Designation: C208 – 22

Standard Specification for Cellulosic Fiber Insulating Board[1]

This standard is issued under the fixed designation C208; 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 U.S. Department of Defense.

1. Scope

1.1 This specification covers the principal cellulosic fiber insulating board types, grades, and sizes. Requirements are specified for composition, construction, physical properties, tolerances, sampling procedures, and test methods.

1.2 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.

1.3 When the installation or use of thermal insulation materials, accessories, and systems may pose safety or health problems, the manufacturer shall provide the user appropriate current information regarding any known problems associated with the recommended use of the company's products and shall also recommend protective measures to be employed in their safe utilization. The user shall establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.

1.4 *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 Recommendations 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

C209 Test Methods for Cellulosic Fiber Insulating Board

C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

C846 Practice for Application of Cellulosic Fiber Insulating Board for Wall Sheathing

D1037 Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

D1554 Terminology Relating to Wood-Base Fiber and Particle Panel Materials

D2164 Methods of Testing Structural Insulating Roof Deck (Withdrawn 2005)[3]

E72 Test Methods of Conducting Strength Tests of Panels for Building Construction

2.2 *Federal Standard:*

4900.1 Rev-1 U.S. Dept. of Housing and Urban Development Minimum Property Standards, One and Two Family Dwellings[4]

3. Terminology

3.1 For definitions of terms used in this specification, see Terminology C168 and Definitions D1554.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cellulosic fiber insulating board*—a fibrous-felted, homogeneous panel made from ligno-cellulosic fibers (usually wood) and having a density of less than 31 lb/ft^3 (497 kg/m^3) but more than 10 lb/ft^3 (160 kg/m^3).

3.2.1.1 *Discussion*—Cellulosic fiber insulating board is characterized by an integral bond which is produced by interfelting of the fibers, but which has not been consolidated under heat and pressure as a separate stage in manufacture. Other materials may be added during manufacture to improve certain properties.

4. Classification

4.1 Insulating board covered by this specification consists of six types:

4.1.1 *Type I*—Sound deadening board, for use in wall assemblies to control sound transmissions.

[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.

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

[4] Available from the U.S. Department of Housing and Urban Development, Construction Standards Division, HUD Building, Washington, DC 20410.

4.1.2 *Type II*—Roof insulation board, for use as insulation and cover boards in various roofing systems.

4.1.2.1 *Grade 1*—Primarily for use under built-up, and modified bitumen roof systems.

4.1.2.2 *Grade 2*—Primarily for use under single-ply, built-up, and modified bitumen roofing systems.

4.1.3 *Type III*—Ceiling tiles and panels.

4.1.3.1 *Grade 1*—Nonacoustical, for use as decorative wall and ceiling coverings.

4.1.3.2 *Grade 2*—Acoustical, for use as decorative, sound absorbing wall and ceiling coverings.

4.1.4 *Type IV*—Wall Sheathing.

4.1.4.1 *Grade 1*—Regular, for use as wall sheathing in frame construction.

4.1.4.2 *Grade 2*—Structural, for use as wall sheathing in frame construction. When installed in accordance with Practice C846, structural wall sheathing provides adequate racking resistance for use as exterior wall bracing.

4.1.5 *Type V*—Backer board, for use behind exterior finish in wall assemblies where there are no structural requirements.

4.1.6 *Type VI*—Roof deck, for use as roof decking for flat, pitched, or shed-type, open-beamed, ceiling-roof construction.

4.2 On occasion these products are used for other applications. The manufacturer and the purchaser shall agree upon any special requirements for such end uses.

5. Materials and Manufacture

5.1 Cellulosic fiber insulating board shall be manufactured from refined or partially refined ligno-cellulosic (usually wood) fibers, by a felting or molding process, into homogeneous panels. Other ingredients may be added to provide or improve certain properties such as strength and water resistance, in addition to surface finishes for decorative products and special coatings which impart resistance to flame spread. The material is subjected to such drying temperatures as to effect complete destruction of rot producing fungi.

5.2 The finished board may be either single or multiple ply. When multiple-ply boards are supplied, a suitable moisture-resistant adhesive shall be used to join the plies.

6. Physical Properties

6.1 The insulating board shall conform to the physical properties in Table 1.

6.2 Type II roof insulation products may be laminated from multiple plies of thinner board stock. For those thicknesses of roof insulation products not listed in Table 1, and which are laminated from thinner board stock, the thinner board stock shall be tested for conformance to physical property requirements of the respective thinner board stock's grade and thickness listed in Table 1.

7. Dimensions, Mass, and Permissible Variations

7.1 The materials covered by this specification are available in the sizes shown in Table 2.

7.2 *Length and Width Tolerances*—Unless otherwise specified, the tolerance for length and width of any size panel shall by + 0, – 1⁄16 in. per ft (+ 0, – 5.2 mm⁄m), but the total tolerance in any dimension shall not exceed + 0, – 3⁄8 in. (+ 0 mm, – 10 mm).

7.3 *Thickness Tolerance*—The thickness tolerances are shown in Table 3.

TABLE 1 Physical Property Requirements for Cellulosic Fiber Insulating Board

Physical Requirements	Sound Deadening Board ½ in. (13 mm) thick	Roof Insulation Board						
		Grade 1				Grade 2		
		7⁄16 in. (11 mm) thick	½ in. (13 mm) thick	1 in. (25 mm) thick	2 in. (51 mm) thick	½ in. (13 mm) thick	1 in. (25 mm) thick	2 in. (51 mm) thick
Thermal conductivity (k), max, Btu· in./h· ft^2·°F (W/m·K) at mean temperature of 75± 5°F (24 ± 3°C)	0.38 (0.055)	0.38 (0.055)	0.38 (0.055)	0.38 (0.055)	0.38 (0.055)	0.50 (0.072)	0.40 (0.058)	0.40 (0.058)
Transverse strength either direction, min, lbf (N)	12 (53.4)	7 (31.1)	7 (31.1)	14 (62.3)	28 (124.6)	12 (53.4)	24 (107)	36 (160)
Tensile strength parallel to surface, min, lbf/in.^{2} (kPa)[B]	150 (1034)	50 (345)	50 (345)	50 (345)	...	150 (1034)	150 (1034)	...
Tensile strength perpendicular to surface, min, lbf/ft^2 (kPa)	600 (28.7)	500 (23.9)	500 (23.9)	500 (23.9)	500 (23.9)	600 (28.7)	600 (28.7)	600 (28.7)
Water absorption by volume, max,%	7	10	10	10	10	7	7	7
Linear expansion, 50–90 % RH, max,%	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Flame Spread Index, finish surface, max	...	...	...	...	...	...	...	...
Vapor permeance, grains/h·ft^2 ·in. Hg pressure differential, (mg/s·m^2·kPa) min	5 (0.287)	...	...	...	...	...	...	...
Modulus of rupture, min, lbf/in.^{2} (kPa)	240 (1655)	140 (965)	140 (965)	80 (552)	40 (276)	275 (1896)	140 (965)	70 (483)
Deflection at specified min load, max, in. (mm)	0.85 (22)	1.25 (32)	1.25 (32)	0.62 (16)	0.31 (8)	0.75 (19)	0.42 (11)	0.21 (5)
Modulus of Elasticity, min, lbf/in.^{2} × 10^3 (mPa)[F]	...	...	...	...	...	...	...	...
Deflection Span Ratio, max [F]	...	...	...	...	...	...	...	...
Moisture content by weight, max,%	10	10	10	10	10	10	10	10
Racking Load[G], min plf (N/m)	...	...	...	...	...	...	...	...
Compressive Strength[H], min, lbf/in.^{2} (kPa)	...	14.5 (100)	14.5 (100)	14.5 (100)	14.5 (100)	15 (105)	15 (105)	15 (105)

TABLE 1 Physical Property Requirements for Cellulosic Fiber Insulating Board *(continued)*

Physical Requirements	Ceiling Tiles and Panels (Both Grades)[A] ½ in. (13 mm) 9/16 in. (14 mm) 5/8 in. (16 mm)	Wall Sheathing Regular ½ in. (13 mm) thick	Wall Sheathing Structural ½ in. (13 mm) thick	Wall Sheathing Structural 25/32 in. (20 mm) thick	Backer Board 7/16 in. (11 mm) 3/8 in. (10 mm) thick	Roof Deck 1½ in. (38 mm) 2 in. (51 mm) 3 in. (76 mm) thick
Thermal conductivity (k), max, Btu· in./h· ft^2·°F (W/m·K) at mean temperature of 75± 5°F (24 ± 3°C)	0.38 (0.055)	0.40 (0.058)	0.44 (0.063)	0.40 (0.058)	0.40 (0.058)	0.40 (0.058)
Transverse strength either direction, min, lbf (N)	10 (44.5)	14 (62.3)	20 (89.0)	25 (111.2)	6 (27)	...
Tensile strength parallel to surface, min, lbf/in.^{2} (kPa)[B]	150 (1034)	150 (1034)	200 (1379)	150 (1034)	150 (1034)	...
Tensile strength perpendicular to surface, min, lbf/ft^2 (kPa)	600 (28.7)	600 (28.7)	800 (38.3)	600 (28.7)	600 (28.7)	600 (28.7)
Water absorption by volume, max,%	...	7	[C]	7	7	10
Linear expansion, 50–90 % RH, max,%	0.5	0.5	0.6	0.5	0.5	0.5
Flame Spread Index, finish surface, max	200	...	...	...	...	200
Vapor permeance, grains/h·ft^2 ·in. Hg pressure differential, (mg/s·m^2·kPa) min	...	5 (0.287)	5 (0.287)	5 (0.287)	5 (0.287)	[D]
Modulus of rupture, min, lbf/in.^{2} (kPa)	...	275 (1896)	400 (2758)	200 (1379)	200 (1379)	[E]
Deflection at specified min load, max, in. (mm)	...	0.75 (19)	0.75 (19)	0.56 (14)	1.18 (30)	...
Modulus of Elasticity, min, lbf/in.^{2} × 10^3 (mPa)[F]	...	...	...	...	...	40 (276)
Deflection Span Ratio, max[F]	...	...	...	...	...	1/240
Moisture content by weight, max,%	10	10	10	10	10	10
Racking Load[G] , min plf (N/m)	...	...	650 (9500)	650 (9500)	...	...

[A] Physical properties listed in this column, except flame spread index, apply to the base material before punching, drilling, perforating, or embossing.
[B] Tensile strength requirements shall be applicable only on thicknesses up to and including 1 in. (25 mm).
[C] Water absorption for ½ in. (13 mm) structural wall sheathing is determined by the 24-h test in accordance with Test Methods D1037 using 15 % as the maximum. Water absorption for all other products is determined by the 2-h test in accordance with Test Methods C209.
[D] For roof deck products with a vapor retarder, the maximum should be 0.5 (0.029). For roof deck products manufactured without a vapor retarder, there is no requirement for permeance.
[E] For roof decking, Modulus of Rupture (MOR) is determined using Methods D2164. Matched samples are to be tested before and after accelerated aging. Minimum MOR for unaged samples shall be 225 lbf/in.^{2} (155 kPa). For aged samples, the minimum shall be no less than 50 % of the unaged test result.
[F] Using Methods D2164.
[G] The specified racking results are as tested in accordance with Test Methods E72 when the product is applied vertically and fastened 6 in. (152 mm) apart to intermediate framing and 3 in. (76 mm) apart around the edges of the sheets using Number 11 gage galvanized roofing nails with 7/16 in. (11 mm) head diameters 1 ¼ in. (32 mm) long for ½ in. (13 mm) and 1 ½ in. (38 mm) for 25/32 in. (20 mm). The panels shall be tightly butted. Nails shall be 3/8 in. (10 mm) from the edges along the center stud and shall be moved to the centerline of other framing. Alternative installation methods as specified by the manufacturer shall be permitted provided the alternative methods achieve a minimum of 650 plf (9500 N/m).
[H] Tested in accordance with Test Method C165 Procedure B with a crosshead speed of 0.05 in. (1.27 mm) per minute after conditioning. Reported values are at 10 % compression.

8. Workmanship, Finish, and Appearance

8.1 *Defects*—The insulating board shall have no defects that will adversely affect its service qualities. The surface shall be free of cracks, lumps, excessive departure from planeness, or other defects that affect performance or appearance.

8.2 *Surface Finish*—The surface finishes of the board shall be as specified in Table 2.

8.3 *Edge Details*—The edge details of the board shall be as specified in Table 2.

9. Sampling

9.1 Unless otherwise specified in the purchase order or contract, the material shall be sampled in accordance with Practice C390.

10. Test Methods

10.1 Unless otherwise specified in Table 1, determine the properties enumerated in this specification in accordance with Test Methods C209.

11. Inspection and Resubmittal

11.1 The following requirements are generally employed for purposes of acceptance sampling of lots or shipments of qualified material:

11.1.1 Surface finish,

11.1.2 Edge detail,

11.1.3 Dimensional tolerances, and

11.1.4 Workmanship.