



Designation: C534/C534M – 23

# Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form<sup>1</sup>

This standard is issued under the fixed designation C534/C534M; 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 preformed flexible elastomeric cellular-thermal insulation in sheet and tubular form. Grade 1 covers materials to be used on commercial or industrial systems with operating temperatures from  $-183$  to  $104^{\circ}\text{C}$  [ $-297$  to  $220^{\circ}\text{F}$ ], Grade 2 covers material used on industrial systems with operating temperatures from  $-183$  to  $150^{\circ}\text{C}$  [ $-297$  to  $300^{\circ}\text{F}$ ], and Grade 3 covers material used on industrial systems with operating temperatures from  $-183$  to  $120^{\circ}\text{C}$  [ $-297$  to  $250^{\circ}\text{F}$ ] where halogens are not permitted.

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 *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.*

1.4 *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:*<sup>2</sup>

**C168** Terminology Relating to Thermal Insulation

**C177** Test Method for Steady-State Heat Flux Measure-

ments and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

**C390** Practice for Sampling and Acceptance of Thermal Insulation Lots

**C335** Test Method for Steady-State Heat Transfer Properties of Pipe Insulation

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

**C447** Practice for Estimating the Maximum Use Temperature of Thermal Insulations

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

**C534** Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

**C585** Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing

**C692** Test Method for Evaluating the Influence of Thermal Insulations on External Stress Corrosion Cracking Tendency of Austenitic Stainless Steel

**C795** Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

**C871** Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions

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

**C1058** Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal 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

**C1427** Specification for Extruded Preformed Flexible Cellular Polyolefin Thermal Insulation in Sheet and Tubular Form

**C1763** Test Method for Water Absorption by Immersion of Thermal Insulation Materials

**D883** Terminology Relating to Plastics

**D1622** Test Method for Apparent Density of Rigid Cellular Plastics

**D1667** Specification for Flexible Cellular Materials—Poly (Vinyl Chloride) Foam (Closed-Cell)

<sup>1</sup> 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.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



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

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

[E177](#) Practice for Use of the Terms Precision and Bias in ASTM Test Methods

[E456](#) Terminology Relating to Quality and Statistics

[E691](#) Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

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

2.2 *Other Standards*.<sup>3</sup>

[CAN/ULC-S102](#) Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

### 3. Terminology

3.1 *Definitions*—Terms used in this specification are defined in Terminology [C168](#) and in Terminology [D883](#).

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *cellular elastomeric foam*—a closed-cell foam made of natural or synthetic rubber, or a mixture of the two, and containing other polymers, other chemicals, or both, which is permitted to be modified by organic or inorganic additives. These foams have properties similar to those of vulcanized rubber, namely, (1) the ability to be converted from a thermoplastic to a thermosetting state by cross-linking (vulcanization) and (2) the ability to recover substantially its original shape when strained or elongated.

3.2.2 *flexible cellular*—a flexible cellular organic polymeric material shall not rupture within 60 s when a specimen 200 by 25 by 25 mm [8 by 1 by 1 in.] is bent around a 25-mm [1-in.] diameter mandrel at a uniform rate of one lap in 5 s in the form of a helix at a temperature between 18 and 29°C [65 and 85°F].

NOTE 1—The flexibility of these materials may decrease at lower temperatures.

### 4. Classification

4.1 When referencing Specification C534/C534M, type and grade shall always be specified.

4.2 The types are designated below:

4.2.1 *Type I*—Tubular.

Grade 1 Use temperature (minimum/maximum values) -183 to 104°C [-297 to 220°F].

Grade 2 Use temperature (minimum/maximum values) -183 to 150°C [-297 to 300°F].

Grade 3 Use temperature (minimum/maximum values) -183 to 120°C [-297 to 250°F].

4.2.2 *Type II*—Sheet.

Grade 1 Use temperature (minimum/maximum values) -183 to 104°C [-297 to 220°F].

Grade 2 Use temperature (minimum/maximum values) -183 to 150°C [-297 to 300°F].

Grade 3 Use temperature (minimum/maximum values) -183 to 120°C [-297 to 250°F].

4.3 Grade 1 is flexible elastomeric material for use on typical commercial systems.

4.4 Grade 2 is a high temperature flexible elastomeric material.

4.5 Grade 3 is an elastomeric material that does not contain any leachable chlorides, fluorides or polyvinyl chloride.

NOTE 2—Continuous long-term exposure at or above the upper use temperature may cause degradation in the form of loss of flexibility

### 5. Materials

5.1 These products shall be made of a homogeneous blend of natural or synthetic rubber that is permitted to be modified with various thermoplastic or thermosetting resins, plasticizers, modifiers, antioxidants, curatives, blowing agents and other additives. These products are thermoset and are not thermoplastic in nature.

5.2 These products are expanded with chemical blowing agents that decompose with the application of heat. The gases produced by these blowing agents are similar to those found in the atmosphere and thus the diffusion rate is not significant. These gases do not change over time and the thermal conductivity of the insulation is stable over time.

5.3 Flexible, elastomeric, cellular thermal insulations shall be of uniform core density and have closed cells. Even though these insulation materials are permitted to have a smooth skin surface on one or both sides, they are to be considered homogeneous for the purposes of determining thermal performance.

### 6. Physical Requirements

6.1 *Qualification Requirements*—Thermal conductivity, water vapor permeability and dimensional stability physical properties listed in [Table 1](#), are defined as qualification requirements (refer to Practice [C390](#), Section 5, Classification of Requirements and Section 6, Acceptance for Qualification Requirements).

6.2 *Inspection Requirements*:

6.2.1 The requirements for water absorption listed in [Table 1](#) is defined as an inspection requirement (refer to Practice [C390](#), Section 5, Classification of Requirements, and Section 7, Acceptance for Inspection Requirements).

6.2.2 All dimensional requirements shall be as described in Section 6 and [Table 2](#).

6.2.3 All workmanship, finish and appearance requirements shall be as described in Section 9.

6.2.4 Compliance with inspection requirements shall be in accordance with Practice [C390](#).

6.3 Both Type I and Type II insulations shall conform to the physical property requirements listed in [Table 1](#).

6.4 The material shall be free of objectionable odors at all temperatures within the recommended use range when tested according to Test Method [C1304](#).

6.5 *Surface Burning Characteristics*—The material shall be tested to assess its surface burning characteristics, at the thickness supplied, in accordance with Test Method [E84](#) with

<sup>3</sup> Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.