 Whether such additional tests may be made by any sampling process or other method approved by the parties.

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