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Standard Specification for ASBESTOS-CEMENT TRANSMISSION PIPE¹

This Standard is issued under the fixed designation C 668; 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 reappraisal.

1. Scope

1.1 This specification covers asbestos-cement transmission pipe intended for use in transmission systems that carry fluids under pressure. A transmission system consists of pipe lines which convey fluids from their source to a point of distribution or discharge. The system is characterized by relatively steady flow and few appurtenances, thereby permitting reasonable hydraulic analysis, including surge analysis.

NOTE 1—The values stated in U.S. customary units are to be regarded as the standard. The metric equivalents of U.S. customary units may be approximate.

NOTE 2—This specification is issued for product standardization and purchasing purposes only, and does not include requirements for installation or the relationships between operating conditions and the strength characteristics of the various classifications of pipe. The purchaser is cautioned that he must correlate installation and operating conditions with the specified characteristics of the pipe.

2. Applicable Documents

- 2.1 *ASTM Standards:*
C 500 Testing Asbestos-Cement Pipe.²
D 1869 Specification for Rubber Rings for Asbestos-Cement Pipe.²

3. Classification

3.1 Asbestos-cement pipe furnished under this specification shall be manufactured in Classifications 30, 35, 40, 45, 50, 60, 70, 80, and 90. The classifications represent one tenth of the minimum hydrostatic strength.

3.2 The types of pipe shall be known as Type I and Type II corresponding to the chemical requirements in Section 7 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 Methods C 500.

4. Definitions

4.1 *pipe*—asbestos-cement transmission pipe as defined in Sections 1, 3, and 5.

4.2 *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.

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

4.4 *lot*—A lot as used herein for pipe 21 in. 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. A lot as used herein for pipe larger than 21 in. in diameter is defined as 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 7 days.

5. Manufacture

5.1 Asbestos-cement pipe furnished under this specification shall be composed of an intimate mixture of portland cement or portland blast-furnace slag cement and asbestos fiber

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² Annual Book of ASTM Standards, Part 16



with or without silica; or it shall be composed of 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. Rubber Rings

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

7. Chemical Requirements

7.1 When uncombined calcium hydroxide tests are requested, one sample shall be taken from each lot of pipe and tested in accordance with Sections 17 and 18 of Methods C 500. The sample to be tested may be taken from one of the specimens selected for the crushing test. 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.

8. Hydrostatic Strength

8.1 Each standard, random, or short length of pipe (see Section 11) and each coupling sleeve, when manufactured from the same material as the pipe, shall be hydrostatically tested by the manufacturer prior to shipment and shall have sufficient strength to withstand the internal hydrostatic pressure prescribed in Table 1, when tested in accordance with Section 5 of Methods C 500.

8.2 From each lot of pipe which has passed the routine hydrostatic proof test, one length shall be selected by the inspector. A 12-in. (305-mm) or longer section of pipe cut from an unmachined portion of the selected length shall have the minimum hydrostatic strength designated in Table 2, when tested in accordance with Section 5 of Methods C 500, except that the pressure need not be held for 5 s.

9. Flexural Strength

9.1 Each length of pipe in sizes 6 and 8 in. nominal diameter having lengths 10 ft (3.05 m) or longer shall have sufficient flexural strength to withstand without failure the total

load prescribed in Table 3 when tested in accordance with Section 8 of Methods C 500.

10. Crushing Strength

10.1 From each lot, one length shall be selected by the inspector. A 1-ft (305-mm) section of pipe cut from an unmachined portion of the selected length shall have the minimum crushing strength prescribed in Table 4 when tested in accordance with Section 11.1.1 of Methods C 500.

11. Dimensions and Permissible Variations

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 the proper accessories and put into service for which the pipe is intended.

11.2 Pipe shall be manufactured with nominal inside diameters of 6, 8, 10, 12, 14, 15, 16, 18, 20, 21, 24, 27, 30, 33, 36, 39, and 42 in. in the classifications defined in 3.1, except 6-in. diameter pipe shall be of Classification 40 through 90 only. The average diameters of standard and random lengths may be less than the nominal inside diameter by not more than 5.0 percent, when measured approximately 3 in. (75 mm) from the end.

11.3 The standard length shall be 13 ft $\pm$ 1 in. (3.96 m $\pm$ 25 mm). Alternative standard lengths shall be 10 ft $\pm$ 1 in. (3.05 m $\pm$ 25 mm) for 6-in. pipe and 16 ft $\pm$ 1 in. (4.88 m $\pm$ 25 mm) for 14-in. and larger pipe. At least 85 percent of the total footage of pipe of any one classification, 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, when specifically ordered, shall not exceed 6 $\frac{3}{4}$ ft (2.06 m).

12. Workmanship and Finish

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

12.2 Each pipe shall be free of bulges, dents, and tears in the inside surface that result in a variation in diameter of more than

$\frac{1}{16}$ in. (5 mm) from that obtained on adjacent unaffected portions of the surface.

3. Sampling

13.1 All samples shall be in a normal air-dried condition when tests are initiated.

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 in his order (see Appendix X1), 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.

14.2 Pipe and couplings shall be inspected by the manufacturer, before shipment, for compliance with the standards for dimensions, and workmanship, and finish (See also Sections 7 to 10).

14.3 Failure of any specimen tested for crushing strength to withstand 75 percent of the load specified in Section 10 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 10, 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 10 shall be cause for rejection of the

entire lot from which the original sample was taken.

14.4 If any pipe subjected to the hydrostatic strength test described in 8.2 fails to withstand the pressure specified, two additional lengths of the same size and classification shall be selected from the pipe manufactured during the same shift and shall be subjected to the specified pressure. 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 classification manufactured during the same shift as the test lengths.

14.5 If the results of the uncombined calcium hydroxide test shows 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 7 shall be cause for rejection of the lot.

15. Marking and Shipping

15.1 Each standard and random length of pipe shall be marked by the manufacturer with the trade name, nominal size, classification, and date of manufacture. The trade name shall include, but is not limited to, the manufacturer's name or trademark and the words "Transmission Pipe." Each coupling sleeve, if made of the same material as the pipe, shall be marked by the manufacturer with the nominal size, classification, and the letter "T" to indicate that it has been hydrostatically tested.

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

TABLE 1 Applied Hydrostatic Proof Pressures^a

Pipe Classification	Pressure, min psi (MPa)
30	225 (1.55)
35	262 (1.81)
40	300 (2.07)
45	337 (2.32)
50	375 (2.58)
60	450 (3.10)
70	525 (3.62)
80	600 (4.13)
90	675 (4.65)

^a The pressures and classifications indicated apply to all sizes

TABLE 2 Minimum Hydrostatic Strength^a

Pipe Classification	Pressure, psi (MPa)
30	300 (2.07)
35	350 (2.41)
40	400 (2.76)
45	450 (3.10)
50	500 (3.44)
60	600 (4.13)
70	700 (4.82)
80	800 (5.51)
90	900 (6.20)

^a The pressures and classifications indicated apply to all sizes

TABLE 3 Minimum Applied Flexural Proof Loads, lbf (kN)

Nominal Size, in.	Pipe Classification								
	30	35	40	45	50	60	70	80	90
6			2300 (10.23)	2500 (11.12)	2800 (12.45)	3200 (14.23)	3700 (16.46)	4000 (17.79)	4900 (21.80)
8	3700 (16.46)	4400 (19.57)	5100 (22.68)	5700 (25.35)	6400 (28.47)	6900 (30.69)	7600 (33.80)	8800 (39.14)	10100 (44.92)

TABLE 4 Minimum Crushing Strength, lbf/linear ft

Nominal Size, in.	Pipe Classification								
	30	35	40	45	50	60	70	80	90
6			2400	3200	4000	4700	5400	6700	9000
8	2000	2400	2800	3400	4000	4800	5500	7400	9300
10	2000	2500	3000	3500	4500	5500	7000	9000	11000
12	2000	2500	3000	4000	5200	6400	7800	10000	12200
14	2000	2500	3000	4000	5200	7000	8800	11000	13500
15	2300	2800	3300	4300	5500	7400	9300	12000	14500
16	2500	3000	3500	4500	5800	7500	9500	12400	15400
18	2500	3000	4000	5000	6500	8500	11000	14000	18000
20	2500	3500	4500	5500	7100	9500	12000	15000	20000
21	2500	3500	4500	5800	7300	9700	12500	16000	21000
24	2800	3800	5000	6200	8100	11000	15000	19000	24000
27	3500	4200	5500	7000	8800	12500	16500	20500	27000
30	3500	4500	6000	7500	9700	13500	18000	22500	30000
33	3500	5000	6500	8000	10500	14500	19500	24500	33000
36	4000	5000	7000	9000	11200	16000	21000	26000	36000
39	4200	5300	7500	9700	12000	17200	22500	28000	39000
42	4300	5700	8000	10500	13000	18500	24000	30000	42000

TABLE 4A Minimum Crushing Strength, N/linear m

Nominal Size, in.	Pipe Classification								
	30	35	40	45	50	60	70	80	90
6			35.0	46.7	58.4	68.6	78.8	97.8	131.3
8	29.2	35.0	40.9	49.6	58.4	70.1	80.3	108.0	135.7
10	29.2	36.5	43.8	51.1	65.7	80.3	102.2	131.3	160.5
12	29.2	36.5	43.8	58.4	75.9	93.4	113.8	145.9	178.0
14	29.2	36.5	43.8	58.4	75.9	102.2	128.4	160.5	197.0
15	33.6	40.9	48.2	62.8	80.3	108.0	135.7	175.1	211.6
16	36.5	43.8	51.1	65.7	84.7	109.5	138.6	181.0	224.7
18	36.5	43.8	58.4	73.0	94.9	124.0	160.5	204.3	262.7
20	36.5	51.1	65.7	80.3	103.6	138.6	175.1	218.9	291.9
21	36.5	51.1	65.7	84.6	106.5	141.6	182.4	233.5	306.5
24	40.9	55.5	73.0	90.5	118.2	160.5	218.9	277.3	350.3
27	51.1	61.3	80.3	102.2	128.4	182.4	240.8	299.2	394.0
30	51.1	65.7	87.6	109.5	141.6	197.0	262.7	328.4	437.8
33	51.1	73.0	94.9	116.8	153.2	211.6	284.6	357.6	481.6
36	58.4	73.0	102.2	131.3	163.5	233.5	306.5	379.4	525.4
39	61.3	77.3	109.5	141.6	175.1	251.0	328.4	408.6	569.2
42	62.8	83.2	116.8	153.2	189.7	270.0	350.3	437.8	612.9

APPENDIX

X1. ADDITIONAL PURCHASE ORDER OPTIONS

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.

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