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Standard Specification for Cellular Glass Insulation Used in Building and Roof Applications¹

This standard is issued under the fixed designation C1902; 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 general requirements for thermal insulation block composed of rigid cellular glass intended for use in building exterior and interior walls, foundation, floor, ceiling, and roofing applications. The insulation blocks are intended for continuous use at temperatures between 200°F and –50°F (93.3°C and –45.6°C).

1.2 This standard is intended to apply to rigid cellular glass thermal insulation block products that are commercially useful in building exterior and interior walls, foundation, floor, ceiling, and roofing construction. For engineering and design purposes, users need to follow specific product information provided by block 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 or both. 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 for information only. For conversion to metric units other than those contained in this standard, refer to IEEE/ASTM SI 10.

1.5 *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.*

1.6 *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 Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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
- C203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
- C240 Test Methods for Testing Cellular Glass Insulation Block
- C303 Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation
- C390 Practice for Sampling and Acceptance of Thermal Insulation Lots
- C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
- C1617 Practice for Quantitative Accelerated Laboratory Evaluation of Extraction Solutions Containing Ions Leached from Thermal Insulation on Aqueous Corrosion of Metals
- D2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- E84 Test Method for Surface Burning Characteristics of Building Materials
- E96/E96M Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
- E136 Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C

3. Terminology

3.1 For definitions used in this specification, see Terminology C168.

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.20 on Homogeneous 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.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *block, n*—unfaced cellular glass.

3.2.2 *board, n*—fabricated flat, rectangular units composed of cellular glass insulation adhered together and covered with a facing adhered to one or both major faces.

4. Classification

4.1 Cellular glass insulation covered by this specification shall be classified in the five Types shown in **Table 1**. Types vary in compressive strength, density, thermal resistance, and flexural strength. Cellular glass insulation is furnished in the following types:

4.1.1 *Type I*—minimum R-3.6 per inch thermal resistance at 75°F mean temperature, minimum compressive strength 50 psi.

4.1.2 *Type II*—minimum R-3.1 per inch thermal resistance at 75°F mean temperature, minimum compressive strength 55 psi.

4.1.3 *Type III*—minimum R-2.9 per inch thermal resistance at 75°F mean temperature, minimum compressive strength 100 psi.

4.1.4 *Type IV*—minimum R-2.6 per inch thermal resistance at 75°F mean temperature, minimum compressive strength 160 psi.

4.1.5 *Type V*—minimum R-2.3 per inch thermal resistance at 75°F mean temperature, minimum compressive strength 240 psi.

5. Ordering Information

5.1 Purchase orders for cellular glass insulation furnished to this specification shall include the following information:

5.1.1 Type designation (see **4.1**).

5.1.2 Dimensions according to type (see **Section 9**).

6. Materials and Manufacture

6.1 The block material shall consist of a glass composition that has been foamed or cellulated under molten conditions, annealed, and set to form a rigid noncombustible material with hermetically sealed cells. The material shall be trimmed into blocks of standard dimensions that are rectangular or tapered.

7. Physical Properties

7.1 The cellular glass insulation shall conform to the following physical requirements in **Table 1**.

7.1.1 *Density*—Test in accordance with **12.2.1**.

7.1.2 *Apparent Thermal Resistance*—Test in accordance with **12.2.2**.

7.1.3 *Compressive Strength (capped)*—Test in accordance with **12.2.3**.

7.1.4 *Flexural Strength*—Test in accordance with **12.2.4**.

7.1.5 *Water Absorption*—Test in accordance with **12.2.5**.

7.1.6 *Water Vapor Permeability*—Test in accordance with **12.2.6**.

7.1.7 *Dimensional Stability*—Test in accordance with **12.2.7**.

7.1.8 *Corrosiveness to Steel*—Test in accordance with **12.2.8**.

7.1.9 *Surface Burning Characteristics*—Test in accordance with **12.2.9**.

7.1.10 *Combustibility*—Test in accordance with **12.2.10**.

TABLE 1 Physical Requirements – Block^A

Properties	Type I	Type II	Type III	Type IV	Type V
Density, min., pcf (kg/m ³)	5.0 (80)	5.5 (88)	6.9 (110)	8.5 (136)	10.6 (170)
Thermal Resistance of 1-in. (25.4 mm) thickness °F·ft ² ·hr./Btu (K·m ² /W) ^B					
@ 100°F (38°C) mean temperature	3.4 (0.60)	3.0 (0.53)	2.8 (0.48)	2.5 (0.44)	2.2 (0.38)
@ 75°F (24°C) mean temperature	3.6 (0.64)	3.1 (0.55)	2.9 (0.51)	2.6 (0.46)	2.3 (0.40)
@ 50°F (10°C) mean temperature	3.8 (0.67)	3.3 (0.59)	3.0 (0.53)	2.7 (0.48)	2.4 (0.42)
@ 25°F (−4°C) mean temperature	4.0 (0.71)	3.5 (0.61)	3.2 (0.56)	2.8 (0.50)	2.4 (0.43)
Compressive Strength, min., psi (kPa)	50 (345)	55 (379)	100 (689)	160 (1103)	240 (1665)
Flexural Strength, min., psi (kPa)	30 (207)	35 (241)	45 (310)	65 (448)	85 (586)
Water absorption, vol.%, max.	0.5	0.5	0.5	0.5	0.5
Water Vapor permeability, max. per-in. (ngPa ^{−1} ·s ^{−1} ·m ^{−1})	0.005 (0.007)	0.005 (0.007)	0.005 (0.007)	0.005 (0.007)	0.005 (0.007)
Dimensional Stability, Percent Linear Change, max. in any direction					
@ 200°F & Ambient R.H.	1.0	1.0	1.0	1.0	1.0
@ 158°F & 97% R.H.	1.0	1.0	1.0	1.0	1.0
@ −40°F & Ambient R.H.	1.0	1.0	1.0	1.0	1.0
Mass Loss Corrosion Rate (steel only)	≤ DI ^C	≤ DI	≤ DI	≤ DI	≤ DI
Surface Burning Characteristics					
Flame Spread Index, max.	25	25	25	25	25
Smoke Developed Index, max.	50	50	50	50	50
Combustibility in a Vertical Tube Furnace	Pass	Pass	Pass	Pass	Pass

^A Physical property requirements shown are for the materials in the as-manufactured condition. They do not necessarily represent the values of these properties under certain in-service conditions, depending on the type of installation and the ultimate temperature exposure.

^B Properties shown are for 1 in. thick material. Thermal transmission properties of insulation will vary with temperature, temperature gradient, thickness, and shape. Note the apparent thermal conductivity values in the table are based on samples tested under conditions specified in **12.2.2**. These are comparative values for establishing specification compliance. They do not necessarily represent the installed performance for the insulation under use conditions differing substantially from the test conditions.

^C DI = deionized water.