



Designation: C 1534 – 02

Standard Specification for Flexible Polymeric Foam Sheet Insulation Used as a Thermal and Sound Absorbing Liner for Duct Systems¹

This standard is issued under the fixed designation C 1534; 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 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are in SI, and are 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 requirements prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- C 168 Terminology Relating to Thermal Insulating Material²
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus²
- C 209 Test Methods for Cellulosic Fiber Insulating Board²
- C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots²
- C 411 Test Method for Hot-Surfaced Performance of High Temperature Thermal Insulation²
- C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method²
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus²
- C 634 Terminology Relating to Environmental Acoustics²
- C 665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing²
- C 1045 Practice for Calculating Thermal Transmission

- Properties from Steady-State Heat Flux Measurements²
- C 1071 Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)²
- C 1104 Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation²
- C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus²
- C 1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials²
- C 1338 Test Method for Determining the Fungi Resistance of Insulation Materials and Facings²
- E 84 Test Method for Surface Burning Characteristics of Building Materials³
- E 176 Terminology of Fire Standards³
- G 21 Practice for Determining Resistance of Synthetic Polymer Materials to Fungi⁴
- G 22 Practice for Determining Resistance of Plastics to Bacteria⁴

3. Terminology

3.1 The definitions of terms used in this specification shall be in accordance with Terminologies C 168, C 634, and E 176. In case of any conflicts, Terminology C 168 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 flexible foam. Type II is an open cell flexible foam.

NOTE 1—The primary difference between Type I and Type II materials

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 Non-Homogenous Inorganic Thermal Insulations.

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² Annual Book of ASTM Standards, Vol 04.06.

³ Annual Book of ASTM Standards, Vol 04.07.

⁴ Annual Book of ASTM Standards, Vol 14.04.

are: Type I materials exhibit lower water absorption properties and Type II materials have greater acoustical properties as noted in **Tables 1** and **2**.

5. Materials

5.1 These products shall be made of a homogeneous blend of natural or synthetic polymeric materials that may be modified with various thermoplastic or thermosetting resins, plasticizers, modifiers, antioxidants, curatives, blowing agents and other additives.

5.2 Flexible, polymeric cellular thermal insulations shall be of uniform core density. Even though these insulation materials may have a smooth skin surface or coating on one or both sides, 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** and **Note 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**.

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

7.5 *Water Absorption*—Shall be tested in accordance with **12.5**. See **Table 1**.

7.6 *Dimensional Stability*—Shall be tested in accordance with **12.6**.

7.7 *Odor Emission*—There shall be no detectable odor of objectionable nature when tested in accordance with **12.7**.

7.8 *Corrosiveness*—No corrosion shall be noted when tested in accordance with **12.8**.

7.9 *Fungi Resistance*—When tested in accordance with **12.9**, the test specimens shall show no fungal growth.

7.10 *Bacteria Resistance*—When tested in accordance with **12.10** the test specimens shall show no bacteria growth.

7.11 *Erosion Resistance*—The product shall show no evidence of delamination or continued erosion when air is passed through typical duct sections when tested in accordance with **12.11**.

7.12 *Sound Absorption Coefficient*—When tested in accordance with Test Method **C 423** using an “A” mounting, the insulation shall have sound absorption coefficient and NRC not less than that indicated in **Table 2**.

8. Qualification and Inspection Requirements

8.1 *Qualification Requirements*—The following requirements shall be used for purposes of initial material qualification:

- 8.1.1 Apparent thermal conductivity,
- 8.1.2 Surface burning characteristics,
- 8.1.3 Hot surface performance,
- 8.1.4 Water vapor sorption,
- 8.1.5 Water absorption,
- 8.1.6 Odor emission,
- 8.1.7 Corrosiveness,
- 8.1.8 Fungi resistance,
- 8.1.9 Bacterial resistance,
- 8.1.10 Sound absorption coefficient, and
- 8.1.11 Erosion resistance.

8.2 *Inspection*—The following requirements shall be used for purposes of acceptance sampling of lots or shipments of qualified thermal insulation:

- 8.2.1 Dimensional tolerances, and
- 8.2.2 Workmanship.

TABLE 1 Physical Properties

NOTE 1—Consult manufacturer regarding maximum thickness approved for surface burning characteristics.

NOTE 2— Actual product properties may be better, consult manufacturers for specific applications.

| | Type I | Type II |
|---|----------------------|----------------------|
| Maximum Apparent Thermal Conductivity Btu-in./h-ft sq.-°F) max. (W/m-K) max. | 0.30 (0.043) | 0.30 (0.043) |
| Surface Burning Characteristics (at maximum total installed thickness): | (See Note 1) | (See Note 2) |
| Flame Spread Index, (max) ≤ 25 | Pass | Pass |
| Smoke Development Index, (max) ≤ 50 | Pass | Pass |
| Water Vapor Sorption wt % gain by vol. (max.) | 0.00 | 0.1 |
| Water Absorption, wt % gain by vol. (max.) | 0.2 | 4.0 |
| Dimensional Stability % change (max.) length, width or thickness | 7.0 | 1.0 |
| Odor Emission | Pass | Pass |
| Corrosiveness | Pass | Pass |
| Fungi/Bacteria Resistance | No Growth | No Growth |
| Erosion Resistance | Pass | Pass |
| Hot Surface Performance at not less than 250°F (125°C) (See 7.3 for requirements) | Pass | Pass |