



Designation: C1449/C1449M – 05a (Reapproved 2019)

Standard Specification for Non-Asbestos Fiber-Cement Nonpressure Sewer Pipe¹

This standard is issued under the fixed designation C1449/C1449M; 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 requirements relating to non-asbestos fiber-cement non-pressure sewer pipe, joints, and fittings suitable for use with gravity flow, intended for sewerage and drainage applications from point of use to point of treatment or disposal. It defines certain conditions of manufacture, classification, characteristics, and acceptance tests applicable to these products.

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

NOTE 1—Rubber rings suitable for use with this pipe are covered in Specification D1869.

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.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This specification is under the jurisdiction of ASTM Committee C17 on Fiber-Reinforced Cement Products and is the direct responsibility of Subcommittee C17.02 on Non-Asbestos Fiber Cement Products.

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2. Referenced Documents

2.1 ASTM Standards:²

C150/C150M Specification for Portland Cement
C497 Test Methods for Concrete Pipe, Concrete Box Sections, Manhole Sections, or Tile

C500/C500M Test Methods for Asbestos-Cement Pipe
C595/C595M Specification for Blended Hydraulic Cements
C1154 Terminology for Non-Asbestos Fiber-Reinforced Cement Products

D1869 Specification for Rubber Rings for Fiber-Reinforced Cement Pipe

2.2 Federal Standard:

No. 123 Marking for Domestic Shipment (Civilian Agencies)³

2.3 Military Standard:

No. 129 Marking for Shipment and Storage³

2.4 ISO Standards:

ISO 390:1993 Products in Fibre Reinforced Cement—Sampling and Inspection⁴

ISO 2859-1:1999 Sampling Procedures for Inspection by Attributes Part 1: Sampling Schemes Indexed by Acceptance Quality Limit (AQL) for Lot-by-Lot Inspection⁴

ISO 3951:1989 Sampling Procedures and Charts for Inspection by Variables for Percent Nonconforming⁴

2.5 Other Standards:

Uniform Freight Classification Rules⁵

National Motor Freight Classification Rules⁶

3. Terminology

3.1 Definitions:

3.1.1 Refer to Terminology C1154.

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

⁴ Available from International Organization for Standardization (ISO), 1 rue de Varembe, Case postale 56, CH-1211, Geneva 20, Switzerland.

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., NW, Washington, DC 20036.

3.1.2 *coupling, n*—section for joining fiber-cement non-pressure sewer pipe, as defined in 5.3, that when properly installed with the proper accessories, develops an assembled joint, equivalent in serviceability and strength to the pipe sections when tested in accordance with 6.3.

3.1.3 *fitting, n*—components such as wyes, tees, adaptors, for use in laying fiber-cement pipe, such that, when properly installed, yields develops an assembly fitting equivalent in serviceability and strength to the pipe sections.

3.1.4 *pipe, n*—fiber-cement non-pressure sewer pipe as defined in Sections 1, 3, and 5.

4. Classification

4.1 The types of pipe shall be shown as Type I and Type II corresponding to the chemical requirements given in S3.

NOTE 3—There are no chemical requirements for Type I pipe. Type II pipe is generally accepted as being unaffected by sulfates in groundwater which cause matrix expansion and consequential pipe deterioration.

4.2 Fiber-cement sewer pipe furnished under this specification shall be designated as Class I, II, III, IV, and V. The corresponding strength requirements are prescribed in Table 1. The D load is the saturated crushing test load expressed in pounds-force per linear foot per foot of diameter. [The D1 load is the saturated crushing test load expressed in Newtons per linear metre per millimetre of diameter.] The pipe shall be furnished in 4, 6, 8, 10, 12, 15, 18, 21, 24, 27, 30, 33, 36, 42 and 48-in. [100, 150, 200, 250, 300, 375, 450, 525, 600, 675, 750, 825, 900, 1050 and 1200-mm] sizes.

4.3 When requested by the owner, the manufacturer shall provide the owner the relationship between the short term crush load required to achieve the long-term design loads with supporting estimates of service life using recognized calculation methods.

NOTE 4—To assist the purchaser in choosing the type of pipe most suitable for his use, guidelines for the definitions of aggressiveness of water and of soil environments for selection of the proper type of fiber-cement pipe are covered in the appropriate sections of Test Methods C500/C500M.

5. Materials and Manufacture

5.1 Fiber-cement pipes shall be composed of an intimate mixture of an inorganic hydraulic binder (see Specification C150/C150M) or a calcium silicate binder (see Specification C595/C595M) formed by the chemical reaction of a siliceous material and a calcareous material reinforced by organic fibers, inorganic non-asbestos fibers, or both. Process aids, fillers and pigments which are compatible with fiber-reinforced cement are not prohibited from being added.

TABLE 1 Minimum Crushing Load

Pipe Class	D Load lbf/ft/ft	D1 Load N/m/mm
I	1200	60
II	1500	75
III	2000	100
IV	3000	150
V	3750	175

TABLE 2 Minimum Quality Sample Size

Inspection by Variables		Inspection by Attributes	
Inspection Lot Size	Number Samples	Inspection Lot Size	Number Samples
< 280	3	< 150	5
281 - 500	4	151 - 500	8
502 - 1200	5	501 - 3200	13

5.2 The pipe shall be of laminar construction formed under pressure to a homogeneous structure and cured under natural or accelerated conditions to meet the chemical and physical requirements of this specification.

5.3 Couplings:

5.3.1 Fiber-cement non-pressure sewer couplings shall be made in conformance with 5.1 and 5.2.

5.3.2 Fiber-cement non-pressure sewer couplings shall be equivalent in serviceability to those couplings defined in 5.3.1 and shall be installed in accordance with the manufacturer's recommendations.

5.4 Fittings:

5.4.1 Fiber-cement non-pressure sewer fittings shall be made in conformance with 5.1 and 5.2.

5.4.2 Fiber-cement non-pressure sewer fittings shall be equivalent in serviceability to those fittings defined in 5.4.1 and shall be installed in accordance with the manufacturer's recommendations.

6. Physical Properties

6.1 *Crushing Strength*—Crushing tests shall be conducted before shipment. Test specimens 12 in. [150 mm] cut from an unmachined portion of pipe shall be tested in accordance with the appropriate section of Test Methods C497.

6.2 *Flexural Strength*—Longitudinal bending tests shall be conducted before shipment. Each length of pipe 10 ft [3 m] or longer, for designated sizes 8 in. [200 mm] and less, shall have the minimum proof flexural strength prescribed in Table 3, when tested in accordance with the appropriate section of Test Methods C500/C500M.

6.3 *Joint Tightness*—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

TABLE 3 Flexural Proof Strength

Designated Size, in. [mm]	Total Applied Load ^A
4 [100]	550 [2.4]
5 [125]	950 [4.2]
6 [150]	1500 [6.7]
8 [200] ^B	2700 [12.2]

^AThe indicated loads are applied over a clear span of 9 ft [2.7 m]. It shall be optional to test at 75 % of the indicated loads on a clear span of 12 ft [3.7 m].

^B8 in. [200 mm] Class V pipe (per Table 1) shall be tested to a Total Applied Load of 3000 Lbf [13.3 kN].