



Designation: C1186 – 22

Standard Specification for Flat Fiber-Cement Sheets¹

This standard is issued under the fixed designation C1186; 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. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification covers either untextured or surface textured fiber-cement flat sheets intended for exterior applications such as wall claddings, facades, curtain walls, soffits, and so forth.

1.2 This specification is not applicable to asbestos-cement flat sheets (Specification C220), gypsum-based boards (Specifications C1396/C1396M, C1177/C1177M, C1178/C1178M), or particle boards (Terminology D1554) discrete non-asbestos fiber-cement interior substrate sheets (Specification C1288), fiber-mat reinforced non-asbestos cement interior substrate sheets (Specification C1325), or cement-bonded particleboards (Specification BS 5669: Part 4) and (ISO 8335).

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.5 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

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 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.

C220 Specification for Flat Asbestos-Cement Sheets (Withdrawn 2021)³

C1154 Terminology for Non-Asbestos Fiber-Reinforced Cement Products

C1177/C1177M Specification for Glass Mat Gypsum Substrate for Use as Sheathing

C1178/C1178M Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel

C1185 Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards

C1288 Specification for Fiber-Cement Interior Substrate Sheets

C1325 Specification for Fiber-Mat Reinforced Cementitious Backer Units

C1396/C1396M Specification for Gypsum Board

D1554 Terminology Relating to Wood-Base Fiber and Particle Panel Materials

E84 Test Method for Surface Burning Characteristics of Building Materials

2.2 *British Standards:*⁴

BS 5669: Part 4 Specification for Cement Bonded Particleboard

2.3 *International Standards:*⁴

ISO 8335 Cement-bonded Particleboards—Boards of Portland or Equivalent Cement Reinforced with Fibrous Wood Particles

3. Terminology

3.1 *Definitions*—Refer to Terminology C1154.

4. Classification

4.1 Flat sheets covered by this specification are divided into two types, according to their intended application.

4.2 *Type A*—Sheets are intended for exterior applications, subjected to the direct action of sun, rain, or snow. They are supplied coated or uncoated.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

4.3 *Type B*—Sheets are intended for exterior applications, not subjected to the direct action of sun, rain, or snow.

NOTE 1—If sheets of Type B are used in an exterior application, where they are directly exposed to the weather, but are protected by impregnation or coatings, the weather resistance of the product may be altered by the quality of the protection. Specification of this protection, as well as the method for control and test, are outside the scope of this specification.

4.4 The sheets are further classified into four grades according to their flexural strengths. The manufacturer shall declare the type and grade of a given product in the literature for that product.

5. Composition and Manufacture

5.1 *Composition*—This specification is applicable to fiber cement flat sheets consisting essentially of an inorganic hydraulic binder or a calcium silicate binder 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 that are compatible with fiber cement are not prohibited from being added.

5.2 *Manufacture*—These products are formed either with or without pressure and cured, either under natural or accelerated conditions, to meet the physical requirements of this specification.

6. Mechanical and Physical Requirements

6.1 Mechanical and physical properties shall be determined on uncoated product wherever practical. Where products are supplied coated, this material shall also be tested with the results identified as applying to coated material.

6.1.1 Sampling and inspection for mechanical and physical properties shall be conducted in accordance with Test Method C1185.

6.2 Mechanical Requirements:

6.2.1 *Flexural Strength*—When tested in accordance with Test Method C1185, the flexural strength shall not be less than the corresponding value for the appropriate grade in Table 1. Where manufacturers state minimum product strength, this shall be at the 4 % acceptable quality level (AQL) as are the values of Table 1.

6.2.2 Type A sheets for exterior applications shall be tested and specified in both the wet and equilibrium conditions. Type A sheets shall meet the minimum wet and minimum equilibrium flexural strength requirements for the appropriate grade specified in Table 1. In addition, the average wet flexural

strength of the sample shall not be less than 50 % of the mean equilibrium strength of the sample.

6.2.3 Type B sheets shall be specified and tested in the equilibrium condition only.

NOTE 2—When sampling from continuous production, these tests may be conducted on dry, equilibrium, or saturated specimens, provided a relationship can be established between this testing and the specified values.

6.3 Physical Requirements:

6.3.1 *Density*—Nominal values and tolerances for density shall be stated by the manufacturer for each product. When tested in accordance with the method specified in Test Method C1185, the value for density shall comply with the value stated by the manufacturer.

7. Dimensions and Tolerances

7.1 *Method of Measurement*—The method of measurement shall be in accordance with Test Method C1185.

7.2 *Nominal Length and Width*—The manufacturer shall specify the nominal lengths and widths of the fiber-cement sheets.

7.3 *Nominal Thickness*—Fiber-cement sheets are normally available in thickness of 1/8 in. (3.5 mm) to 1 in. (25 mm), although thickness outside of this range is not prohibited from being supplied. Refer to Table 2.

7.4 *Length and Width Tolerance*—The tolerance from the nominal shall be $\pm 0.5\%$ with a maximum variation of $\pm 1/4$ in. (6 mm). A tolerance of $\pm 1/8$ in. is acceptable for dimensions less than 24 in. (609 mm).

7.5 *Thickness Tolerance*—The maximum difference between extreme values of the thickness measurement within a sheet shall not exceed 15 % of the maximum measured value. Thickness variation from sheet to sheet shall not exceed the tolerances shown in Table 2.

7.6 *Squareness Tolerance*—The length of the diagonals shall not vary by more than 1/32 in./ft (2.6 mm/m) of the length of the sheet. Opposite sides of the sheet shall not vary in length by more than 1/32 in./ft (2.6 mm/m).

7.7 *Edge Straightness Tolerance*—The sheet edges shall be straight within 1/32 in./ft (2.6 mm/m) of length or width.

8. Workmanship, Finish, and Appearance

8.1 *Workmanship*—Sheets shall have a commercially uniform surface on one side, and be free of major defects that will impair appearance, erection, use, or serviceability.

8.2 *Finish*—The surface of the sheet to be exposed shall be smooth, granular, or otherwise textured.

TABLE 1 Flexural Strength Requirements

NOTE 1—The values of Table 1 are lower limit values based on an acceptable quality level (AQL) of 4 % at a 90 % confidence level.

Grade	Wet Strength, psi (MPa) min	Equilibrium Strength, psi (MPa) min
I	580 (4)	580 (4)
II	1015 (7)	1450 (10)
III	1885 (13)	2320 (16)
IV	2610 (18)	3190 (22)

TABLE 2 Thickness Requirements

Nominal Thickness, in. (mm)	Tolerance, in. (mm)
1/8 – 3/16 (3.5–5)	± 0.02 (0.5)
$> 3/16$ – 3/8 (>5–10)	± 0.04 (1.0)
$> 3/8$ – 5/8 (>10–16)	± 0.05 (1.3)
$> 5/8$ – 3/4 (>16–20)	± 0.06 (1.5)
$> 3/4$ (>20)	$\pm 10\%$ thickness