



Standard Specification for Corrugated Asbestos-Cement Sheets for Bulkheading¹

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1. Scope

1.1 This specification covers the types, physical properties, and dimensions of bulkhead corrugated asbestos-cement sheets designed to provide sheet piling for erosion control along fresh-water lake shores and inland waterways of fresh or salt water.

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

1.3 **Warning**—Breathing of asbestos dust is hazardous. Asbestos and asbestos products present demonstrated health risks for users and for those with whom they come into contact. In addition to other precautions, when working with asbestos-cement products, minimize the dust that results. For information on the safe use of chrysotile asbestos, refer to “Safe Use of Chrysotile: A Manual on Preventive and Control Measures.”²

1.4 The following precautionary caveat pertains only to the test method portion, Sections 9 – 12 of this specification. *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:³

C208 Specification for Cellulosic Fiber Insulating Board

C460 Terminology for Asbestos-Cement (Withdrawn 2001)⁴

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

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² Available from The Asbestos Institute, <http://www.chrysotile.com/en/sr/use/manual.htm>.

³ 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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

2.2 *Federal Standard*:⁵

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.3 *Military Standard*:⁵

MIL-STD-129 Marking for Shipment and Storage

2.4 *BNQ Standard*:⁶

BNQ Standard 3807-098 Vulcanized Rubber-Hardness Determination

3. Terminology

3.1 *Definitions*:

3.1.1 *flexural strength, n*—the transverse breaking load in newtons per meter of width (lbf/ft of width) of saturated sheets when loaded on a span of 1.524 m (5 ft) with the load applied equally and simultaneously at both one-third points of the span.

3.1.2 Refer to Terminology C460 for additional terminology.

4. Classification

4.1 The corrugated asbestos-cement sheets covered by this specification are classified on the basis of the bending moment capacity of saturated units.

Designation (Note 1)	Bending Moment Capacity (Minimum)
Type 1	1270 N-m/m of width (285 lbf-ft/ft of width)
Type 2	2250 N-m/m of width (505 lbf-ft/ft of width)
Type 3	3600 N-m/m of width (790 lbf-ft/ft of width)
Type 10	4450 N-m/m of width (1000 lbf-ft/ft of width)
Type 18	5800 N-m/m of width (1300 lbf-ft/ft of width)

NOTE 1—The bending moment capacity required for a given installation depends upon many variables. Its determination is illustrated in the design manuals of the producing companies. The color coding for the various types of bulkhead corrugated is painted on one end of the sheet to designate type: Type 1-brown, Type 2-green, Type 3-red, Type 10-gray, Type 18-yellow.⁷

5. Materials and Manufacture

5.1 Corrugated asbestos-cement sheets for bulkheading shall be composed of a combination of asbestos fiber and

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094. Attn: NPODS.

⁶ Available from Bureau de Normalisation du Québec. Department of Industry and Commerce, 50 Saint Joseph Street East, Québec QC Canada G1K 3A5.

⁷ Design Manual for Asbestos-Cement Canal Bulkheads published by the Mineral Fiber Products Bureau. Available from the Asbestos Institute, 1130 Sherbrooke Street W, Suite 410, Montreal, QC Canada H3A 2M8.

portland cement, or portland blast furnace slag cement, and not more than 1 weight % of organic fiber, with or without the addition of curing agents, silica, water-repellent substances, mineral fillers, coatings, pigments, or mineral granules, formed under pressure and cured to meet the physical requirements of this specification.

6. Physical Properties

6.1 *Strength*—The corrugated bulkhead product shall conform to the bending moment requirements of 4.1 when tested in accordance with the methods prescribed in Section 12 of this standard.

6.2 *Tolerances on the Nominal Dimensions:*

6.2.1 Length tolerance shall be ± 6.4 mm ($\frac{1}{4}$ in.).

6.2.2 Width tolerance shall be ± 6.4 mm ($\frac{1}{4}$ in.).

6.2.3 Thickness tolerance shall be ± 7.5 %.

6.3 *Pitch*—The nominal pitch as designated by the manufacturer is the distance between midpoints of adjacent crests of the corrugated. The tolerance for pitches on a single sheet or between sheets shall be ± 7.5 %.

6.4 *Corrugation Depth*—The nominal depth of the corrugated is the overall maximum thickness measured from the base of the vale to the top of the crest. The tolerance for depth between sheets shall be ± 7.5 %. For information on the dimensions or shapes, of products available to meet this specification, consult the manufacturer's literature.

7. Dimensional Measurements

7.1 *Thickness*—Measure the thickness of each specimen to the nearest 0.025 mm (0.001 in.) at the crest and vale by a micrometer having ball anvil and ball spindle ends approximately $\frac{1}{8}$ to $\frac{1}{4}$ in. (3 to 6 mm) in diameter, or an anvil and spindle, each with a 30° taper and a 0.4 mm ($\frac{1}{64}$ -in.) flat at its end. Place the anvil or spindle of the micrometer between the projections on the back of the sheet so as to measure the flat plane surface. The thickness shall be the average of at least four measurements, two of which are on the crest (one at each end) and two of which are in the vale (one at each end).

8. Workmanship, Finish, and Appearance

8.1 *Workmanship*—The corrugated bulkheading surface shall be relatively smooth and free of defects that impair appearance or serviceability.

8.2 *Color*—Color shall be the natural color of the asbestos-cement product, or as agreed upon between the purchaser and the seller. Efflorescence that sometimes may appear is not considered to be a defect on natural color asbestos-cement sheets.

TEST METHODS

9. Sampling

9.1 From each shipment or fraction thereof representing a product of the same type, a number of sheets shall be selected at random. Table 1 shows the number of sheets to be selected from shipments of various sizes.

TABLE 1 Sheet Selection

Number of Sheets in Shipment	Number of Sheets to Be Selected at Random
500 and under	3
501 to 1000	5
1001 to 1728	6
1729 to 2744	7
2745 to 4096	8
4097 to 5832	9
5833 to 8000	10

Additional sheets may be tested at the discretion of the inspector.

10. Rejection and Retest

10.1 If the sample fails to conform to the requirements of this specification, a second sample from the same lot shall be prepared and tested. The results of the retest shall be averaged with the results of the original test to determine compliance with this specification.

10.2 Failure to conform to the requirements of this specification upon retest as prescribed in 10.1 shall constitute grounds for rejection. The seller shall have the right to reinspect the rejected shipment and resubmit the lot after removal of the portion of the shipment not conforming to the specified requirements, provided this is done within 20 days after the receipt of notice of the specific cause of rejection.

11. Specimen Preparation

11.1 Immerse all specimens to be tested for strength characteristics in a tank containing clean water at 15.6 to 26.7°C (60 to 80°F) covering the uppermost crests by at least 25 mm (1 in.) of water. Remove after 24 h and conduct the tests within $\frac{1}{2}$ h after removal.

11.2 Prior to testing, any specimen showing obvious visual defects shall not be included for testing, and shall be replaced with another specimen.

12. Flexural Strength Test

12.1 *Significance*—The flexural strength is used to ascertain ultimate bending moment capacity for comparison with design specifications. If side lap occurs in the specific design, this increases the factor of safety.

12.2 *Size of Specimens*—Specimens shall be 1680 ± 13 mm ($66 \pm \frac{1}{2}$ in.) in length. Full width sheets are used for the flexural strength test. For sinusoidal corrugated shapes, three complete corrugations are adequate for the width. The length shall be parallel to the corrugations. Cracked or otherwise damaged specimens shall not be tested, but substitute specimens shall be provided.

12.3 *Apparatus*—The apparatus shall be assembled as shown in Fig. 1 and Fig. 2 and shall conform to the detailed requirements for component parts prescribed in 9.4.1 through 9.4.5, or the equivalent.

12.3.1 *Supports*—Two steel rollers 50 mm (2 in.) in diameter of a length equal to or greater than the specimen width, with a plate as specified in 9.4.2 between each supporting roller and the specimen. Supports shall not exert longitudinal constraint.