



Standard Specification for Mineral Wool Roof Insulation Board¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers the composition and physical properties of mineral wool insulation board used above structural roof decks in building construction. The mineral wool roof insulation acts as a base for systems such as single-ply, polymer-modified bitumen and built-up roof. This specification also covers mineral wool insulation boards that incorporate a fibrous high density upper layer on the top surface

1.2 It is possible that the use of thermal insulation materials covered by this specification will be regulated by building codes or other agencies that address fire performance, or both. The fire performance of the material needs to be addressed through standard fire test methods established by the appropriate governing documents.

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 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 the regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following standards, 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:*²

C165 Test Method for Measuring Compressive Properties of Thermal Insulations

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.

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

C209 Test Methods for Cellulosic Fiber Insulating Board

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

C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

C1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

D312 Specification for Asphalt Used in Roofing

D482 Test Method for Ash from Petroleum Products

D450 Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing

D2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging

E84 Test Method for Surface Burning Characteristics of Building Materials

E2058 Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA)

2.3 *Other Referenced Documents:*

CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies³

EN 12430 :1998/A1 Thermal Insulating Product for Building Applications – Determination of Behaviour Under Point Load⁴

³ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

⁴ Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.

FM 4470 Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Constructions⁵

ISO 1716 :2002, Reaction-to-Fire Tests for Building Products – Determination of the Heat of Combustion⁶

3. Terminology

3.1 *Definitions*: Terms used in this specification are defined in Terminology C168.

3.1.1 *noncombustible core*—a fibrous roof insulation product conforming to the ash content, visible flaming and heat of combustion requirements 12.11.

4. Classification

4.1 The thermal insulation shall be of the following types, classes and grades;

4.1.1 *Type I*—Roof insulation board comprised of a monolithic fibrous material having a fibrous high density upper surface layer and a lower density fibrous bottom layer.

4.1.1.1 *Class 1*—Minimum upper surface layer actual density of 11.2 lb/ft³ (180 kg/m³) and a minimum lower layer actual density of 7.5 lb/ft³ (120 kg/m³).

4.1.1.2 *Class 2*—Upper surface layer and lower surface layer density less than Class 1.

(1) *Grade A* – Minimum point load of 146 lbf (650 N).

(2) *Grade B* – Point load < 146 lbf (650 N).

4.1.2 *Type II*—Roof insulation board of singular density.

4.1.2.1 *Class 1*—Minimum actual density of 9 lb/ft³ (144 kg/m³).

4.1.2.2 *Class 2*—Actual density less than Class 1.

5. Ordering Information

5.1 Orders for material purchased under this specification shall include:

5.1.1 Designation of this specification,

5.1.2 Product name,

5.1.3 Board dimensions,

5.1.4 Quantity of material, and

5.1.5 Special packaging or marking, (14.1 and 14.2) if required.

6. Materials and Manufacture

6.1 Mineral wool roof insulation board shall consist of mineral wool with an organic resin or other suitable binder.

6.2 For built-up roofing or polymer modified bitumen systems the board shall be faced during manufacture on one surface with a cover adequate for the application of Specification D312 asphalt or Specification D450 coal-tar pitch.

6.3 For single ply membrane systems the board shall be permitted to be faced or unfaced. For mechanically fastened single ply membrane systems the board shall be permitted to be faced or unfaced. For adhered single ply membrane systems

the board shall be permitted to be faced during manufacture on one surface with a cover adequate for the application of the adhesive used to secure the single ply membrane.

7. Physical Properties

7.1 The average thermal resistance, *R*, of specimens sampled in accordance with Practice C390 shall be as specified by the manufacturer.

7.2 Nominal thickness required to obtain the specified resistance or conductance shall be as stated by the manufacturer.

7.3 Roof insulation boards shall have the limiting property values shown in Table 1.

8. Dimensions and Tolerances

8.1 The dimensions shall be as agreed upon between the purchaser and manufacturer. Tolerances shall be as follows:

TABLE 1 Physical Properties

Property	Requirement
Type I:	
Class 1—Minimum Upper Density, lb/ft ³ (kg/m ³)	11.2 (180)
Minimum Lower Density, lb/ft ³ (kg/m ³)	7.5 (120)
Class 2—Upper Density, lb/ft ³ (kg/m ³)	<11.2 (180)
Lower Density, lb/ft ³ (kg/m ³)	<7.5 (120)
Type II:	
Class 1 Minimum Density, lb/ft ³ (kg/m ³)	9.0 (144)
Class 2 Density, lb/ft ³ (kg/m ³)	<9.0 (144)
Compressive resistance:	
at 25 % deformation, min, psi (kPa)	12 (83)
at 10 % deformation min, psi (kPa)	7 (48)
Tensile strength perpendicular to board surface, min, lb/ft ² (kPa)	450 (22)
Breaking load, min, lbf (N):	
Type 1	60 (266)
Type 2	30 (133)
Water absorption, max, volume %	5 ^A
Dimensional Stability:	
% Linear Change, Thickness, Max	
+200 ± 4°F (93 ± 2°C)	<1
-40 ± 6 °F (-40 ± 3°C)	<1
+158 ± 4 °F (70 ± 2°C)	<1
% Linear Change, Length and Width, Max	
+200 ± 4°F (93 ± 2°C)	<1
-40 ± 6 °F (-40 ± 3°C)	<1
+158 ± 4°F (70 ± 2°C)	<1
Point Load at 5mm compression, min, N: Type I	650
Noncombustible Core	
Ash content (%)	≥90
Visible Flaming	None
Heat of Combustion, max, BTU/lb (kJ/g)	860 (2.0)
Corrosiveness	Shall meet requirements of Specification C665 for Steel
Surface Burning Characteristics	Flame Spread ≤25 Smoke ≤ 50

^A There shall be no delamination during the water absorption test.

⁵ FM Approvals, 1151 Boston-Providence Turnpike, P.O. Box 9102, Norwood, MA 02062.

⁶ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.

	Tolerance, in. (mm)
Long dimension	$\pm \frac{1}{4}$ (6)
Short dimension	$\pm \frac{1}{4}$ (6)
Thickness	$\pm \frac{1}{8}$ (3)

The long and short dimension tolerances in this section are for individual boards. The tolerance for long and short dimension averages for at least 20 boards shall be $\pm \frac{1}{16}$ in. (2 mm).

8.2 Board squareness shall be within required tolerance if the two diagonal measurements of the board differ by no more than $\frac{1}{4}$ in. (6 mm).

8.3 Board flatness shall be within required tolerance if, when board is placed concave side up, the average distance between a flat supporting surface and the bottom board surface at the corners does not exceed $\frac{5}{16}$ in. (8 mm) over a temperature range from 20 to 140°F (–7 to 60°C). Maximum distance at an individual corner shall not exceed $\frac{1}{2}$ in. (13 mm).

8.4 The thermal resistance of any single specimen shall not be more than 10 % below the value specified by the manufacturer.

8.5 Mass per unit area of any board, lb/ft² (kg/m²) shall be within 10 % of the value specified by the manufacturer. Average mass per unit area of at least 20 boards shall be within 5 % of the value specified by the manufacturer.

9. Workmanship, Finish, and Appearance

9.1 Insulation boards shall not have visible defects that will adversely affect service qualities.

10. Sampling

10.1 Sampling for qualification tests, if required, shall be in accordance with Practice C390. Qualification tests will be conducted on the physical requirements in 7.1 and Table 1.

10.2 Sampling for inspection tests, if required, shall be in accordance with Practice C390. Inspection requirements are dimensions (Section 8) plus any other properties as agreed upon between the purchaser and manufacturer.

11. Specimen Preparation

11.1 Specimens for all tests shall include any factory-applied cover. Take care that the cover is not partially detached in the process of cutting specimens.

11.2 Unless otherwise specified, condition samples prior to cutting specimens for at least 12 h at 73 ± 2°F (24 ± 1°C), 50 ± 5 % relative humidity before testing.

11.3 Unless otherwise stated testing of Type I product shall be done with the higher density surface layer facing up.

12. Test Methods

12.1 *Thermal Resistance*—Test Method C177, C518, or Test Method C1363 at a mean temperature of 75 ± 2°F (24 ± 1°C) and 40°F (22°C) minimum temperature gradient across the thickness of the test specimen or at a mean temperature agreed upon between the purchaser and manufacturer. Some typical additional mean temperatures of interest are 25°F (–4°C) and 110°F (43°C).

12.2 *Compressive Resistance*—Test Method C165, Procedure A. Crosshead speed shall be 0.1 ± 0.01 in. (2.5 ± 0.25 mm) for each 1 in. (25.4 mm) of specimen thickness. A total of four (4) specimens shall be tested with one (1) specimen from each of four (4) different boards. The average of the results shall not be less than those defined in Table 1 and any individual specimen shall not be less than 90% of the minimum in Table 1.

12.3 *Tensile Strength Perpendicular to the Board Surface*—Test Methods C209, see Test Conditions and Tensile Strength Perpendicular to Surface, except that the specimens shall be 6 in. by 6 in. (150 mm by 150 mm). A total of four (4) specimens shall be tested with one (1) specimen from each of four (4) different boards. The average of the results shall not be less than those defined in Table 1 and any individual specimen shall not be less than 90% of the minimum in Table 1.

12.4 *Breaking Load*—Test Methods C203, Method I, Procedure D. Specimen width shall be 6 in. (152 mm) and support span shall be 10 in. (254 mm). A total of four (4) specimens shall be tested with one (1) specimen from each of four (4) different boards. The average of the results shall not be less than those defined in Table 1 and any individual specimen shall not be less than 90% of the minimum in Table 1.

12.5 *Water Absorption*—Test Methods C209 (see Water Absorption section). When material is thicker than 1.0 in., split the material to give a specimen thickness of 1.00 ± 0.03 in. For Type 1 product, test at 1 inch or the minimum manufactured thickness as slicing would not provide a representative specimen. The test specimen shall include the faced side of the material if applicable. Immerse the specimen with the faced surface down. A total of four (4) specimens shall be tested with one (1) specimen from each of four (4) different boards.

12.6 *Surface Burning Characteristics of Building Materials*—Test with the bottom surface exposed to the test flame. Test in accordance with Test Method E84. For Canada, test in accordance with Test Method CAN/ULC-S102. When the referenced Canadian document in this specification is referred to in applicable Canadian building codes, the editions, referenced by those building codes, shall govern.

12.7 *Dimensions*—Test Methods C209, see Test Conditions, Thickness, and Size of Finished Board.

12.8 *Point Load*—Test in accordance with EN 12430:1998/A1. A total of four (4) specimens shall be tested with one (1) specimen from each of four (4) different boards. The average of the results shall not be less than those defined in Table 1 and any individual specimen shall not be less than 90% of the minimum in Table 1.

12.9 *Dimensional Stability*—Test Method D2126 except that each specimen shall be 12 by 12 in. (300 by 300 mm) by the full thickness. A total of four (4) specimens shall be tested with one (1) specimen from each of four (4) different boards.

12.9.1 The standard environmental conditions shall be as follows:

Temperature		Relative Humidity, %RH	Exposure Time, Days
°F	°C		
+200 ± 4	(93 ± 2)	Ambient	7
-40 ± 6	(-40 ± 3)	Ambient	7
+158 ± 4	(70 ± 2)	97 ± 3%	7

12.10 **Density**—Test for actual density in accordance with Test Method **C303**.

12.10.1 To test the upper and lower surface layer densities of Type 1 product, the layers are separated using slicing procedures such as a band saw. Report the thickness used for this determination. For testing purposes the upper layer thickness is ½ inch (12.7 mm) for Type I products.

12.11 **Noncombustible Core**—See **Note 1**.

12.11.1 When tested in accordance with Test Method **D482**, the samples shall have a minimum content of 90% ash. When a single test produces a result of less than 90%, two (2) additional tests shall be permitted to be conducted. The results of all three (3) tests shall be averaged. When averaged, the result shall not be less than 90% ash. See **Note 1**.

12.11.2 When tested in accordance with Test Methods **E2058**, visible flaming of the insulation core shall not occur during the entire test. The test shall be terminated at 15 min if the mass loss from the sample has ceased or if visible vapors (if present) have ceased to be generated, or both. If, at 15 min, the sample still exhibits mass loss or visible vapors, or both, the test shall continue until the mass loss or visible vapors cease, or both. See **Note 1**.

12.11.3 When tested in accordance with ISO 1716, the insulation core shall have a maximum heat of combustion of 860 BTU/lb (2.0 kJ/g). When a single test produces greater than 860 BTU/lb (2.0 kJ/g), two (2) additional tests shall be

permitted to be conducted. The results of all three (3) tests shall be averaged. When averaged, the result shall be less than 860 BTU/lb (2.0 kJ/g). See **Note 1**.

NOTE 1—Methodology and requirements conforming to FM 4470, Section 4.9, NCC (Noncombustible Core) Rated Roof Insulation,

12.12 **Corrosiveness**—Test in accordance with Specification **C665** for corrosiveness to steel. The product shall conform to the requirements within Specification **C665** for steel.

13. Rejection

13.1 Failure to conform to the requirements in this specification shall constitute cause for rejection. In case of rejection, the manufacturer shall have the right to reinspect the rejected shipment and resubmit the lot after removal of that portion not conforming to requirements.

14. Packaging and Marking

14.1 **Packaging**—Unless otherwise specified, the insulation shall be supplied in the manufacturer's standard commercial packages.

14.2 **Marking**—Unless otherwise specified, each package shall be marked with the material name, manufacturer's name or trademark, board dimensions, number of pieces, coverage area of the material in the package, and thermal resistance or conductance.

14.2.1 Products that incorporate a fibrous high density upper layer on the top surface as in Type I shall be marked in order to identify the top layer for installation purposes.

15. Keywords

15.1 board; insulation; mineral wool; roof

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