



# Standard Specification for Reflective Insulation for Building Applications<sup>1</sup>

This standard is issued under the fixed designation C 1224; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers the general requirements and physical properties of reflective insulations for use in building applications. These insulation materials consist of one or more low emittance surfaces, such as metallic foil or metallic deposits, unmounted or mounted on substrates. Reflective insulations derive their thermal performance from surfaces with an emittance of 0.1 or less, facing enclosed air spaces.

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

1.3 *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:

- C 168 Terminology Relating to Thermal Insulating Materials<sup>2</sup>
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus<sup>2</sup>
- C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots<sup>3</sup>
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus<sup>2</sup>
- C 727 Practice for Use of Reflective Insulation in Building Constructions<sup>2</sup>
- C 1258 Test Method for Elevated Temperature and Humidity Resistance of Vapor Retarders for Insulation<sup>2</sup>
- C 1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings<sup>2</sup>
- C 1363 Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus<sup>2</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.21 on Reflective Insulation.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.06.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 15.06.

C 1371 Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emis-someters<sup>2</sup>

E 84 Test Method for Surface Burning Characteristics of Building Materials<sup>4</sup>

E 96 Test Methods for Water Vapor Transmission of Mate-rials<sup>2</sup>

### 2.2 Other Standard:

TAPPI Standard T 512 om-86, Creasing of Flexible Pack-aging Material Paper Specimens for Testing<sup>5</sup>

## 3. Terminology

3.1 *Definitions*—Terminology C 168 shall apply to the terms in this specification.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *reflective insulation*—thermal insulation consisting of one or more low emittance surfaces, bounding one or more enclosed air spaces.

## 4. Ordering Information

4.1 Prior to purchase, for sampling and acceptance proce-dures, Criteria C 390 can be agreed upon between the pur-chaser and the manufacturer.

4.2 Specify the required thermal resistance by the direction of the heat flow.

4.3 Specify the width, depth, and total area to be insulated.

4.4 Specify special markings, if required.

## 5. Materials and Manufacture

5.1 Reflective insulation materials shall consist of low emittance surface(s) with, or without, substrates and adhesives required to meet the specified thermal performance and physi-cal properties.

5.2 Multiple layer reflective insulations shall be designed to attain the intended separation of layers in normal application. Such multiple layer insulation shall form an attachment flange suitable for stapling, or other means of attachment.

5.3 *Dimensions*—Insulation shall be furnished in dimen-sions to fit framing members, at spacings standard in the construction industry, or as specifically agreed upon between

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 04.07.

<sup>5</sup> Available from TAPPI, Technology Park/Atlanta, P.O. Box 105113, Atlanta, GA 30348.

the producer and the buyer.

## 6. Physical Properties Requirements

6.1 Low emittance materials shall have a surface with an emittance of 0.1 or less, as determined in accordance with 9.1.

6.2 *Permeance*—If the reflective insulation is to serve as a vapor retarder, the permeance of the material shall not exceed one perm, as determined in accordance with 9.2.

6.3 *Surface Burning Characteristics*—Building code requirements specify flame spread and smoke development values determined in accordance with 9.3, except as follows:

(a) Maximum surface burning characteristics shall not exceed 25 flame spread index and 50 smoke development index in either marine or inside plenum applications.

(b) Maximum surface burning characteristics shall not exceed 25 flame spread index and 450 smoke development index in exposed building applications or other installations that may have specific requirements not covered by the building code.

6.4 *Humidity Resistance*—The laminates of the reflective insulation shall be tested in accordance with 9.4. Three specimens shall be exposed. Shield the test specimens from condensate that may drip from the ceiling of the humidity chamber.

6.4.1 The specimens shall be evaluated for visible corrosion and delamination. For purposes of corrosion evaluation, the outer .25 inch (6.4 mm) perimeter may be disregarded. No tested specimen shall exhibit visible crystalline deposits exceeding 2 % of the test area nor exhibit unaided delamination of layers.

### 6.5 *Adhesive Performance*:

6.5.1 *Bleeding*—Adhesives, when used, shall show no sign of bleeding when tested in accordance with the test procedure in 9.5.1. Bleeding at cut edges may be disregarded. Bleeding or delamination, covering over 2 % of the specimen area, shall be cause for rejection.

6.5.2 *Pliability*—Specimens tested in accordance with the test procedure in 9.5.2 shall not show cracking or delamination.

6.6 *Fungi Resistance*—Specimens shall not have growth greater than comparative item when tested in accordance with 9.6. Use interpretation of results in section 7.2 of C 1338.

6.7 *Thermal Resistance*—Determine the thermal resistance in accordance with procedures in 9.7. The results of the procedures shall indicate the R-value of the product, in the assembly tested.

## 7. Workmanship, Finish, and Appearance

7.1 The insulation shall be manufactured, packaged, and shipped in such a manner that, when received by the customer, it shall be suitable for installation in accordance with Practice C 727.

## 8. Sampling

8.1 Sampling shall be performed in accordance with Criteria C 390.

## 9. Test Methods

9.1 *Emittance*—The emittance of the product shall be tested in accordance with Test Method C 1371.

9.2 *Permeance*—The permeance of the product shall be

tested in accordance with Test Method E 96, Desiccant Method.

9.3 *Surface Burning*—Surface burning characteristics shall be tested in accordance with Test Method E 84.

9.4 *Humidity Resistance*—The humidity resistance of the product shall be tested in accordance with Test Method C 1258.

### 9.5 *Adhesive Performance*:

#### 9.5.1 *Bleeding and Delamination*:

9.5.1.1 *Scope*—This test method covers the determination of bleeding and delamination of the reflective insulation.

9.5.1.2 *Significance and Use*—It is necessary that reflective insulation not show adhesive bleeding or delamination since this could cause a loss of structural integrity and a change in water permeability.

9.5.1.3 *Sampling*—A minimum of three specimens of the reflective insulation, with dimensions of approximately 3 by 6 inches (7.62 cm by 15.24 cm), shall be tested. The test specimens shall be cut from separate locations on a roll or panel of the insulation.

9.5.1.4 *Procedure*—Suspend the specimens vertically in an oven and heat to a temperature of 180°F ( $\pm$  5°F) for at least 5 h. Determine, under 5 $\times$  magnification, if the adhesive has bled or exuded through the surface, or if separation of foil from substrate (delamination) has occurred.

9.5.1.5 *Precision and Bias*—No information is presented about either precision or bias of this test method for determining Bleeding and Delamination, since the test results are nonquantitative.

#### 9.5.2 *Pliability*:

9.5.2.1 *Scope*—This test method covers the determination of cracking or delamination of the reflective insulation due to folding and bending. Any reflective insulation product that does not require bending during installation shall be exempt from the requirements of this section.

9.5.2.2 *Significance and Use*—It is necessary that reflective insulation not crack or delaminate since this could cause a loss of structural integrity and change in water permeability.

9.5.2.3 *Sampling*—A minimum of three specimens of the reflective insulation shall be subjected to two tests: one specimen shall contain a factory produced edge.

9.5.2.4 *Procedure*—Immediately prior to testing: (a) The specimens shall be conditioned at a temperature of 70°F ( $\pm$  2°F) and a relative humidity of 50 % ( $\pm$  5 %) for a period of no less than 24 h for the first test. The second test shall be at 32°F ( $\pm$  2°F) for a period of no less than 24 h. (b) The foil laminate shall be folded in accordance with TAPPI Standard T-512 om-86, and the folded edge smoothed, using light finger pressure. The finished laminate shall not crack or delaminate when folded to a 180° bend.

9.5.2.5 *Precision and Bias*—No information is presented about either precision or bias of TAPPI Standard T-512 om-86 for determining cracking or delamination, due to folding or bending, since the test result is non-quantitative.

9.6 *Fungi Resistance*—The fungi resistance of the product shall be determined in accordance with Test Method C 1338.

9.7 *Thermal Performance*—The thermal performance of reflective insulation shall be determined in accordance with Test Method C 1363 using the following criteria: