Designation: C 209 – 07

Standard Test Methods for Cellulosic Fiber Insulating Board[1]

This standard is issued under the fixed designation C 209; 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 These test methods cover those insulation products in specified Specification C 208 that are not singularly specified elsewhere as insulating formboard (see Specification C 532) and nail-base sheathing (see Specification D 2277). The requirements for the products' physical properties are specified in Specification C 208. The methods for the general insulation products' physical properties are given as follows:

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1.2 Reference is provided to an established source for nomenclature and definitions.

1.3 *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.*

1.4 Several of the test methods contained in this document are referenced by material specifications other than cellulosic fiber insulating board. These include mineral fiber, perlite, polyisocyanurate, polystyrene and phenolic materials.

2. Referenced Documents

2.1 *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 208 Specification for Cellulosic Fiber Insulating Board

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

C 532 Specification for Structural Insulating Formboard (Cellulosic Fiber)[3]

C 870 Practice for Conditioning of Thermal Insulating Materials

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

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

D 1037 Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

D 1554 Terminology Relating to Wood-Base Fiber and Particle Panel Materials

D 2277 Specification for Fiberboard Nai-Base Sheathing[3]

E 84 Test Method for Surface Burning Characteristics of Building Materials

E 96/E 96M Test Methods for Water Vapor Transmission of Materials

3. Terminology

3.1 *Definitions*—The definitions of terms used in these methods shall be in accordance with Definitions D 1554 and Terminology C 168.

3.2 *cellulosic fiber insulating board*—a fibrous-felted, homogeneous panel made from ligno-cellulosic fibers (usually wood or cane) 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 *Discussion*—Cellulosic fiber insulating board. It is characterized by an integral bond that 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.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *board*—refers to the material as received.

3.3.2 *sample*—refers to the 36 by 48-in. (0.9 by 1.2-m) piece cut from a board.

[1] These test methods are under the jurisdiction of ASTM Committee C16 on Thermal Insulation and are the direct responsibility of Subcommittee C16.32 on Mechanical Properties.

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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] Withdrawn.

3.3.3 *test specimen*—refers to the test piece cut from a sample unless otherwise specified in the test method.

3.3.4 *sorption*—a general term in physical chemistry used to describe the combined processes of:

(*1*) *absorption*—refers to the taking up of matter in bulk by other matter, for example, the penetration of substances into the bulk of another solid or liquid.

(*2*) *adsorption*—refers to surface retention or adhesion of an extremely thin layer of molecules to the surfaces of solids or liquids with which they are in contact.

4. Significance and Use

4.1 The test methods contained in this document are intended for cellulosic fiber insulating board as described in Specification C 208. These test methods examine mechanical, physical and thermal properties, properties related to water absorption and water vapor exposure, and flammability related properties.

4.2 The results of these tests may be used to describe the performance of insulating board and are suitable for use in material specifications.

NOTE 1—Committee C-16 is in the process of splitting this document into discrete test methods categorized by the nature of the test methods.

5. Sampling

5.1 *Selection of Boards*—Refer to Specification C 208, Section 9 on Sampling.

5.2 *Size of Sample*— From each board a sample, 36 by 48 in. (0.9 by 1.2 m) shall be cut. When possible, the larger dimension of the sample shall be crosswise of the longer dimension of the board as it is usually obtained. When the individual boards are less than 36 by 48 in. (0.9 by 1.2 m) in size, enough material shall be taken to give the equivalent area.

6. Test Conditions

6.1 *Preconditioning*— Tests shall be made under prevailing atmospheric conditions except in the case of dispute. Tests then shall be made in specimens conditioned until equilibrium is obtained in accordance with Practice C 870.

7. Thickness

7.1 *Apparatus*—An instrument such as a dial gage capable of measuring a 36 by 48 in. (0.9 by 12 m) sample, on which the contacting surfaces are flat and have a minimum diameter of ½ in. (13 mm) shall be used. Pressure on the contacting surfaces shall not be greater than 1 psi (6.9 kPa) nor less than 0.25 psi (1.7 kPa), and the instrument shall read to an accuracy of 0.001 in. (0.03 mm).

7.2 *Procedure*—Measure the thickness at five points, near each corner and near the center, to an accuracy of ±0.001 in. (±0.02 mm). Take care that the sample is not deformed when the thickness measurements are taken.

7.3 *Calculation and Report*—Report the average of the five measurements as the average thickness of the sample. Report as the average thickness of the sample, the average thickness of the lot, report thickness tolerance, as follows:

$$\text{Thickness tolerance} = (h_1 - h_2)/h_1 \quad (1)$$

where:

h_1 = average thickness of lot, and
h_2 = average thickness of sample.

8. Size of Finished Board

8.1 *Procedure*—Obtain the average width of the finished board by measuring the width at each end and at the middle to an accuracy of ±0.3 % or 1⁄16 in. (2 mm), whichever is smaller, and averaging these readings. Obtain the average length of the finished board in a similar manner.

9. Thermal Conductivity

9.1 *Procedure*—Determine thermal conductivity in accordance with Test Method C 177, or in accordance with Test Methods C 518, C 1045 or C 1114. Test two specimens from one sample from one board.

10. Transverse Strength

10.1 *Apparatus*:

10.1.1 *Testing Machine*— Any standard mechanical or hydraulic testing machine capable of applying and measuring the required load within an accuracy of ±2 % may be used.

10.1.2 *Bearing Edges*— The bearing edges shall be rounded to a radius of 3⁄8 in. (10 mm) to prevent injury to the specimen. The bearing edges shall be straight and shall maintain full contact with the specimen throughout the test.

10.2 *Test Specimen*— The specimen shall be 3 by 15 in. (76 by 381 mm) and conditioned in accordance with 6.1. Three specimens from the long dimension of each sample from each board and three at right angles shall be tested. If the sample has a dimension less than 15 in. (381 mm), test only in that direction for which a 15 in. (381 mm) specimen can be obtained.

10.3 *Procedure*—Determine the transverse load by placing the specimen on horizontal bearing edges 12 in. (305 mm) apart and applying the load at midspan on a bearing parallel to the end supports, so that the head of the testing machines, through which the load is applied, moves at a rate of 6 ± 2 in./min (152 ± 51 mm/min) until failure occurs.

10.4 *Calculation and Report*—Report as the transverse load for specimen, the maximum load reached during the test. Report as the average transverse load in pounds-force (or Newtons) in each direction for a sample, the average of three specimens taken from that direction. Report as the total average transverse load in each direction, the average of all samples in that direction. Calculate modulus of rupture values in pounds-force per square inch (or megapascals) as follows:

$$MOR = 6P/t^2 \quad (2)$$

where:

MOR = Modulus of rupture, psi (MPa),
P = Transverse load, lbf (N), and
t = thickness, in. (mm).

10.5 *Precision and Bias*—See Section 19.

11. Deflection at Specific Minimum Load

11.1 *Procedure*—Determine, to the nearest 0.01 in., (0.3 mm) the deflection at the corner of each specimen subjected to