



Standard Specification for Non-Asbestos Fiber-Cement Roofing Shakes, Shingles, and Slates with Designed Varying Profiles and Thicknesses¹

This standard is issued under the fixed designation C 1530; 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 roofing shakes, shingles, and slates that are of designed varying profiles and thicknesses manufactured to provide the weather-exposed surfaces on roofs of buildings.

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

1.3 This specification does not include details of product installation or system performance. Refer to the manufacturer's installation literature for proper installation instructions, to Specification C 1459 for roofing systems performance, and to Test Method E 108 for levels of fire resistance.

1.4 This specification is not applicable to asbestos-cement or fiber-cement products as specified in Specifications C 222 and C 1225.

1.5 *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 requirements prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

- C 222 Specification for Asbestos-Cement Roofing Shingles
- C 1154 Terminology for Non-Asbestos Fiber-Reinforced Cement Products
- C 1185 Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing, and Siding Shingles, and Clapboards
- C 1225 Specification for Non-Asbestos Fiber-Cement Roofing Shingles, Shakes, and Slates

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.

C 1459 Specification for Performance of Non-Asbestos Fiber-Reinforced Cement Shake, Shingle, and Slate Roofing Systems

D 3359 Test Methods for Measuring Adhesion by Tape Test

E 108 Test Method for Fire Tests of Roof Coverings

E 284 Terminology of Appearance

G 152 Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

G 153 Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials

3. Terminology

3.1 *Definitions*—Refer to Terminology C 1154.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *breaking load, n*—the value of perpendicular force expressed in newtons (pound-force), as calculated from the breaking load of a test specimen, loaded as a simple beam, with the load applied to the center.

4. Manufacture and Composition

4.1 *Manufacture*—These products shall 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-cement roofing products, consisting of an inorganic binder (for example, Portland cement) reinforced by discrete non-asbestos fibers.

NOTE 1—Process aids, fillers, mineral aggregates, and pigments are permitted.

5. Mechanical and Physical Properties

5.1 Mechanical and physical properties, as defined in Section 9, shall be determined on uncoated and unsealed specimens, unless the coating is an integral part of the product. Where products are tested coated or sealed, the results shall be identified as pertaining to coated material. Coating surface changes as a consequence of mechanical testing shall not

constitute a mechanical failure as long as such materials have passed all the physical properties required.

6. Supplementary Shapes

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

7. Inspection and Acceptance

7.1 Inspection of material shall be at the point of shipment at the manufacturing facility. 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.

7.2 Third party certification, including inspections conducted either continuously or at regular intervals, shall be recognized as the alternative to lot inspection.

7.3 The manufacturer shall set up a quality control program to inspect the product throughout the manufacturing process. Each production lot shall be marked or coded to identify the date of manufacture. The Quality Control Program shall have provisions to identify and set aside any material or finished product that appears defective and does not meet this specification.

7.4 Third party inspection for Quality Control Program Certification shall be made at a minimum of once per quarter. These inspections shall occur without notice at anytime the plant is in operation. ISO 9000 Self Certification shall be permitted in lieu of a third party Quality Control Inspection Program and quarterly inspections.

7.5 Failure to conform with any of the requirements of this specification shall constitute grounds for non-acceptance.

8. Production Quality Control Requirements

8.1 Sampling:

8.1.1 *Breaking Load Test*—A minimum of one test specimen per 500 m² (5382 ft²) exposed area of merchantable material produced shall be randomly selected from a consistent stage in the manufacturing process and tested for breaking load as defined in 8.2.1.

8.1.2 *Water Absorption Test*—A minimum of one test specimen per lot of merchantable material produced shall be randomly selected from a consistent stage in the manufacturing process and tested for water absorption as defined in 8.3.

8.2 Mechanical Requirements:

8.2.1 *Breaking Load Test Procedure*—Each test specimen shall be centered on two parallel metal supports, having a radius of 13 mm (½ in.), which shall be free to rotate (see Fig. 1). The center-to-center distance between the supports shall be 254 mm (10 in.). A load shall be applied at the center of the span, with a metal bar of 13 mm (½ in.) radius, be parallel to the two parallel metal supports, and be in contact with the test specimen over its entire width. The load shall be applied at a uniform rate not exceeding 44.5 N (10 lb_f) per second until

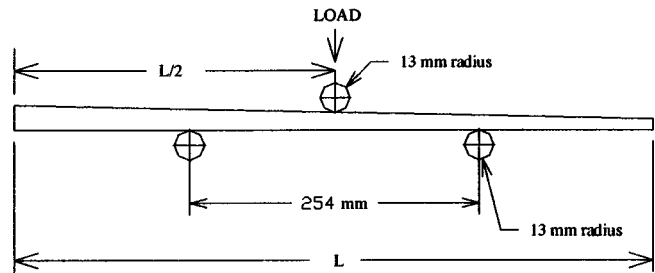


FIG. 1 Breaking Load Test Apparatus

failure. The failing load for each test specimen shall be recorded to the nearest 9 N (2 lb_f). Test results shall be recorded as N (lb_f).

8.2.2 Precision and Bias:

8.2.2.1 *Precision*—The precision of the procedure in this standard for breaking load test is being determined.

8.2.2.2 *Bias*—Since there is no applicable reference material to determine bias for the breaking load test, no statement of bias is being made.

8.2.3 *Condition of Acceptance*—The breaking load shall be a minimum of 312 N (70 lb_f) for a 305-mm (12-in.) wide specimen prior to shipping. If the manufacturer produces a product of widths other than 305 mm (12 in.), a force per unit width shall be calculated. The minimum force shall be 1.0 N/mm (5.8 lb/in.).

8.3 *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 on a full-sized specimen. The values obtained are used for quality control purposes. The maximum water absorption shall be 25 %.

8.4 Dimensions and Tolerances:

8.4.1 *Nominal Length, Width, and Thickness*—The shape, size, and thickness shall be specified by the manufacturer. Dimensions shall be determined as specified in Test Methods C 1185.

8.4.2 *Length and Width Tolerance*—The maximum variation from the manufacturer's specified lengths and widths shall be ±12 mm (½ in.) and ±6 mm (¼ in.), respectively.

8.4.3 *Thickness Tolerance*—The maximum variation from the manufacturer's specified thickness shall be ±25 % at the centerline when cut at the middle of the test specimen's length.

8.4.4 *Weight Tolerance*—The maximum variation from the manufacturer's specified weight, on samples taken at a consistent point in the manufacturing process which are either as received or oven dried, shall be ±10 %.

8.5 Workmanship and Finish:

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

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

8.5.3 *Color*—The exposed surface of the product shall be the natural color of the product or be colored by the addition of mineral pigments, pigmented coatings, veneers, or embedded mineral granules.

TABLE 1 Frost Resistance Classification

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

8.5.4 *Holes for Nails and Supplemental Fasteners*—When holes for nails and fasteners are provided in the units during manufacturing, they shall be located to provide the required lap and allow for proper application of necessary supplemental fasteners.

8.5.5 *Efflorescence*—Efflorescence that appears on fiber-cement products is not a serviceability defect.

8.5.6 *Weathering*—Natural weather exposure, which can vary with site location, slope, and exposure, will affect a colored product. Any change in color does not in itself detract from the mechanical or physical properties.

9. Product Qualification Testing

9.1 Product qualification testing shall consist of “once only” tests, with the manufacturer’s statement of results provided upon customer’s request. Changes in product formulation, design or manufacturing process, beyond the ranges allowed in the manufacturer’s product specification, shall require appropriate retesting and written concurrence by an independent testing agency stating that the changes in formulation, design or manufacturing process are not detrimental to the requirements of this specification.

9.2 *Frost Resistance Test (Freeze/Thaw)*—When tested in accordance with Test Method C 1185 Section 16 (Freeze/Thaw for Roofing Products), the average ratio of retained strength for the freeze/thaw specimens shall be categorized by grade as defined in Table 1. Where freeze/thaw testing has not been done, the product shall be assigned a rating of grade 1.

9.3 *Warm Water Test*—Methods of testing shall be in accordance with Test Method C 1185.

9.3.1 *Conditions of Acceptance*—After testing, the specimens shall comply with the following:

9.3.1.1 No additional visible cracks, structural alteration or delamination shall be apparent.

9.3.1.2 The mean breaking load per unit width of the test specimens after warm water exposure shall be at least 80 percent of the mean breaking load per unit width of the wet control specimens.

9.4 Accelerated Weathering Test:

9.4.1 Products shall be coated or uncoated as tested in 5.1.

9.4.2 *Sample*—Ten representative and randomly selected samples of the product shall be used, of which five must be held as controls.

9.4.3 *Apparatus*—Testing shall be performed using Practice G 152, G 153, or G 155. The test method used shall be reported.

9.4.4 *Procedure*—The test shall be run for a period of 3000 h on coated or uncoated material, as specified in the manufacturer’s literature. It shall be reported whether the test was performed on coated or uncoated material.

9.4.5 *Conditions of Acceptance*—Surface changes such as cracking, checking, crazing, erosion, or chalking shall be reported in accordance with Standard E 284. Loss of adhesion of the top surface, as evaluated in accordance with Test Methods D 3359, shall constitute a failure.

9.5 *Water Tightness*—A full-sized, finished product specimen, when completely framed and tested in accordance with Test Method C 1185, shall not be prohibited from showing moisture on the underside, but in no instance shall there be any falling drops of water.

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

10. Keywords

10.1 accelerated weathering; breaking load; cement; efflorescence; fiber-cement; freeze/thaw test; frost resistance; inorganic fibers; mechanical properties; natural fiber; organic fibers; physical properties; roofing; shakes; shingles; slates; water tightness; weathering; weatherometer test

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