Designation: ~~C591 – 12b~~ C591 – 13

Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation[1]

This standard is issued under the fixed designation C591; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers the types, physical properties, and dimensions of unfaced, preformed rigid cellular polyisocyanurate plastic material intended for use as thermal insulation on surfaces from -297°F (-183°C) to 300°F (149°C). For specific applications, the actual temperature limits shall be agreed upon by the manufacturer and purchaser.

1.2 This specification only covers "polyurethane modified polyisocyanurate" thermal insulation which is commonly referred to as "polyisocyanurate" thermal insulation. This standard does not encompass all polyurethane modified materials. Polyurethane modified polyisocyanurate and other polyurethane materials are similar, but the materials will perform differently under some service conditions.

1.3 This standard is designed as a material specification, not a design document. Physical property requirements vary by application and temperature. At temperatures below -70°F (-51°C) the physical properties of the polyisocyanurate insulation at the service temperature are of particular importance. Below -70°F (-51°C) the manufacturer and the purchaser must agree on what additional cold temperature performance properties are required to determine if the material can function adequately for the particular application.

1.4 This standard addresses requirements of unfaced preformed rigid cellular polyisocyanurate thermal insulation manufactured using blowing agents with an ozone depletion potential of 0 (ODP 0).

1.5 When adopted by an authority having jurisdiction, codes that address fire properties in many applications regulate the use of the thermal insulation materials covered by this specification. Fire properties are controlled by job, project, or other specifications where codes or government regulations do not apply.

1.6 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.

1.7 *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]

C165 Test Method for Measuring Compressive Properties of Thermal Insulations
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
C272 Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions
C303 Test Method for Dimensions and Density of Preformed Block and Board–Type Thermal Insulation
C335 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

[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.

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[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.

C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
C550 Test Method for Measuring Trueness and Squareness of Rigid Block and Board Thermal Insulation
C585 Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing
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
C1303 Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation
C1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
D883 Terminology Relating to Plastics
D1621 Test Method for Compressive Properties of Rigid Cellular Plastics
D1622 Test Method for Apparent Density of Rigid Cellular Plastics
D2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
D2856 Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer (Withdrawn 2006)[3]
D6226 Test Method for Open Cell Content of Rigid Cellular Plastics
E84 Test Method for Surface Burning Characteristics of Building Materials
E96/E96M Test Methods for Water Vapor Transmission of Materials

3. Terminology

3.1 For descriptions of terms used in this specification, refer to Terminologies C168 and D883.

3.2 The term polyisocyanurate does not encompass all polyurethane containing materials (see 1.2).

3.3 The term "core specimen" refers to representative samples cut in accordance with the sampling procedure listed within each property test method.

3.4 *Definitions of Terms Specific to This Standard:*

3.4.1 *ozone depletion potential (ODP)*—a relative index indicating the extent to which a chemical product causes ozone depletion.

[3] The last approved version of this historical standard is referenced on www.astm.org.

3.4.1.1 *Discussion*—

The reference level of 1 is the potential of trichlorofluoromethane (R-11 or CFC-11) to cause ozone depletion. ODP 0 is an ozone depletion potential of zero.

4. Classification

4.1 Unfaced, preformed rigid cellular polyisocyanurate thermal insulation covered by this specification is classified into six types as follows:

4.1.1 *Type I*—Compressive resistance of 20 lb/in^2 (137 kPa), minimum.
4.1.2 *Type IV*—Compressive resistance of 22 lb/in^2 (150 kPa), minimum.
4.1.3 *Type II*—Compressive resistance of 35 lb/in^2 (240 kPa), minimum.
4.1.4 *Type III*—Compressive resistance of 45 lb/in^2 (310 kPa), minimum.
4.1.5 *Type V*—Compressive resistance of 80 lb/in^2 (550 kPa), minimum.
4.1.6 *Type VI*—Compressive resistance of 125 lb/in^2 (862 kPa), minimum.

4.2 Unfaced, preformed rigid cellular polyisocyanurate thermal insulation covered by this specification is classified into one grade as follows:

4.2.1 Grade 2–Service temperature range of -297°F (-183°C) to 300°F (149°C).

5. Ordering Information

5.1 Orders for materials purchased under this specification shall include the following:
5.1.1 Designation of this specification and year of issue,
5.1.2 Product name or grade/type, or both,
5.1.3 Apparent thermal conductivity and specific thickness required,
5.1.4 Product dimensions,
5.1.5 Quantity of material,