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Standard Specification for ASBESTOS-CEMENT NONPRESSURE SMALL- DIAMETER SEWER PIPE¹

This standard is issued under the fixed designation C 644; 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.

This specification has been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

1. Scope

1.1 This specification covers asbestos-cement nonpressure sewer pipe for conveying sanitary sewage by gravity flow from point of occupancy to system of disposal.

NOTE 1—The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units given in the standard may be approximate.

NOTE 2—Rubber rings suitable for use with this pipe are covered in ASTM Specification D 1869, for Rubber Rings for Asbestos-Cement Pipe.

2. Classification

2.1 Asbestos-cement sewer pipe furnished under these specifications shall be designated as Class 1500, Class 2400, and Class 3300, based on the respective crushing strengths, and furnished in 4, 5, and 6-in. (10.2, 12.7, and 15.2-cm) sizes.

2.2 The types of pipe shall be known as Type I and Type II corresponding to the chemical requirements given in Section 6 of this specification.

NOTE 3—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 Sections 19 to 25 ASTM Methods C 500, Testing Asbestos-Cement Pipe.

3. Definitions

3.1 *pipe*—asbestos-cement nonpressure sewer pipe as defined in Sections 1, 2, and 5.

3.2 *coupling*—a coupling that is manufac-

tured so that, when properly installed, lengths of pipe may be assembled and put into service for which they are intended.

3.3 *fittings*—wyes, tees, adaptors, etc., for use in laying asbestos-cement sewer pipe manufactured as described in Section 5 and made to such dimensions as will provide equivalent strength and tight joints when assembled with the pipe.

3.4 *purchaser*—the actual purchaser of the pipe or his authorized agents acting within the scope of the duties entrusted to them.

3.5 *lot*—those lengths of pipe of that size and class manufactured during the same shift.

4. Basis of Purchase

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

4.1.1 Any tests, in addition to those prescribed by this specification, as the special circumstances may require.

4.1.2 The place or places where any additional tests are to be made.

4.1.3 Description of the additional testing facilities.

4.1.4 Who shall bear the expense of such additional tests.

This specification is under the jurisdiction of ASTM Committee C-17 on Asbestos-Cement Products.

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¹ Annual Book of ASTM Standards, Parts 16 and 38.

² Annual Book of ASTM Standards, Part 16.

4.1.5 Whether such additional tests may be made by any reliable sampling process or other method approved by the parties, and

4.1.6 Such other matters as the parties may find desirable to include in their written agreement.

5. Materials and Manufacture

5.1 Asbestos-cement sewer pipe shall be composed of an intimate mixture of portland cement or portland blast-furnace slag cement and asbestos fiber with or without silica, or portland-pozzolan cement and asbestos fiber. The mixture shall be free of organic additives. 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. Chemical Requirements

6.1 When tested in accordance with Sections 17 and 18 of ASTM Methods C 500, the amount of uncombined calcium hydroxide shall not exceed 1.0 percent for Type II pipe.

NOTE 4 There are no chemical requirements for Type I pipe.

7. Dimensions and Permissible Variations

7.1 Couplings and coupling area of the 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.

7.2 The average diameter may be less than the nominal by not more than $\frac{1}{4}$ in. (0.63 cm).

7.3 The standard lengths may be 5, 6.5, 10, or 13 ft (1.52, 1.98, 3.05 or 3.96 m) $\pm$ 1 in. (2.5 cm). At least 85 percent of the total footage of any one class, type, and size, excluding short lengths, shall be furnished in standard lengths. The remaining 15 percent may be in random lengths of not less than 7 ft (2.13 m) when the standard length is 10 or 13 ft (3.05 or 3.96 m) and not less than 4 ft (1.22 m) when the standard length is 5 or 6.5 ft (1.52 or 1.98 m).

8. Workmanship

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

8.2 Each pipe shall be free of bulges, dents,

and tears in the inside surface that result in a variation of more than $\frac{1}{16}$ in. (0.48 cm) from the adjacent unaffected portions of the surface.

8.3 Each length of pipe shall not vary in straightness by more than $\frac{1}{16}$ in./ft (5.2 mm/m) of length when the variation is measured in accordance with Section 13 of Methods C 500.

9. Sampling

9.1 For crushing tests, one full length of pipe shall be selected from each 500 lengths of 10 and 13-ft (3.05 and 3.96-m) lengths and each 1000 lengths of 5 and 6.5-ft (1.52 and 1.98-m) lengths of each size, class, and type of pipe covered by the order. One test specimen 12 in. (30.5 cm) long shall be cut from the un-machined portion of the selected length of pipe.

9.2 When uncombined calcium hydroxide tests are requested (Section 6), one sample shall be taken from each lot of pipe. The sample to be tested may be taken from any one of the specimens selected for the crushing test.

9.3 All material tested under this specification shall be in a normal air-dried condition.

10. Test Methods

10.1 Joint Tightness:

10.1.1 The tests outlined in this section are considered to be one-time qualification tests to establish the adequacy of the manufacturer's joint design. Instead of requiring performance of these tests, the purchaser may require the manufacturer to certify that pipes and couplings equivalent in material and design have passed the tests enumerated in this section. At his own expense, however, the purchaser, by designation with his order, may require that assembled pipes and couplings pass the following performance tests without leakage:

10.1.1.1 *Straight Alignment*— Make hydrostatic pressure test on an assembly of two sections of pipe, properly connected with a coupling in accordance with the joint design. An equivalent alternative may be a single pipe with a coupling on each end. Subject the assembly to an internal hydrostatic pressure of 10 psi (69 kPa) for 10 min. Any visible water leakage shall be considered a failure of the test requirements.

10.1.1.2 Maximum Deflected Position—Upon completion of the test for pipes in straight alignment in accordance with 10.1.1.1, deflect the test sections 5 deg with one half of the deflection being between each pipe and the coupling and subject the test sections to an internal hydrostatic pressure of 10 psi (69 kPa) for 10 min. Any visible water leakage shall be considered a failure of the test requirements.

10.1.2 Test one sample of each size unless some other arrangement is made with the purchaser by designation with his order. At the option of the purchaser, the sample of the pipes and couplings to be tested may be selected by him.

10.2 Flexural Strength:

10.2.1 Each length of pipe shall have sufficient flexural strength to withstand, without failure, the total load prescribed in Table 1 when tested in accordance with Section 8 of Methods C 500.

10.3 Crushing Strength:

10.3.1 Pipe—Conduct crushing tests before shipment. One-foot (0.3 m) lengths of pipe cut from unmachined portions of the pipe shall have the minimum crushing strength prescribed in Table 2, when tested in accordance with Section 11.3 of Methods C 500.

10.3.2 Couplings—The couplings, when assembled on pipe, shall be capable of withstanding simultaneously:

10.3.2.1 The minimum crushing strength in pounds-force per linear foot prescribed in Table 2, when tested in accordance with 11.3 of Methods C 500, and

10.3.2.2 The hydrostatic pressure test described in 10.1.1.1 of this specification.

11. Inspection

11.1 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 may arrange for witnessing such tests and inspections at his own expense. Instead of such inspection, when requested, the manufacturer shall be prepared to certify

that his product conforms to the requirements of this specification.

11.2 Pipe and coupling shall be inspected by the manufacturer, before shipment, for compliance with the standards for dimensions, workmanship, and finish (see also Section 9).

12. Rejection

12.1 Failure of the specimens tested for crushing strength to withstand 75 percent of the load specified in 10.3 shall be cause for rejection of the entire lot represented by the test specimens. When the specimen tested for crushing strength withstands over 75 percent but under 100 percent of the load specified in 10.3, one specimen shall be cut from each of two additional pipes of the same size and class manufactured during the same shift. Failure of one of these additional specimens to meet the strength requirements of 10.3 shall be cause for rejection of the entire lot of that size and class manufactured during the same shift as the test specimen.

12.2 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 6 shall be cause for rejection of the lot.

13. Marking and Shipping

13.1 Each standard and random length of pipe shall be marked by the manufacturer with the trade name, nominal size, class, and the date of manufacture. Each coupling sleeve shall be marked by the manufacturer with the nominal size and class for the pipe with which it shall be used.

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

14. Field Performance and Acceptance

14.1 All field-assembled joints for asbestos-cement nonpressure small diameter sewer pipe shall meet the requirements set forth in 14.5 for infiltration/exfiltration.

14.2 Measurements shall be based on a segment or segments of sewer line of asbestos-

cement nonpressure small diameter sewer pipe installed separately or as a part of a sewer main system between two consecutive manholes or other similar increment of distance, rather than taken from a single joint.

14.3 Before the sewer line is backfilled and tested, all pipe shall be inspected for proper bedding to assure uniform support of the pipe, and the absence of high points and irregularities which induce beam and shear loadings on the pipe.

14.4 Final acceptance testing shall be per-

formed on the sewer line(s) after the final backfilling has been completed.

14.5 The infiltration/exfiltration of the installed pipe shall not exceed 0.079 gal./in. internal pipe diameter per 100 ft of pipelines h (0.386 litre/cm of internal pipe diameter per 100 m of pipelines per hour), where the maximum hydrostatic head at the center line of the pipe does not exceed 25 ft (7.63 m) (corresponds to 100 gal./in. of pipe diameter per mile per 24 h (92.6 litres/cm of pipe diameter per 1000 m per 24 h).

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 Rules⁴ or National Motor Freight Classification Rules.⁵ 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 may 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.

⁴ Available from the Uniform Classification Commission, Room 1106, 222 S. Riverside Plaza, Chicago, Ill. 60606.

⁵ Available from National Motor Freight Inc., 1616 P St., N.W., Washington, D.C. 20036.

TABLE 1 Applied Flexural Proof Loads

Nominal Size, in. (mm)	Total Applied Load, lbf (kN)
4 (100)	550 (2440)
5 (125)	950 (4230)
6 (150)	1500 (6680)

TABLE 2 Minimum Crushing Loads

Pipe Class	Crushing Strength, lbf, linear ft (kN/m)
1500	1500 (21.8)
2400	2400 (35.0)
3300	3300 (48.0)

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