



Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board¹

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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 may be regulated by building codes, or other agencies that address fire performance, or both. The fire performance of the material should 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 for information only and may be approximate. 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.*

¹ This specification is under the jurisdiction of ASTM Committee C-16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.

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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:

C 168 Terminology Relating to Thermal Insulating Materials²

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus²

C 203 Test Methods for Breaking Load and Flexural Properties of Block Type Thermal Insulation²

C 208 Specification for Cellulosic Fiber Insulating Board²

C 209 Test Methods for Cellulosic Fiber Insulating Board²

C 236 Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box²

C 303 Test Method for Density of Preformed Block-Type Thermal Insulation²

C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots²

C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus²

C 550 Practice for Measuring Trueness and Squareness of Rigid Block Thermal Insulation²

C 728 Specification for Perlite Thermal Insulation Board²

C 976 Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box²

C 1045 Practice for Calculating Thermal Transmission Properties from Steady-State Heat Flux Measurements²

C 1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation²

C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus²

D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing³

D 1621 Test Method for Compressive Properties of Rigid Cellular Plastics⁴

D 2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging⁴

² Annual Book of ASTM Standards, Vol 04.06.

³ Annual Book of ASTM Standards, Vol 04.04.

⁴ Annual Book of ASTM Standards, Vol 08.01.

E 84 Test Method for Surface Burning Characteristics of Building Materials⁵

E 96 Test Method for Water Vapor Transmission of Materials²

IEEE/ASTM SI 10—Standard for Use of the International System of Units (SI): (The Modernized Metric System)⁶

2.3 *ANSI Standard:*

Voluntary Product Standard ANSI A 208.1 Wood Particle-board⁷

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*—Faced with organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane 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 an organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane 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 an organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane facer on the other major surface of the core foam.

4.1.5 *Type V*—Faced with oriented strand board or wafer-board on one major surface of the foam and an organic/inorganic/asphalt-saturated/polymer-bonded/fibrous felt or uncoated/asphalt-coated/polymer-bonded/glass fiber mat membrane facer on the other major surface of the core foam.

4.1.6 *Type VI*—Faced with a perlite insulation board on both major surfaces 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 may contain organic fibers, inorganic fibers, or mixtures of organic and inorganic fibers and may be suitably bonded in one of several alternative ways using organic binders or conventional asphalt saturation to produce suitable membrane facers. Glass fiber mats can be used uncoated, or asphalt coated or otherwise polymer bonded to also produce suitable membrane facers.

⁵ Annual Book of ASTM Standards, Vol 04.07.

⁶ Annual Book of ASTM Standards, Vol 14.02.

⁷ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

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, Class, or both if Type 1, (see Section 4),

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, 11.1.3.1, 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 *Polymer-Bonded Organic/Inorganic Fibrous Felt*—This organic/inorganic fibrous felt shall consist of an organic fiber felt containing inorganic fibers, internally bonded with organic polymer binders.

6.2.3 *Asphalt-Saturated Organic Fibrous Felt*—The asphalt-saturated organic fibrous felt shall conform to the material and physical properties requirements specified in Specification D 226.

6.2.4 *Polymer-Bonded Organic Fibrous Felt*—The polymer-bonded organic fibrous felt shall consist of organic fiber felt bonded with organic polymer binders.

6.2.5 *Asphalt-Coated Glass Fiber Mat*—The asphalt-coated glass fiber mat shall consist of fibrous glass mats coated with asphalt or asphalt emulsion.

6.2.6 *Polymer-Bonded Glass Fiber Mat*—The polymer-bonded glass fiber mat shall consist of fibrous glass mats bonded with organic polymer binders.

6.2.7 *Perlite Insulation Board*—The perlite insulation board shall conform to the material and physical property requirements specified in Standard Specification C 728, either type 1 or type 2 may be used. The perlite insulation board may be either the ½-in. board listed in Specification C 728, which has a *higher* core density and *modified* formulation (as agreed upon between buyer and seller) than the thicker products, or may be a ½-in. thickness (available only to manufacturers of laminated rigid foam products) of the ¾ to 3 in. formulation perlite board listed in Specification C 728.

6.2.8 *Cellulosic Fiber Insulation Board*—The cellulosic fiber insulating board shall conform to the material and

TABLE 1 Physical Properties^A

Product Type	Type I Class 1	Type I Class 2	Type II	Type III	Type IV	Type V	Type VI
Facer covering one surface	Aluminum foil	Aluminum foil	Fibrous Felt or Glass Fiber Mat Membrane	Perlite Insulation Board	Cellulosic Fiber Insulating Board	Oriented Strand Board or Waferboard	Perlite Insulation Board
Facer covering opposite surface	Aluminum foil	Aluminum foil	Fibrous Felt or Glass Fiber Mat Membrane	Fibrous Felt or Glass Fiber Mat Membrane	Fibrous Felt or Glass Fiber Mat Membrane	Fibrous Felt or Glass Fiber Mat Membrane or Aluminum Foil	Perlite Insulation Board
Physical Property							
Compressive strength, psi (kPa), min ^B	16 (110)	16 (110)	16 (110)	16 (110)	16 (110)	16 (110)	16 (110)
Dimensional Stability^B							
Percent linear change, max							
−40°F (−40°C) amb, RH	2.0	1.5	2.0	2.0	2.0	2.0	2.0
158°F (70°C)/ 97 % RH	2.0	1.5	4.0	4.0	4.0	4.0	4.0
200°F (93°C)/ amb RH	4.0	1.5	4.0	4.0	4.0	4.0	4.0
Flexural Strength (modulus of rupture)^B							
psi (kPa), min	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	40 (275)	50 (345)
(Break load) lbf (N), min	8 (35)	8 (35)	17 (75)	17 (75)	17 (75)	17 (75)	33 (147)
Tensile Strength, psf (kPa), min^B							
Perpendicular to board surface	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)	500 (24)
Water Absorption 2h percent by volume, max^B							
	1.0	1.0	1.5	1.0	2.0	1.0	1.5
Water Vapor Transmission, Perm (ng/Pa·s·m²), max							
	0.3 (17.2) ^B	0.3 (17.2) ^B	1.0 (57.2) ^B	^C	^C	^C	^C

^A Because core foam thickness and facer type, thickness, and permeability can all influence the magnitude of values measured for these physical properties, a nominal 1 in. foam core product has been described for referee purposes. Consult manufacturers regarding specific foam-facer composite products and other product thicknesses. When appropriate, physical property values as agreed between buyer and seller shall replace those listed in Table 1 as qualification requirements described in 10.3.

^B Nominal 1-in. (25.4-mm) core foam.

^C Not applicable.

physical properties requirements specified in Specification C 208.

6.2.9 *Oriented Strand Board and Waferboard*—The oriented strand board and waferboard shall conform to the material and physical properties requirements specified in ANSI A208.1.

7. Physical Properties

7.1 The thermal insulation board shall conform to the properties stated in Table 1.

7.1.1 The physical properties stated in Table 1 shall not be used as design or engineering values unless this recommendation is made in writing by the product manufacturer. It remains the buyer's responsibility to specify design requirements and obtain supporting physical properties documentation from each

product manufacturer and supplier.

7.2 *Thermal Resistance (R-value)*—When ordering, specify the R-value; thickness shall be specified if there is a specific thickness requirement and R-value is not specified. The values specified shall be for the faced insulation product only, and shall not include any additional thermal resistances from reflective facer surfaces and adjacent air spaces or from other components of the building system. The mean thermal resistance of the material tested shall not be less than the minimum relevant value prescribed in Table 2. The thermal resistances of individual specimens tested shall not be less than 90 % of the minimum value identified in Table 2.

NOTE 2—Thermal characteristics of cellular plastics may be significantly influenced by installation and service-related variables such as age,