

AMERICAN NATIONAL  
STANDARD

ASTM C 428 - 80

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St., Philadelphia, Pa. 19103

Reprinted from the Annual Book of ASTM Standards, Copyright ASTM  
If not listed in the current combined index, will appear in the next edition.

## Standard Specification for ASBESTOS-CEMENT NONPRESSURE SEWER PIPE<sup>1</sup>

This standard is issued under the fixed designation C 428; 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 in gravity-flow systems.

NOTE 1—Rubber rings suitable for use with this pipe are covered in ASTM Specification D 1869, for Rubber Rings for Asbestos-Cement Pipe.<sup>1</sup>

### 2. Classification

2.1 Asbestos-cement pipe furnished under this specification shall be designated as Classes 1500, 2400, 3300, 4000, 5000, 6000, and 7000 based on the respective crushing strengths, and shall be furnished in the following sizes:

| Class | Nominal Size, Diameter, in.                                |
|-------|------------------------------------------------------------|
| 1500  | 8, 10, 12, 14, 15, 16                                      |
| 2400  | 8, 10, 12, 14, 15, 16, 18, 20, 21, 24                      |
| 3300  | 8, 10, 12, 14, 15, 16, 18, 20, 21, 24, 27, 30              |
| 4000  | 10, 12, 14, 15, 16, 18, 20, 21, 24, 27, 30, 33, 36, 39, 42 |
| 5000  | 10, 12, 14, 15, 16, 18, 20, 21, 24, 27, 30, 33, 36, 39, 42 |
| 6000  | 36, 39, 42                                                 |
| 7000  | 36, 39, 42                                                 |

NOTE 2—Sizes 4, 5, and 6 in. diameters in classes 1500, 2400, and 3300 are covered by ASTM Specification C 644, Asbestos-Cement Nonpressure Small-Diameter Sewer Pipe.<sup>2</sup>

2.2 The types of pipe shall be known as Type I and Type II corresponding to the chemical requirements in Section 9 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 of ASTM Methods C 500, Testing Asbestos-Cement Pipe.<sup>3</sup>

### 3. Definitions

3.1 *pipe*—asbestos cement nonpressure sewer pipe as defined in Sections 1, 2, and 4.

3.2 *coupling*—a 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.

3.3 *fittings*—fittings such as wyes, tees, adaptors, etc., for use in laying asbestos-cement nonpressure sewer pipe as described in Section 4, 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:

3.5.1 A lot as used herein for pipe 21 in. (533 mm) in diameter and smaller is defined as each 300 lengths of pipe or less, of identical class and size manufactured on each machine during a 24-h period.

3.5.2 A lot as used herein for pipe larger than 21 in. (533 mm) in diameter is defined as each 300 lengths of pipe or less, of identical

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

Current edition approved April 25, 1980. Published June 1980. Originally published as C 428 - 59 T. Last previous edition C 428 - 78.

Annual Book of ASTM Standards, Part 16.

Annual Book of ASTM Standards, Parts 16 and 38.

class and size manufactured on each machine during a period of consecutive working days not exceeding 7 days.

#### 4. Manufacture

4.1 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; and 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.

#### 5. Joint Tightness

5.1 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:

5.1.1 *Straight Alignment*—A hydrostatic pressure test shall be made 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. The assembly shall be subjected to an internal hydrostatic pressure 10 psi (69 kPa) for 10 min. Any visible water leakage shall be considered a failure of the test requirements.

5.1.2 *Maximum Deflected Position*—Upon completion of the test for pipes in straight alignment in accordance with 5.1.1, deflect the test sections 5 deg for 12 in. (305 mm) and smaller diameters and 3 deg for 14 in. (356 mm) and larger diameters (with one half of the deflection being between each pipe and the coupling) and subject it 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 requirement.

5.2 Test one sample of at least one 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.

#### 6. Flexural Strength

6.1 Each standard length of pipe in size 8 in. (203 mm) shall have sufficient flexural strength to withstand, without failure, the total load prescribed in Table 1, when tested in accordance with Section 8 of ASTM Methods C 500.

#### 7. Crushing Strength

7.1 Crushing tests shall be conducted before shipment. A 1-ft (0.305-m) length of pipe cut from an unmachined portion 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.

#### 8. Couplings

8.1 The couplings, when assembled on pipe, shall be capable of withstanding simultaneously:

8.1.1 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

8.1.2 The hydrostatic pressure test described in 5.1.1 of this specification.

#### 9. Chemical Requirements

9.1 When tested in accordance with Sections 17 and 18 of 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.

#### 10. Sampling

10.1 Test all material under this specification in a normal air-dried condition.

10.2 Each standard length of pipe in size 8 in. (203.2 mm) shall be tested in flexure by the manufacturer prior to shipment in accordance with Section 8 of Methods C 500.

10.3 For crushing tests, select one full length of pipe from each lot of each size, class, and type of pipe covered by the order. Cut one test specimen 12 in. (304.8 mm) long from the unmachined portion of the selected

length of pipe.

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

### 11. Sizes and Dimensions

11.1 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.

11.2 The average diameter may be less than the nominal by not more than  $\frac{1}{8}$  in. (6.4 mm) or 1½ percent, whichever is the greater.

11.3 The standard length of 8-in. (203-mm) diameter pipe may be 10 or 13 ft  $\pm$  1 in. (3.04 or 3.96 m  $\pm$  25.4 mm). The standard length of 10, 12, 14, 15, 16, 18, 20, 21, 24, 27, 30, 33, 36, 39, and 42-in. diameter pipe shall be 13 ft  $\pm$  1 in. (3.96 m  $\pm$  25.4 mm). 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). Short lengths specifically ordered for use in making rigid connection to manholes or other structures shall not exceed 6 ft 9 in. (2.06 m).

### 12. Workmanship and Finish

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

12.2 Each pipe shall be free of bulges, dents, and tears in the inside surface that result in a variation of more than  $\frac{1}{8}$  in. (4.8 mm) from that obtained on adjacent unaffected portions of the surface.

12.3 Each length of pipe shall not vary in straightness by more than 0.05 in./ft (4.17 mm/m) of length when the variation is measured in accordance with Section 13 of Methods C 500.

### 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. Inspection and Rejection

14.1 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. In lieu of such inspection, when requested, the manufacturer shall be prepared to certify that his product conforms to the requirements of this specification.

14.2 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).

14.3 Failure of any specimen tested for crushing strength to withstand 75 percent of the load specified in Section 7 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 percent but under 100 percent of the load specified in Section 7, 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 7 shall be cause for rejection of the entire lot from which the original sample was taken.

14.4 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.

### 15. Field Performance and Acceptance

15.1 All field assembled joints for asbestos-cement nonpressure sewer pipe shall meet the requirements set forth in 15.5 for infiltration/exfiltration.

15.2 Base measurements on a segment of sewer line between two consecutive manholes or other similar increment of distance, rather than taken from a single joint.

15.3 Before the sewer line is backfilled and tested, inspect the pipe line 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.

15.4 Perform final acceptance testing on the sewer line after the final backfilling has been completed.

15.5 The infiltration/exfiltration of the installed pipe shall not exceed 0.079 gal/in. of internal pipe diameter per 100 ft of pipelines per hour (0.1177 litre/cm of internal pipe

diameter per 30.5 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 (149 litres/cm of pipe diameter per mile per 24 h.))

NOTE 5—Where infiltration/exfiltration tests are specified and the acceptance of a sewer line is dependent upon a satisfactory test, it should be recognized that leakage may occur at several locations beside the pipe joints. Manhole bases, walls, and connections to sewer lines must be tight. Fittings, including capped or plugged tees and wyes must be properly braced to prevent movement from thrust action; and, where used for vertical risers or sewer chimneys, proper support must be provided beneath the piping to withstand the greater transmitted earth and surface loads.

## 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<sup>3</sup> or National Motor Freight Classification Rules.<sup>4</sup> 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.

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.

### 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

<sup>3</sup> Available from the Uniform Classification Commission, Room 1106, 222 S. Riverside Plaza, Chicago, Ill. 60606.

<sup>4</sup> Available from National Motor Freight Inc., 1616 P St., N.W., Washington, D.C. 20036.

TABLE 1 Applied Flexural Proof Loads

| Nominal Size, in. | Pipe Length, ft | Test Span, ft | Total Applied Load, lbf (kN) |             |             |
|-------------------|-----------------|---------------|------------------------------|-------------|-------------|
|                   |                 |               | Class 1500                   | Class 2400  | Class 3300  |
| 8                 | 10              | 9             | 2700 (12.0)                  | 3000 (13.3) | 3900 (17.3) |
| 8                 | 13              | 12            | 2025 (9.0)                   | 2250 (10.0) | 2925 (13.0) |

TABLE 2 Minimum Crushing Load

| Pipe Class | Crushing Strength, lbf/ft<br>(kN·m) |
|------------|-------------------------------------|
| 1500       | 1500 (21.8)                         |
| 2400       | 2400 (35.0)                         |
| 3300       | 3300 (48.0)                         |
| 4000       | 4000 (58.2)                         |
| 5000       | 5000 (72.8)                         |
| 6000       | 6000 (87.4)                         |
| 7000       | 7000 (102.0)                        |

## APPENDIX

## XI. SUPPLEMENTARY REQUIREMENTS

X1.1 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:

X1.1.1 Any tests, in addition to those prescribed by this specification, as the special circumstances may 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 sound sampling process or other method approved by the parties, and

X1.1.6 Such other matters as the parties may find desirable to include in their written agreement.

*The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.*