



Designation: **C1668—13 C1668 – 13a**

Standard Specification for Externally Applied Reflective Insulation Systems on Rigid Duct in Heating, Ventilation, and Air Conditioning (HVAC) Systems¹

This standard is issued under the fixed designation C1668; 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 the requirements and physical properties of reflective insulation systems applied externally to Rigid Heating, Ventilation, and Air Conditioning (HVAC) duct systems operating at or below 250°F (121.1 °C). These insulation systems consist of one or more low-emittance surfaces, such as metallic foil or metallic deposits, mounted on substrates to produce reflective air spaces. Reflective insulation systems derive thermal performance from surfaces with an emittance of no greater than 0.1 facing enclosed air spaces.

1.2 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.

1.3 *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:²

[C168 Terminology Relating to Thermal Insulation](#)

[C335 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation](#)

[C390 Practice for Sampling and Acceptance of Thermal Insulation Lots](#)

[C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation](#)

[C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions](#)

[C1258 Test Method for Elevated Temperature and Humidity Resistance of Vapor Retarders for Insulation](#)

[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](#)

[E84 Test Method for Surface Burning Characteristics of Building Materials](#)

[E96/E96M Test Methods for Water Vapor Transmission of Materials](#)

[E2231 Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics](#)

2.2 Other Test Method:

[TAPPI Standard T-512 sp-02 Creasing of Flexible Packaging Material Paper Specimens for Testing](#)³

3. Terminology

3.1 Definitions:

3.1.1 Unless otherwise noted, the terms used in this specification conform to Terminology [C168](#).

3.2 Definitions of Terms Specific to This Standard:

¹ 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.

Current edition approved ~~May 1, 2013~~ Nov. 1, 2013. Published ~~June 2013~~ January 2014. Originally approved in 2009. Last previous edition approved in ~~2012~~ 2013 as [C1668-12-13](#). DOI: [10.1520/C1668-13.10.1520/C1668-13A](#).

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](#).

3.2.1 *HVAC ducts*—as pertaining to this standard, ducts having rigid rectangular or circular cross-section used to transfer air from the air handling equipment to the conditioned space and return.

3.2.2 *insulation spacers*—material used to form enclosed air spaces that are interior to the reflective insulation system.

3.2.3 *reflective insulation*—thermal insulation consisting of one or more low emittance surfaces, bounding one or more enclosed air space(s).

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4. Classification

4.1 Products covered by this specification are classified according to the substrate material and have the physical properties as listed in **Table 1**.

4.1.1 *Type A*—Product with polyethylene foam substrate.

4.1.2 *Type B*—Product with polyethylene bubble pack substrate.

4.1.3 *Type C*—Product with fiberglass substrate.

4.1.4 *Type D*—Product with polyester fiber substrate.

4.1.5 *Type E*—Product with kraft paper substrate.

5. Ordering Information

5.1 Specify the required thermal resistance.

5.2 Specify the number of layers of insulation, width, thickness of the insulation system and the configuration of the duct(s) to be insulated.

5.3 Special markings, when required, shall be specified.

5.4 Special performance requirements, when required.

6. Materials and Manufacture

6.1 Reflective insulation shall consist of low-emittance surface(s) with substrates and adhesives required to meet the specified thermal performance and physical properties. Air spaces shall be maintained by use of insulation spacers.

6.2 Multiple layer reflective insulation shall be designed to attain the intended separation of layers. The design separation shall be maintained by the use of proper size, location and method of securing the insulation spacers to the duct system.

6.3 *Dimensions*—Insulation and properly sized insulation spacers shall be furnished in dimensions specifically agreed upon between the producer and the buyer.

7. Physical Properties

7.1 *Emittance*—Low-emittance surfaces used for this insulation shall have a surface emittance of 0.1 or less, as determined in accordance with **10.1**.

7.2 *Water Vapor Permeance*—The water vapor permeance shall be determined in accordance with **10.2** and shall meet the requirements of **Table 1**.

7.3 *Surface Burning Characteristics*—Surface Burning Characteristics shall be determined in accordance with **10.3**. The maximum flame spread index shall not exceed 25 and the maximum smoke developed index shall not exceed 50.

7.4 *Aging Resistance*—The laminates of the reflective insulation shall be tested for aging resistance in accordance with **10.4**. Three specimens shall be tested. The test specimens shall be shielded from condensate that drips from the ceiling of the humidity chamber during the test.

7.4.1 After exposure the specimens shall be evaluated for visible corrosion and delamination. For purposes of corrosion evaluation, disregard the outer 0.25 in. (6 mm) perimeter. No tested specimen shall exhibit visible corrosion or unaided delamination of layers.

TABLE 1 Classification Criteria

Property	Type A	Type B	Type C	Type D	Type E
Emittance	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10
Max. Flame Spread Index	25	25	25	25	25
Max. Smoke Developed Index	50	50	50	50	50
Hot Surface Performance	Min. 250°F	Min. 250°F	Min. 250°F	Min. 250°F	Min. 250°F
Water Vapor Permeance (perms)	0.02 or less	0.02 or less	0.02 or less	0.02 or less	0.02 or less