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Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation[1]

This standard is issued under the fixed designation C1126; 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 faced or unfaced, rigid cellular phenolic thermal insulation. Boards shall be faced or unfaced. Tubular forms covered by this standard shall be unfaced. It does not apply to field expanded cellular phenolic materials.

NOTE 1—If a facer or vapor retarder is to be used for the tubular form, then refer to Practice C921.

1.2 Materials covered by this specification are used as roof insulation; sheathing or rigid board for non-load bearing, building material applications; and pipe insulation for use between −40 and 257°F (−40 and 125°C). Type II and Type III materials with an appropriate vapor retarder covering on the warm surface are used to a lower temperature limit of −290°F (−180°C). (See 7.2.)

1.3 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.

1.4 This specification covers closed cell rigid cellular phenolic thermal insulation manufactured using blowing agents with an ozone depletion of 0 (ODP=0).

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 and health practices and determine the applicability of regulatory limitations prior to use.*
For specific precautionary statements, see Section 16.

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
C209 Test Methods for Cellulosic Fiber Insulating Board
C335 Test Method for Steady-State Heat Transfer Properties of Pipe 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
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
C921 Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
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
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
D1621 Test Method for Compressive Properties of Rigid Cellular Plastics
D1622 Test Method for Apparent Density of Rigid Cellular Plastics
D1623 Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

[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.

D2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
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 The definitions and terms in Terminology C168 shall apply to this specification.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *foam core*—rigid cellular thermal installation without any facers or barriers on the surface of the installation.

3.2.2 *closed cell material*—foam where more than 90 % of the cells are totally enclosed by cell walls, and not interconnected with other cells.

3.2.3 *open cell material*—foam whose cells are not totally enclosed by its walls and therefore exhibits a predominance of interconnecting cells.

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

3.2.4.1 *Discussion*—

ODP 0–an ozone depletion potential of zero.

4. Classification

4.1 The thermal insulation shall be of the following types:

4.1.1 *Type I*—For use as roof insulation board. Produced without integral vapor retarder facers.

4.1.2 *Type II*—For use as sheathing or rigid panel for non-load bearing applications. Produced with integral vapor retarder facers.

4.1.3 *Type III*—For use as pipe insulation. Produced without integral vapor retarder facers.

5. Ordering Information

5.1 Orders for materials purchased under this specification shall include the following information:

5.1.1 Designation of this specification.

5.1.2 Product name and type.

5.1.3 Size and dimensions.

5.1.4 Quantity of material.

5.1.5 Special requirements for inspection and/or testing.

5.1.6 Pipe insulation jacketing (optional).

6. Materials and Manufacture

6.1 *Foam Core Chemical Composition*—The foam shall be produced by a chemical reaction of a phenolic resin, surfactant, blowing agent, and other additives as needed.

6.2 *Facings*—Facing on Type II material shall be adhered to the core stock and suitable for the service intended. They shall be supplied as agreed upon between manufacturer and purchaser.

7. Physical Properties

7.1 The material shall conform to the requirements as shown in Table 1.

7.2 Not all physical properties at temperatures below −40°F (−40°C) have been fully tested, and the user shall consult the manufacturer for any properties and performance required at these lower temperatures.

8. Dimensions and Tolerances

8.1 *Dimensions*—The dimensions shall be as agreed upon between the purchaser and the supplier, but commonly shall be as follows:

8.1.1 *Type I*—Width, 24 in., 36 in., or 48 in. (610 mm, 915 mm, or 1220 mm). Length, 48 in. or larger (1220 mm or larger).

8.1.2 *Type II*—Width, 48 in. (1220 mm). Length, 96 in. or larger (2440 mm or larger).

8.1.3 *Type III*—Pipe insulation with dimensions that are in accordance with Practice C585.

8.2 *Tolerances*—Unless otherwise agreed upon between the purchaser and the supplier, the tolerances shall be as follows:

8.2.1 *Types I and II*— When measured at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity, these types shall conform to the following:

TABLE 1 Physical Property Requirements

NOTE 1—As Type II insulation is produced with integral vapor retarder facers, the orientation of the facer is important in preventing moisture penetration into the insulation and the water vapor permeance of the Type II faced insulation is valid as long as the facer does not fail.

Property	Unit	Type I	Type II	Type III[A]
Density, min lbs/ft^3 (kg/m^3)†		N/A[B]	2 (32)	2 (32)
Compressive resistance, min (faced or unfaced) at 10 % deformation or yield whichever occurs first	psi (kPa)	16 (108)	18 (124)	18 (124)
Closed cell content minimum %	%	90	90	90
Tensile strength, min (faced)	psf (Pa)	150 (7180)	N/A[B]	N/A[B]
Apparent Thermal Conductivity, max[C] (foam core):	Btu·in./h·ft^2·°F (W/mK)			
–250°F (–157°C) mean temp.		N/A[B]	0.12 (0.017)	0.15 (0.021)
–200°F (–129°C) mean temp.		N/A[B]	0.13 (0.018)	0.16 (0.022)
–150°F (–101°C) mean temp.		N/A[B]	0.14 (0.019)	0.17 (0.024)
–100°F (–73°C) mean temp.		N/A[B]	0.15 (0.021)	0.18 (0.026)
~~–50°F (–46°C) mean temp.~~		~~N/A[B]~~	~~0.15 (0.021)~~	~~0.19 (0.028)~~
–50°F (–46°C) mean temp.		N/A[B]	0.15 (0.021)	0.18 (0.026)
–0°F (–17°C) mean temp.		N/A[B]	0.15 (0.021)	0.18 (0.026)
~~40°F (4°C) mean temp.~~		~~0.16 (0.022)~~	~~0.15 (0.021)~~	~~0.17 (0.024)~~
40°F (4°C) mean temp.		0.16 (0.022)	0.15 (0.021)	0.18 (0.026)
75°F (24°C) mean temp.		0.17 (0.025)	0.15 (0.021)	0.18 (0.026)
110°F (43°C) mean temp.		0.19 (0.028)	0.17 (0.024)	0.19 (0.028)
150°F (65°C) mean temp.		N/A[B]	N/A[B]	0.20 (0.029)
200°F (93°C) mean temp.		N/A[B]	N/A[B]	0.25 (0.036)
Dimensional stability, 1 week[D] Exposure (foam core):	% lin chg, max			
257 ± 4°F (125 ± 2°C), ambient RH		N/A[B]	N/A[B]	2
-40 ± 6°F (–40 ± 3°C), ambient RH		2	2	2
158 ± 4°F (70 ± 2°C), 97 ± 3 % RH		2	2	2
Water absorption, max, (foam core):	% by volume	3.0	3.0	3.0
Water vapor permeance, perms, (facer only)	grains/h·ft^2·in.·Hg ($ng/s{\cdot}m^2{\cdot}Pa$)	[E]	≤1.0 (57)[F]	
Water vapor permeability, max, perm-in. (foam core)	Perm-inch (ng/s·m·Pa)	5.0 (7.2)	5.0 (7.2)	5.0 (7.2)
Flame spread index, max[G,H] (foam core)		25	25	25
Smoke developed index, max[G,H] (foam core)		50	50	50

[A] Type III test samples shall be obtained from a free-rise block of foam, except where otherwise specified.
[B] N/A = not applicable.
[C] Apparent Thermal Conductivity tests shall be used for classification purposes only. The thermal conductivity values shown in this table were obtained using Test Method C518 or C177.
[D] Dimensional stability data at lower temperature will be added when testing is complete.
† Editorially corrected in July 2011.
[E] No minimum or maximum values are required for Type I material. It is expected roof design will reflect actual building and environmental conditions. Under certain circumstances a vapor retarder is required.
[F] Consult manufacturer for certain application in cold climates where greater permeance values are desirable.
[G] This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but ~~dose~~does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under the actual fire conditions.
[H] In some cases facings used on composite products cause the flame spread index and smoke developed index of the composite to be significantly different than those of the foam core ~~indexes.~~itself.

8.2.1.1 *Length*—Not to exceed ±¼ in. (±6.4 mm).

8.2.1.2 *Width*—Not to exceed ±¼ in. (±6.4 mm).

8.2.1.3 *Thickness*—Not to exceed ±⅛ in. (±3.1 mm).

8.2.2 *Type III*—Thicknesses available for various pipe and tube sizes shall be in accordance with Practice C585. The average measured length shall not differ from the standard dimension of the manufacturer by more than ±¼ in. (6.4 mm).

8.3 *Other Parameters for Types I and II:*

8.3.1 *Squareness*—Board squareness shall be within required tolerance if the two diagonal measurements of the board differ by no more than ¼ in. (6.4 mm).

8.3.2 *Straightness*—Unless otherwise specified, the boards shall be furnished with straight edges which shall not deviate by more than 1⁄32 in./ft (2.6 mm/m).

8.3.3 *Flatness*—The boards shall not depart from absolute flatness by more than 1⁄16 in./ft of width or length (5.2 mm/m).

8.3.4 The straightness and flatness shall be determined in accordance with Practice C550, except that a straight edge longer than the dimension being determined shall be used.