Designation: C1534 – 19

# Standard Specification for Flexible Polymeric Foam Sheet Insulation Used as a Thermal and Sound Absorbing Liner for Duct Systems[1]

This standard is issued under the fixed designation C1534; 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 composition, dimensions, and physical properties of flexible unfaced foam sheet, used to insulate interior surfaces of HVAC ducts, plenums and equipment used for the distribution of conditioned air with a temperature of up to 250°F (121°C).

1.2 HVAC ducts, plenums and equipment systems typically operate between a temperature range of 50°F to 150°F (10°C to 65°C) and are designed to meet building code requirements of maximum temperatures of 250°F (121°C).

1.3 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.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

C168 Terminology Relating to Thermal Insulation

C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C209 Test Methods for Cellulosic Fiber Insulating Board

C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

C423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C634 Terminology Relating to Building and Environmental Acoustics

C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions

C1071 Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)

C1104/C1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation

C1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus

C1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials

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

E84 Test Method for Surface Burning Characteristics of Building Materials

E176 Terminology of Fire Standards

E795 Practices for Mounting Test Specimens During Sound Absorption Tests

E2231 Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics

G21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

[1] This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.

Current edition approved March 1, 2019. Published April 2019. Originally approved in 2002. Last previous edition approved in 2018 as C1534 – 18. DOI: 10.1520/C1534-19.

[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.

2.2 *Other Standards:*
CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

## 3. Terminology

3.1 The definitions of terms used in this specification shall be in accordance with Terminologies C168, C634, and E176. In case of any conflicts, Terminology C168 shall be the authority.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *closed cell foam*—a foam comprised of predominately individual non interconnecting cells.

3.2.2 *flexible cellular*—a cellular material that will not rupture within 60 s when a specimen 1 × 1 × 8 in. in length (25 × 25 × 200 mm) is bent around a 1 in. (25 mm) diameter mandrel at a uniform rate of one lap in 5 s in the form of a helix at a temperature between 65 and 85°F (18 and 29°C).

3.2.3 *open cell foam*—a foam made porous by interconnecting cells.

## 4. Classification

4.1 The flexible polymeric insulations of this specification are classified into Types I and II. Type I is a closed cell flexible foam. Type II is an open cell flexible foam.

4.2 When referencing Specification C1534, type and grade shall always be specified.

NOTE 1—The primary difference between Type I and Type II materials are: Type I materials exhibit lower water absorption properties and Type II materials have greater acoustical properties as noted in Table 1 and Table 2.

## 5. Materials

5.1 These products shall be made of a homogeneous blend of natural or synthetic polymeric materials. Modifications with various thermoplastic or thermosetting resins, plasticizers, modifiers, antioxidants, curatives, blowing agents and other additives are allowed. These products do not melt when exposed to heat and are considered to be thermoset materials.

5.2 Flexible, polymeric cellular thermal insulations shall be of uniform core density. These insulation materials are available with a smooth skin surface or coating on one or both sides, and they are to be considered homogeneous for the purposes of determining thermal performance.

## 6. Ordering Information

6.1 Specific installation, insulation type, thickness, length, and width suited for the intended use shall be agreed upon by the purchaser and supplier.

## 7. Physical Properties—See Tables 1 and 2 for Summary of Requirements

7.1 *Apparent Thermal Conductivity*—The material shall be tested for apparent thermal conductivity at 75°F (24°C) mean temperature in accordance with 12.1. The thermal conductivity for the average of any four randomly selected samples, shall not be more than 0.30 Btu-in./h-sq ft°F (0.043 W/m-K) when tested in accordance with 12.1. See Table 1.

NOTE 2—Consult the local or state building codes for the minimum installed thermal resistance, R-value, required to be installed.

7.2 *Surface Burning Characteristics*—Shall be in accordance with 12.2. See Table 1 for requirements.

7.3 *Hot Surface Performance*—The insulation shall have no evidence of flaming, glowing, smoldering, visible smoke, delamination, cracking, warpage, melting, dripping or reduction in thickness when tested in accordance with 12.3 at the temperature specified in Table 1.

NOTE 3—*Hot Surface Performance Characteristics for Type 1 Material*—When this type of material is used on hot applications, the material's characteristics will change and should be considered when selecting the material for an application. Heat will cause the elastomeric insulation to harden. As the temperature approaches the stated high temperature limit, the process occurs faster. This hardening will not negatively effect the thermal performance or water vapor transmission properties of the product. The hardening will be most noticeable closer to the heat source. This effect is based on time and temperature.

7.4 *Water Vapor Sorption*—Shall be tested in accordance with 12.4. See Table 1.

**TABLE 1 Physical Properties**

| | Type I | Type II | |
|---|---|---|---|
| | | Grade A | Grade B |
| Maximum Apparent Thermal Conductivity Btu-in./h-ft $^2$–°F) max. | 0.30 | 0.30 | 0.30 |
| (W/m-K) max. | (0.043) | (0.043) | (0.043) |
| Surface Burning Characteristics ( at maximum total installed thickness): | (See[A] ) | (See[A] ) | (See[A] ) |
| Flame Spread Index, (max) ≤ | 25 | 15 | 25 |
| Smoke Developed Index, (max) ≤ | 50 | 15 | 50 |
| Water Vapor Sorption wt % gain by vol. (max.) | 0.75 | 0.1 | 0.1 |
| Water Absorption, wt % gain by vol. (max.) | 0.2 | 4.0 | 4.0 |
| Dimensional Stability % change (max.) length, width or thickness | 7.0 | 1.0 | 1.0 |
| Odor Emission | Pass | Pass | Pass |
| Corrosiveness | Pass | Pass | Pass |
| Fungi Resistance | No Growth | No Growth | No Growth |
| Erosion Resistance | Pass | Pass | Pass |
| Hot Surface Performance at not less than 250°F (125°C) (See 7.3 for requirements) | Pass | Pass[B] | Pass[B] |

[A]Consult manufacturer regarding maximum thickness approved for surface burning characteristics Type 1 is typically tested at 1 in. thickness. Type 2 is typically tested at 2 in. thickness. Product needs to be tested at the thickness to be used in the application.
[B]In some cases actual product properties exceed requirements listed in Table 1, consult manufacturers for specific applications.