Designation: C 1225 – 00

Standard Specification for Non-Asbestos Fiber-Cement Roofing Shingles, Shakes, and Slates[1]

This standard is issued under the fixed designation C 1225; 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 non-asbestos, fiber-cement shingles, shakes, and slates (roofing products) of nominally uniform thickness (non-tapered) and texture, including accessories designed to provide the weather-exposed surfaces on roofs of buildings.

1.2 This specification is not applicable to asbestos-cement roofing shingles (Specification C 222), particle board (Terminology D 1554), or cement-bonded particleboards (Specification BS 5669: Part 4) and (ISO 8335).

1.3 This specification does not include details of product installation, or installed system performance such as levels of fire resistance which is covered under Test Methods E 108.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses (SI units) are provided for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

C 222 Specification for Asbestos-Cement Roofing Shingles[2]

C 1154 Terminology for Asbestos and Fiber-Cement[2]

C 1185 Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing, and Siding Shingles, and Clapboards[2]

D 1554 Terminology Relating to Wood-Base Fiber and Particle Panel Materials[2]

E 108 Test Methods for Fire Tests of Roof Coverings[3]

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[4]

3. Terminology

3.1 *Definitions*—Refer to Terminology C 1154.

4. Manufacture and Composition

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

4.2 *Composition*—This specification is applicable to fiber-reinforced cement roofing products 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 which are compatible with fiber-reinforced cement may be added.

5. Mechanical and Physical Properties

5.1 Mechanical and physical properties shall be determined on uncoated products wherever practical. Where products are supplied coated, this material shall also be tested with the results identified as applying to coated material. Failure of the coating as a consequence of the mechanical testing shall not constitute failure of the product. Accessory products shall be excluded from these requirements.

5.1.1 Sampling and inspection for mechanical and physical properties shall be conducted in accordance with Test Methods C 1185.

6. Requirements

6.1 *Mechanical Requirements*:

6.1.1 *Flexural Strength*—When tested in accordance with Test Methods C 1185, the product shall be classified according to its modulus of rupture. The product modulus of rupture and breaking moment in the primary strength direction shall be not less than that specified in Table 1.

6.1.2 Where a manufacturer states a minimum product modulus of rupture, it shall be at the 4 % acceptable quality level (AQL) at the 90 % confidence limit as are the values of Table 1.

6.1.3 The primary strength direction is that heaviest loaded direction which will resist wind uplift when the product is installed.

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[2] *Annual Book of ASTM Standards*, Vol 04.05.

[3] *Annual Book of ASTM Standards*, Vol 04.07.

[4] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

TABLE 1 Strength Classification

NOTE—Values in the table are lower limit values based on an acceptable quality level (AQL) of 4 % at a 90 % confidence level.

Minimum Saturated Modulus of Rupture	
psi	(MPa)
798	(5.5)
Minimum Saturated Breaking Moment	
ft lbf/ft	(Nm/m)
5.6	(25)

6.1.3.1 *Known Orientation of Installation*—Where the system design ensures or dictates that the product orientation at installation is known, and the product is manufactured such that its strongest direction coincides with the primary strength direction, then classification of product shall be based on its strongest strength direction.

6.1.3.2 *Unknown Orientation of Installation*—Where a system design does not ensure or dictate that the product orientation at installation is known, then classification of the product shall be based on its weakest strength direction.

6.1.4 The product modulus of rupture in the weakest direction shall not be less than 50 % of the modulus of rupture in the strongest direction.

6.2 *Physical Requirements*:

6.2.1 *Density*—Nominal values and tolerances for density shall be stated by the manufacturer, when tested in accordance with the method specified in Test Methods C 1185.

6.2.2 *Water Absorption*—Calculate the amount of water absorbed from the increase in weight of the dried specimen during submersion for a period of 48 h. Express water absorption as the percentage by weight when tested in accordance with Test Methods C 1185.

6.2.3 *Moisture Content*—State the percentage of moisture content of the fiber-cement shingle when conditioned at 50 ± 5 % relative humidity and a temperature of 73 ± 4°F (23 ± 2°C) in accordance with Test Methods C 1185.

7. Dimensions and Permissible Variations

7.1 *Nominal Length, Width and Thickness*—The shapes, size, and thickness shall be specified by the manufacturer.

7.2 *Length and Width Tolerance*—The permissible variation from the nominal width and length shall be ±¼ in. (±6.4 mm). The method of measurement shall be in accordance with Test Methods C 1185.

7.3 *Thickness Tolerance*—The thickness variation from the nominal thickness shall not exceed − 10 % + 25 %. The method of measurement shall be in accordance with Test Methods C 1185.

8. Workmanship and Finish

8.1 *Workmanship*—The surface of the product to be exposed shall be free of defects that impair serviceability.

8.2 *Finish*—The surface of the product to be exposed may be smooth, grained, granulated, coated, or otherwise textured.

8.3 *Color*—The exposed surface of the product may be the natural color of the fiber-cement product or may be colored by the addition of mineral pigments, chemical impregnation, pigmented coatings, veneers, or embedded mineral granules.

8.4 *Holes for Nails and Supplemental Fasteners*—Holes for nails and supplemental fasteners may be provided in the units during manufacture and, if so, shall be placed as to provide the required lap and allow for proper application of necessary supplemental fasteners.

TABLE 2 Frost Resistance Classification

Grade	No. of Cycles	Retained Strength	Use Limitations
1	0	N/A	To regions where the mean annual rainfall does not exceed 20 in. (508 mm) and the average of the daily lows for any month is at least 35°F (2°C) - and - Consult the manufacturer for geographical recommendations
2	25	75%	To regions where the mean annual rainfall does not exceed 40 in. (1016 mm) and the average of the daily lows for any month is at least 30°F (-1°C) - and - Consult the manufacturer for geographical recommendations
3	100	75%	No limitations

8.5 *Efflorescence*—Efflorescence that may appear on fiber-cement product is not a defect.

8.6 *Weathering*—It should be noted that on exposure a colored product will be affected by weathering which may vary with site location pitch and exposure. Any change in finish does not in itself detract from the minimum mechanical or physical characteristics as specified in this standard or from the function of the product.

9. Supplementary Shapes

9.1 Supplementary shapes such as starter pieces, hip, and ridge finishing pieces, and ridge rolls, shall have the same general characteristics as the product they are designed to complement.

10. Inspection and Acceptance

10.1 Inspection of material, if required, shall be at the point of shipment. The inspector representing the purchaser shall have authorized access to the carriers being loaded for shipment to the purchaser. The purchaser shall be afforded all reasonable and available facilities at the point of shipment for sampling and inspection of the material, which shall be conducted so as not to interfere unnecessarily with the loading of the carriers.

10.2 Third party certification, either continuous or at regular intervals, shall be recognized as an alternative to lot inspection.

10.3 Failure to conform to any one of the requirements of this specification shall constitute grounds for nonacceptance.

11. Additional Requirements

11.1 Additional requirements shall consist of once only tests with manufacturer's statement of results provided upon customer's request. Fundamental changes in formulation or methods of manufacture, or both, shall require subsequent retesting.

11.2 *Water Tightness*—The specimen, when tested in accordance with Test Methods C 1185, may show traces of moisture on the underside of the sheet, but in no instance shall there be any formation of drops of water.

11.3 *Frost Resistance (Freeze/Thaw)*—The specimens shall be tested in accordance with Test Methods C 1185, Section 16.

The ratio of strengths, before and after exposure as calculated from test results, shall be as described in Table 2. Fiber-cement roofing products installation shall be limited to the parameters described in the column labeled "Use Limitations."

11.4 *Warm Water Resistance*—The specimens, when tested in accordance with Test Methods C 1185, shall not show visible cracks or structural alteration, such as to affect their performance in use. The ratio of strengths, before and after exposure as calculated from test results, shall be $\geq$ 80 %.

11.5 *Heat/Rain Resistance*—The specimens, when tested in accordance with Test Methods C 1185, (Part 15) for 25 cycles shall not show visible cracks or structural alteration of the roofing such as to affect their performance in use.

12. Keywords

12.1 breaking moment; color; density; efflorescence; fiber-cement; fiber-reinforced; finish; frost resistance; heat/rain test; inorganic fibers; inspection; length; mechanical properties; modulus of rupture; moisture content; non-asbestos; organic fibers; physical properties; roofing; sampling; shakes; shingles; slates; thickness; tolerance; water absorption; water tightness; width; workmanship