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Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board¹

This standard is issued under the fixed designation C 1289; 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 general requirements for faced thermal insulation boards composed of rigid cellular polyisocyanurate surfaced with other materials. The insulation boards are intended for use at temperatures between -40 and 200°F (-40 and 93°C). This specification does not cover cryogenic applications. Consult the manufacturer for specific recommendations and properties in cryogenic conditions. For specific applications, the actual temperature limits shall be agreed upon by the manufacturer and the purchaser.

1.2 This standard is intended to apply to rigid cellular polyurethane-modified polyisocyanurate thermal insulation board products that are commercially acceptable as non-structural panels useful in building construction. The term polyisocyanurate encompasses the term polyurethane. For engineering and design purposes, users should follow specific product information provided by board manufacturers regarding physical properties, system design considerations and installation recommendations.

1.3 The use of thermal insulation materials covered by this specification is typically regulated by building codes, or other agencies that address fire performance. Where required, the fire performance of the material shall be addressed through standard fire test methods established by the appropriate governing documents.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard. For conversion to metric units other than those contained in this standard, refer to IEEE/ASTM SI 10.

1.5 The following safety hazards caveat pertains only to the test methods, Section 11, in this specification. *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 The following documents, of the issue in effect on the date of material purchase, form a part of this specification to the extent specified herein:

2.2 ASTM Standards:²

C 168 Terminology Relating to Thermal Insulation

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C 203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation

C 208 Specification for Cellulosic Fiber Insulating Board

C 209 Test Methods for Cellulosic Fiber Insulating Board

C 303 Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation

C 390 Practice for Sampling and Acceptance of Thermal Insulation Lots

C 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C 550 Test Method for Measuring Trueness and Squareness of Rigid Block and Board Thermal Insulation

C 728 Specification for Perlite Thermal Insulation Board

C 1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions

C 1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation

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.

- C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
C 1177/C 1177M Specification for Glass Mat Gypsum Substrate for Use as Sheathing
C 1303 Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation
C 1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
D 1621 Test Method for Compressive Properties Of Rigid Cellular Plastics
D 2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
E 84 Test Method for Surface Burning Characteristics of Building Materials
E 96/E 96M Test Methods for Water Vapor Transmission of Materials
IEEE/ASTM SH10—Standard SI 10 Standard for Use of the International System of Units (SI): (The Modernized Metric System)
2.3 *ANSI Standard:*
Voluntary Product Standard PS 2–04 Performance Standard for Wood Based Structural Use Panels Performance Standard for Wood Based structural Use Panels³
2.4 *CAN/ULC Standard:*
CAN/ULC-S770-03 Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams⁴

3. Terminology

- 3.1 For complete descriptions of terms used in this specification, refer to Terminology C 168.
3.2 The term polyisocyanurate encompasses the term polyurethane (see 1.2).

4. Classification

4.1 The faced thermal insulation boards composed of rigid cellular polyisocyanurate covered by this specification are classified as follows:

- 4.1.1 *Type I*—Faced with aluminum foil on both major surfaces of the core foam.
4.1.1.1 *Class 1*—Non-reinforced core foam.
4.1.1.2 *Class 2*—Glass fiber reinforced core foam.
4.1.2 *Type II:*
4.1.2.1 *Class 1*—Faced with glass fiber reinforced cellulosic felt or uncoated or coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam.
4.1.2.1.1 *Grade 1*—16 psi (110 kPa), min, compressive strength.
4.1.2.1.2 *Grade 2*—20 psi (138 kPa), min, compressive strength.
4.1.2.1.3 *Grade 3*—25 psi (172 kPa), min, compressive strength.
4.1.2.2 *Class 2*—Faced with coated polymer-bonded glass fiber mat facers on both major surfaces of the core foam.
4.1.2.3 *Class 3*—Faced with uncoated polymer-bonded glass fiber mat facers on both major surfaces of the core foam.
4.1.3 *Type III*—Faced with a perlite insulation board on one major surface of the core foam and a glass fiber reinforced cellulosic felt or uncoated or coated polymer-bonded glass fiber mat facer on the other major surface of the core foam.
4.1.4 *Type IV*—Faced with a cellulosic fiber insulating board on one major surface of the core foam and a glass fiber reinforced cellulosic felt or uncoated or coated polymer-bonded glass fiber mat facer on the other major surface of the core foam.
4.1.5 *Type V*—Faced with oriented strand board or waferboard on one major surface of the foam and a glass fiber reinforced cellulosic felt or uncoated or coated polymer-bonded glass fiber mat facer on the other major surface of the core foam.

NOTE 1—These general statements refer to generic composition descriptions of facer materials, bonded fibrous felts, and mats that are currently commercially accepted in the marketplace for these products, using terms common to these competing products. Felts are made with organic fibers, inorganic fibers, or mixtures of organic and inorganic fibers. Glass fiber mats are used uncoated, or coated.

4.1.6 *Type VII*—Faced with glass mat faced gypsum board on one major surface and glass fiber reinforced cellulosic felt or uncoated or coated polymer-bonded glass fiber mat facer on the other major surface of the core foam.

5. Ordering Information

- 5.1 Orders shall include the following information:
5.1.1 Title, designation, and year of issue of C 1289,
5.1.2 Quantity of material being ordered,
5.1.3 Product name and manufacturer's name, address, and telephone number,
5.1.4 Type or Class, or both, if Type I; type, class, and grade or type and class, if Type II, (see Section 4),

³ United States Department of Commerce, National Institute of Standards and Technology, Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402

⁴ Available from Underwriter's Laboratories of Canada (ULC), 7 Crouse Road, Toronto, Ontario, M1R 3A9.

⁴ Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

- 5.1.5 R-value and specific thickness, as required (see 7.2),
- 5.1.6 Tolerance if other than specified (see 8.1),
- 5.1.7 Size(s) required (see 8.6),
- 5.1.8 Type of edge (see 8.3 and 8.4),
- 5.1.9 Sampling, if different (see 10.1),
- 5.1.10 If a certificate of compliance is required (see 10.2, 10.3, 10.4, Table 1 and Table 2),
- 5.1.11 If packaging is other than specified (see 13.1), and
- 5.1.12 If marking is other than specified (see 13.2).

6. Materials and Manufacture

6.1 *Cellular Material*—Rigid polyisocyanurate thermal insulation boards shall be based upon the reaction of an isocyanate with a polyol, or the reaction of an isocyanate with itself, or both, using a catalyst and blowing agents to form a rigid closed-cell-structured polyisocyanurate foam. The insulation foam core shall be homogeneous and of uniform density.

6.2 *Facing Materials*— The facing material incorporated into the design of the faced thermal insulation board shall be as follows:

6.2.1 *Aluminum Foil*— Aluminum foil is plain or coated aluminum foil, or foil laminated to a supporting membrane.

6.2.2 *Glass Fiber Reinforced Cellulosic Felt*—This felt shall consist of a cellulosic fiber felt containing glass fibers.

6.2.3 *Coated Polymer-Bonded Glass Fiber Mat*—The polymer-bonded glass fiber mat shall consist of fibrous glass mats bonded with organic polymer binders and coated with organic polymer, clay, or other inorganic substances.

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TABLE 1 Physical Properties^A

Product Type	Type I Class 1	Type I Class 2	Type II Class 1	Type II Class 2	Type II Class 3	Type III	Type IV	Type V	Type VII
Facer covering one surface	aluminum foil	aluminum foil	Glass fiber reinforced cellulosic felt or uncoated or coated polymer bonded glass fiber mat	Coated polymer-bonded glass fiber mat	Uncoated polymer-bonded glass fiber mat	Perlite insulation board	Cellulosic fiber insulating board	Oriented strand board or wafer-board	Glass mat faced gypsum board
Facer covering opposite surface	aluminum foil	aluminum foil	Glass fiber reinforced cellulosic felt or uncoated or coated polymer bonded glass fiber mat	Coated polymer-bonded glass fiber mat	Uncoated polymer-bonded glass fiber Mat	Glass fiber reinforced cellulosic felt or uncoated or coated polymer bonded glass fiber mat	Glass fiber reinforced cellulosic felt or uncoated or coated polymer bonded glass fiber mat	Glass fiber reinforced cellulosic felt or uncoated or coated polymer bonded glass fiber mat	Glass fiber reinforced cellulosic felt or uncoated or coated polymer bonded glass fiber mat
Physical Property									
Compressive strength, psi (kPa), min	16 (110)	16 (110)	Grade 1 16 (110) Grade 2 20 (138) Grade 3 25 (172)	Grade 1 16 (110) Grade 2 20 (138) Grade 3 25 (172)	Grade 1 16 (110) Grade 2 20 (138) Grade 3 25 (172)	16 (110)	16 (110)	16 (110)	16 (110)
Dimensional stability									
Percent linear change, thickness, max									
-40°F (-40°C)	2.0	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
amb, RH									
158°F (70°C)/	2.0	1.5	4.0	4.0	4.0	2.0	4.0	4.0	4.0
97 % RH									
200°F (93°C)/	4.0	1.5	4.0	4.0	4.0	2.0	4.0	4.0	4.0
amb RH									
Percent linear change, length and width, max									
-40°F (-40°C)	2.0	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
amb, RH									
158°F (70°C)/	2.0	1.5	2.0	2.0	2.0	2.0	4.0	4.0	4.0
97 % RH									
200°F (93°C)	4.0	1.5	2.0	2.0	2.0	2.0	4.0	4.0	4.0
amb, RH									
Flexural strength (modulus of rupture)									
psi (kPa), min	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)
(Break load) lbf (N), min	8 (35)	8 (35)	17 (75)	17 (75)	17 (75)	17 (75)	17 (75)	17 (75)	17 (75)