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Standard Specification for Mineral Fiber Block and Board Thermal Insulation¹

This standard is issued under the fixed designation C612; 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 This specification covers the classification, composition, dimension, and physical properties of mineral fiber (rock, slag, or glass) semi-rigid and rigid board intended for the use as thermal insulation on surfaces operating at temperatures between 0°F (-18°C) and 1800°F (982°C). For specific applications, the actual temperature limits shall be agreed upon between the supplier and the purchaser.

1.2 For satisfactory performance, properly installed protective vapor retarder or barriers shall be used on below ambient temperature applications to reduce movement of water through or around the insulation towards the colder surface. Failure to use a vapor retarder or barrier can lead to insulation and system damage. Refer to Practice C1338 to aid material selection. Although vapor retarder properties are not part of this specification, properties required in Specification C1136 are pertinent to applications or performance.

1.3 The orientation of the fibers within the boards is primarily parallel to the principal surface (face). This specification does not cover fabricated pipe and tank wrap insulation where the insulation has been cut and fabricated to provide a fiber orientation that is perpendicular to the surface (face).

1.4 This standard does not purport to provide the performance requirements of hourly-rated fire systems. Consult the manufacturer for the appropriate system.

1.5 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.

1.6 *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.*

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
- C303 Test Method for Dimensions and Density of Preformed Block and Board Type Thermal Insulation
- C356 Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat
- C390 Practice for Sampling and Acceptance of Thermal Insulation Lots
- C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- C447 Practice for Estimating the Maximum Use Temperature of Thermal Insulations
- 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
- C680 Practice for Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated Flat, Cylindrical, and Spherical Systems by Use of Computer Programs
- C795 Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

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.

TABLE 1 Physical Property Requirements^A

Properties	Type IA	Type IB	Type II	Type III	Type IVA	Type IVB	Type V Grade A and B	
Maximum use temperature ^B °F (°C)	450 (232)	450 (232)	850 (454)	1000 (538)	1200 (649)	1200 (649)	1800 (982)	
Apparent thermal conductivity, max, Btu in./h ft ² °F (W/m K)								
Mean temperatures °F (°C)								
25 (-4)	0.22 (0.032)	0.21 (0.030)	0.21 (0.030)	0.21 (0.030)	0.21 (0.030)	0.23 (0.033)	0.44 (0.063)	
75 (24)	0.26 (0.037)	0.26 (0.037)	0.25 (0.036)	0.25 (0.036)	0.25 (0.036)	0.24 (0.035)	0.45 (0.064)	
100 (38)	0.28 (0.040)	0.27 (0.039)	0.27 (0.039)	0.27 (0.039)	0.27 (0.039)	0.25 (0.036)	0.45 (0.064)	
200 (93)	0.36 (0.052)	0.34 (0.049)	0.35 (0.050)	0.35 (0.050)	0.34 (0.049)	0.30 (0.043)	0.47 (0.068)	
300 (149)	0.46 (0.066)	0.42 (0.060)	0.44 (0.063)	0.44 (0.063)	0.44 (0.063)	0.36 (0.052)	0.49 (0.071)	
400 (204)			0.55 (0.079)	0.55 (0.079)	0.55 (0.079)	0.42 (0.061)	0.52 (0.075)	
500 (260)			0.70 (0.101)	0.70 (0.101)	0.70 (0.101)	0.53 (0.076)	0.55 (0.080)	
600 (316)				0.90 (0.130)	0.85 (0.123)	0.63 (0.091)	0.59 (0.085)	
700 (371)					1.00 (0.144)	0.75 (0.108)	0.63 (0.091)	
800 (427)							0.67 (0.097)	
Minimum Compressive resistance at 10 % deformation, min, lb/ft ² (kPa)								
Category 1			no compressive resistance requirement					
Category 2	N. A. ^C	25 (1.2)	25 (1.2)	12 (0.6)	50 (2.4)	50 (2.4)	1000 (48)	
Linear shrinkage, at maximum use temperature, %	2.0	2.0	2.0	2.0	2.0	2.0	4.0	
Water vapor sorption, max, %	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Surface burning characteristics:								
Flame spread index, max	25	25	25	25	25	25	25	
Smoke developed, max	50	50	50	50	50	50	50	

^A Refer to Section 7 for additional physical property requirements.

^B See **Warning** in 6.2.1.

^C N. A. indicates not applicable.

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](#)
C1101/C1101M [Test Methods for Classifying the Flexibility or Rigidity of Mineral Fiber Blanket and Board Insulation](#)
C1104/C1104M [Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation](#)
C1114 [Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus](#)
C1136 [Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation](#)
C1304 [Test Method for Assessing the Odor Emission of Thermal Insulation Materials](#)
C1335 [Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation](#)
C1338 [Test Method for Determining Fungi Resistance of Insulation Materials and Facings](#)
E84 [Test Method for Surface Burning Characteristics of Building Materials](#)

2.2 *Other Referenced Document:*

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

3. Terminology

3.1 *Definitions*—For definitions used in this specification, refer to Terminology C168.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *delivered thickness*—the actual thickness of the product shipped by the manufacturer or the seller and received by the purchaser.

3.2.2 *mean temperature*—the sum of the cold surface temperature and the hot surface temperature divided by two.

3.2.3 *shot*—is defined, for the purposes of this specification, as that material which cannot be brushed or mechanically shaken through No. 100 (150- μ m) sieve.

4. Classification

4.1 Mineral fiber board insulation covered by this specification shall be classified into seven types with two grades for Type V and two categories, shown in Table 1. This classification is based upon the insulation's maximum use temperature, maximum apparent thermal conductivity, minimum compressive resistance, maximum linear shrinkage, maximum water vapor sorption, and maximum surface burning characteristics for the insulations.

4.1.1 *Category 1*—No compressive resistance (load-bearing) properties are required.

4.1.2 *Category 2*—Minimum compressive resistance (load-bearing) properties are required.

4.1.3 *Type V, Grade A*—Requires no heat-up schedule.

³ Available from Underwriters Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario, Canada M1R 3A9.

4.1.4 *Type V, Grade B*—Heat-up schedule is required. **Warning**—Grade B may not be suitable for applications requiring hot installation capability at the maximum temperature indicated. In general, products having a Grade B designation are designed to be used with a heat-up schedule. Failure to use a heat-up schedule with Grade B products may lead to an exothermic reaction. This is dependent on thickness and temperature. Consult the manufacturer or manufacturer’s literature for special heat rate considerations.

5. Ordering Information

5.1 The type, category, grade for Type V, and dimensions shall be specified by the purchaser.

6. Materials and Manufacture

6.1 *Composition*—Mineral fiber block and semi-rigid and rigid board insulation shall be composed of rock, slag, or glass processed from the molten state into fibrous form and bonded with an organic or inorganic binders or both. Asbestos shall not be used as an ingredient or component part of the product.

6.2 *Facings*:

6.2.1 The purchaser shall specify whether the insulation shall be supplied plain or with facings and, if faced, shall specify the type and its requirements. (**Warning**—The user is advised that it is possible that the maximum use temperature of facings and adhesives is lower than the maximum use temperature of the insulation. The user shall ensure that sufficient thickness shall be installed so none of these accessory items (facings and adhesives) are exposed to temperatures above their maximum use temperature.)

6.2.2 The vapor retarder facings shall be in accordance with Specification C1136.

6.2.3 Typical facings are as follows (others are available):

6.2.3.1 Aluminum foil, reinforced fiberglass scrim, and natural (brown) kraft paper laminate (facing) is known as FRK or FSK.

6.2.3.2 White kraft paper, reinforced fiberglass scrim, and aluminum foil laminate (facing) is known as ASJ (All Service Jacket).

6.2.3.3 Aluminum foil, reinforced fiberglass scrim, and plastic film (example: polyethylene) laminate (facing) is known as FSP (Foil-Scrim-Polyethylene).

6.2.3.4 Aluminum foil, and

6.2.3.5 Vinyl film.

7. Physical Properties

7.1 The insulation type shall conform to the following requirements in Table 1: maximum use temperature, apparent thermal conductivity, compressive resistance, linear shrinkage, water vapor sorption, and surface burning characteristics.

7.1.1 *Apparent Thermal Conductivity*—Test in accordance with 12.3.

7.1.2 *Compressive Resistance*—Test in accordance with 12.4.

7.1.3 *Linear Shrinkage*—Test in accordance to 12.5.

7.1.4 *Water Vapor Sorption*—Test in accordance with 12.6.

7.1.5 *Surface Burning Characteristics*—Test in accordance with 12.7.

7.2 *Odor Emission*—A detectable odor of objectionable nature recorded by more than two of five panel members shall constitute rejection of the material when tested in accordance with 12.8.

7.3 *Corrosiveness to Steel*—When tested and evaluated in accordance with 12.9, the corrosion resulting from insulation in contact with steel plates shall be judged to be no greater than for comparative plates in contact with sterile cotton. Test the composite insulation material (with facing and adhesive) when a facing is factory adhered by the manufacturer or the fabricator. (**Warning**—There are adhesives that can cause corrosion to steel when they are in contact with water or water vapor and the steel. Currently, there is not a test method available to satisfy every potential corrosion application.)

7.4 *Stress Corrosion to Austenitic Stainless Steel*—When specified, shall be tested and evaluated in accordance with 12.10.

7.5 *Semi-rigid or Rigid*—When tested and evaluated at its delivered thickness in accordance with 12.11, all mineral fiber (rock, slag, and glass) board and block must qualify to be semi-rigid or rigid.

7.6 *Non-Fibrous (Shot) Content*—The averaged maximum shot content of rock or slag mineral fiber products, Types IA through IVB as shown in Table 1, shall not exceed 25 % by weight as defined in 12.2. Type V products contain other ingredients which invalidates the way shot content is determined. Non-fibrous content is not applicable to glass mineral fiber products.

7.7 *Maximum Use Temperature*—Shall be tested in accordance with 12.1, the board and block insulation shall not warp, flame, or glow during hot surface exposure. No evidence of melting or fiber degradation shall be evident upon posttest inspection.

7.8 *Maximum Exothermic Temperature Rise*—Shall be tested in accordance with 12.1, the internal temperature shall not at any time exceed the hot surface temperature by more than 200°F (111°C). The 200°F criterion applies during heat-up as well as steady state conditions. Exceeding this limit constitutes noncompliance to this specification and rejection.

7.9 *Fungi Resistance*—Shall be tested in accordance with 12.12; growth no greater than that on a comparative item (white birch wood) shall be considered to have passed the test method criteria.

8. Qualification Requirements

8.1 The following requirements shall be employed for the purpose of initial product qualification: