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Standard Specification for Sheet Radiant Barriers for Building Construction Applications[1]

This standard is issued under the fixed designation C1313/C1313M; 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 the general physical property requirements of radiant barrier materials for use in building construction. The scope is specifically limited to requirements for radiant barrier sheet materials that consist of at least one surface having a far-infrared emittance of 0.1 or less, such as metallic foils or metallic deposits mounted or unmounted on substrates.

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

1.3 The following safety hazards caveat pertains only to the test methods (Section 10) described in 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:*[2]

C168 Terminology Relating to Thermal Insulation

C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

C1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings

C1371 Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

C1743 Practice for Installation and Use of Radiant Barrier Systems (RBS) in Residential Building Construction

C1744 Practice for Installation and Use of Radiant Barrier Systems (RBS) in Commercial/Industrial Building Construction

D2261 Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)

D3310 Test Method for Determining Corrosivity of Adhesive Materials

E84 Test Method for Surface Burning Characteristics of Building Materials

E96/E96M Test Methods for Water Vapor Transmission of Materials

E2599 Practice for Specimen Preparation and Mounting of Reflective Insulation, Radiant Barrier and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics

2.2 *Other Standards:*

TAPPI Test Method T 512 sp-02: Creasing of Flexible Packaging Material Paper Specimens for Testing[3]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology C168.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *radiant barrier*—a low emittance (0.1 or less) surface used in the construction of a radiant barrier system.

3.2.2 *radiant barrier system (RBS)*—a building construction consisting of a radiant barrier bounded by an open air space.

3.2.3 *non-structural radiant barrier*—a radiant barrier material design that during manufacture is not bonded to a structural building material.

3.2.4 *structural radiant barrier*—a radiant barrier material design that during manufacture is bonded (leaving no air space between the radiant barrier and the bonding substrate) to a structural building material such as plywood or oriented strand board (OSB).

[1] This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is under the direct responsibility of Subcommittee C16.21 on Reflective Insulation.

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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.

[3] Available from Technical Association of the Pulp and Paper Industry (TAPPI), 15 Technology Parkway South, Norcross, GA 30092, http://www.tappi.org.

4. Ordering Information

4.1 Prior to purchase, for sampling and acceptance procedures, Practice C390 is an option when agreed to by purchaser and manufacturer.

4.2 Specify the width and total area to be installed.

4.3 Specify any special markings.

5. Materials and Manufacture

5.1 Sheet radiant barrier materials shall consist of low emittance surface(s) that are in combination with any substrates and adhesives required to meet the specified physical material properties.

6. Workmanship, Finish, and Appearance

6.1 Sheet radiant barriers shall be manufactured, packaged and shipped in such a manner that, when received by the customer, they are suitable for installation in accordance with either Practice C1743 or C1744.

7. Physical Requirements

7.1 The low–emittance materials shall conform to the physical properties as specified in Table 1 and local building codes.

7.2 The following physical characteristics of sheet radiant barriers are important:

7.2.1 *Surface Emittance*—Radiant barriers derive effectiveness from a low-emittance surface. The surface emittance of sheet radiant barriers shall be determined in accordance with Test Method C1371.

7.2.2 *Water Vapor Transmission*—Sheet radiant barriers are manufactured as vapor retarders or vapor transmitting materials. A radiant barrier that is to serve as a vapor retarder shall not have a permeance greater than one perm, as determined in accordance with Test Methods E96/E96M (Procedure A—Desiccant Method).

7.2.2.1 A vapor transmitting radiant barrier shall have a permeance greater than five perms as determined with Test Methods E96/E96M (Procedure A—Desiccant Method).

7.2.3 *Surface Burning Characteristics*—Determine in accordance with 10.3.

7.2.4 *Corrosivity*— Sheet radiant barriers shall be tested for corrosion resistance in accordance with Test Method D3310. Evidence of significant corrosion shall be cause for rejection. A corrosion test that results in less than 2 % affected surface is satisfactory.

7.2.5 *Tear Resistance*— Sheet radiant barriers shall be tested for tear resistance using Test Method D2261. The tear resistance shall be included in the manufacturer's technical data.

TABLE 1 Physical Properties of Low Emittance Materials

Foils or Deposits
Purity—at least 99 % aluminum (where applicable)
Emittance—0.1 or less
Corrosivity—Test Method D3310 result <2.0 %
Bleeding or delamination—<2.0 %
Pliability—no cracking or delamination
Mold and mildew—growth or delamination outside inoculation area is cause for rejection

7.2.6 *Adhesive Performance:*

7.2.6.1 *Bleeding*—Adhesives, when used in bonding, shall show no sign of bleeding when tested in accordance with the test procedure in 10.1. Bleeding at cut edges shall be disregarded. The total of bleeding or delamination, covering more than 2 % of the sample area, shall be cause for rejection.

7.2.6.2 *Pliability*—Specimens tested in accordance with the test procedure in 10.2 shall not show cracking or delamination. This test does not apply to materials that are not flexible and not intended to be bent or flexed.

7.2.7 *Mold and Mildew*— Fungal resistance of sheet radiant barriers shall be tested in accordance with Test Method C1338. The samples are then examined visually under 5× magnification for the extent of mold growth and for indications of deterioration. Evidence of mold growth beyond the inoculation area shall be cause for rejection.

8. Significance and Use

8.1 This specification recognizes that the effectiveness of a sheet radiant barrier is dependent on proper installation. Practices C1743 and C1744 address use and installation of radiant barriers.

8.2 This specification identifies the material properties that are important for sheet radiant barrier products. When appropriate, values for the properties have been stated.

8.3 When specific material properties are required for a particular application the user shall consult the manufacturer.

8.4 Radiant barriers shall be free of dust or other contaminants to remain effective.

9. Sampling

9.1 Sampling shall be performed in accordance with Practice C390.

10. Test Methods for Adhesive Performance

10.1 *Bleeding and Delamination:*

10.1.1 *Scope*—This test method covers the determination of bleeding and delamination of sheet radiant barriers.

10.1.2 *Significance and Use*—It is necessary that sheet radiant barriers not show adhesive bleeding or delamination. These conditions contribute to a loss of structural integrity, a change in water vapor permeability, or an increase in surface emittance.

10.1.3 *Sampling*—A minimum of three specimens of the radiant barrier material with dimensions of approximately 7.6 by 15.2 cm [3 by 6 in.] will be tested. The test specimens shall be cut from separate locations on the roll or panel of the radiant barrier material.

10.1.4 *Procedure*—Suspend specimens vertically in an oven and heat to a temperature of 82 ± 3°C [180 ± 5°F] for 5 h.

10.1.4.1 Determine under 5× magnification the following: has the adhesive bled or extruded through the surface or has any separation of foil from the substrate (delamination) occurred. Estimate the percentage of the area that has delaminated.

10.1.5 *Precision and Bias*—Precision and bias have not been determined for this qualitative test.

10.2 *Pliability:*

10.2.1 *Scope*—This test method covers the determination of cracking or delamination of the radiant barrier due to folding or bending. Any radiant barrier product that is not subject to bending during installation shall be exempt from the requirements in 10.2.

10.2.2 *Significance and Use*—It is necessary that sheet radiant barriers not crack or delaminate as a result of normal installation since these conditions contribute to loss of structural integrity, change in water vapor transmission, or increase in surface emittance.

10.2.3 *Sampling*—A minimum of three specimens of the radiant barrier materials shall be subjected to two tests. One specimen shall include a factory-produced edge.

10.2.4 *Procedure*—The specimens shall be conditioned at a temperature of 21 ± 1°C [70± 2°F] and 50 % (±5 %) relative humidity for the first test and 0 ± 1°C [32 ± 2°F] and 50 % (±5 %) relative humidity for the second test for a period of no less than 24 h immediately prior to testing.

10.2.4.1 The radiant barrier specimens that have been conditioned shall be folded in accordance with TAPPI Test Method T 512 and the folded edge smoothed using light finger pressure. The radiant barrier materials shall not crack or delaminate when folded to 180 degrees of bend.

10.2.5 *Precision and Bias*—Precision and bias have not been determined for this qualitative test.

10.3 *Surface Burning Characteristics*—Determine in accordance with Test Method E84. Non-structural radiant barrier shall be mounted according to Practice E2599.

11. Inspection

11.1 Inspection of the material shall be agreed upon between the purchaser and supplier. Practice C390 is an option as part of the purchase contract.

12. Rejection and Rehearing

12.1 *Requirements Determined by Visual Inspection*—The product shall be inspected visually for mechanical damage as follows:

12.1.1 Punctures and tears not to exceed one puncture per 500 ft^2 unless the puncture is intended to be characteristic of the finished product.

12.1.2 Damage (for example, bleeding adhesive, corrosion) to surface coatings shall not exceed 2 % of the surface area.

12.2 When inspection of a specimen shows failure to conform to the requirements of this specification, a second specimen from the same lot shall be tested and the results of this retest averaged with the results of the first test.

12.3 When the average described in 12.2 fails to conform to the requirements of this specification then the material fails. Rejection shall be reported to the manufacturer or supplier promptly and in writing. In case of dissatisfaction with the results of the tests, the manufacturer or supplier has a right to make a claim for rehearing.

12.4 In case of rejection, the manufacturer or supplier shall have the right to reinspect the rejected shipment or resubmit the lot after removal of that portion of the shipment not conforming to the specified requirements.

13. Packaging and Package Marking

13.1 All sheet radiant barrier products shall be packaged in a manner which will protect the material from physical damage during storage and transportation.

13.2 *Package Marking:*

13.2.1 All packages shall be either imprinted with the manufacturer's name or trademark to identify product origin or contain a fact sheet containing this information.

13.2.2 All packages shall be marked with a lot number.

13.2.3 All packages shall be marked with the width and length of the material and the total expected coverage area when installed in accordance with the instructions provided by the manufacturer.

13.3 *Radiant Barrier Markings:*

13.3.1 The radiant barrier material shall be imprinted with the manufacturer's or distributor's name or trademark.

13.3.2 The radiant barrier material shall be imprinted with the measured flame spread rate, as determined in accordance with Test Method E84, at a minimum of every 2.4 m [8 ft] of its length or once on each panel for lengths less than 2.4 m [8 ft].

13.3.3 The radiant barrier material shall be imprinted with the measured surface emittance of the operative surface, as determined using Test Method C1371, at a minimum of every 2.4 m [8 ft] of its length or once on each panel for lengths less than 2.4 m [8 ft].

13.3.4 Radiant barrier material manufactured to allow water vapor transmission shall be imprinted with the measured water vapor transmission rate (in perms), as determined in accordance with Test Methods E96/E96M (Procedure A—Desiccant Method), at a minimum of every 2.4 m [8 ft] of its length or once on each panel for lengths less than 2.4 m [8 ft].

13.3.5 Markings that affect emittance shall not exceed 0.5 % of the operative low-emittance surface area of the radiant barrier material.

14. Keywords

14.1 aluminum foil; low emittance; radiant barrier; radiant barrier system; radiation; reflectance; sheet radiant barrier