



Designation: C553-02

## Specification for Designation: C 553 – 02<sup>ε1</sup>

# Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications<sup>1</sup>

This standard is issued under the fixed designation C 553; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

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<sup>ε1</sup> NOTE—Sections 2.2 and 11.4 were editorially updated in June 2008.

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## 1. Scope

1.1 This specification covers the classification, composition, physical properties, and dimensions of mineral fiber (rock, slag, or glass) blanket intended for use as thermal insulation on surfaces at temperatures below ambient or above ambient up to 1200°F (649°C). For specific applications, the actual temperature limit shall be agreed upon between the supplier and the purchaser.

1.2 The orientation of the fibers within the blanket 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).

1.3 For satisfactory performance, properly installed protective vapor retarders must be used in low temperature (below ambient) applications to prevent movement of water vapor through or around the insulation towards the colder surface.

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 shall be regarded as the standard. The System International (SI) equivalents of inch-pound units are given in parentheses and are for information only and are approximate.

1.6 *This standard does not purport to address all of the safety concerns 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:<sup>2</sup>

C 167 Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations

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 390 Practice for Sampling and Acceptance of ~~Preformed~~ Thermal Insulation Lots

C 411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulations<sup>2</sup>—Insulation

C 447 Practice for Estimating the Maximum Use Temperature of Thermal Insulations

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

C 665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

C 680 Practice for ~~Determination~~Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated ~~Pipe—Flat, Cylindrical, and Equipment~~Spherical Systems by the—Use of a—Computer ~~Program~~<sup>2</sup>—Programs

C 1045~~Practice for Calculating Thermal Transmission Properties from Steady-State Heat Flux Measurements~~<sup>2</sup>—Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.23 on Blanket and Loose Fill Insulation.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards*, Vol 04.06, volume information, refer to the standard's Document Summary page on the ASTM website.

- C 1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation
- C 1101/C 1101M Test Methods for Classifying the Flexibility or Rigidity of Mineral Fiber Blanket and Board Insulation
- C 1104/C 1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation
- C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
- C 1136 Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulations<sup>2</sup>-Insulation
- C 1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials
- C 1335 Test Method for Measuring the Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulations<sup>2</sup>Insulation
- E84 Test 84 Test Method for Surface Burning Characteristics of Building Materials

2.2 Other Referenced Documents:

CAN/ULC-S102-M88

CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies<sup>3</sup>

### 3. Terminology

3.1 *Definitions*— For definitions used in this specification, refer to Terminology C 168.

3.2 *Definitions of Terms Specific to This Standard:*

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

3.2.2 *shot*—shot is defined, for the purposes of this document, as that material which cannot be brushed or mechanically shaken through No. 100 (150µm) sieve.

### 4. Classification

4.1 Mineral fiber blanket insulation covered by this specification shall be classified into seven types shown in Table 1. The classification is based upon the insulations' maximum use temperature and apparent thermal conductivity.

### 5. Ordering Information

5.1 The type, dimensions, maximum use temperature, and facing shall be specified by the purchaser. A product certification (if required) shall be specified in the purchase order.

### 6. Materials and Manufacture

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

6.2 *Facings:*

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<https://standards.iteh.ai/catalog/standards/sist/ec28d648-cd5e-4ae0-bfdc-c290d9727157/astm-c553-02e1>

<sup>3</sup> Annual Book of ASTM Standards, Vol 04.07.

<sup>3</sup> Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

**TABLE 1 Physical Property Requirements<sup>4</sup>**

Properties	Type I	Type II	Type III	Type IV	Type V	Type VI	Type VII
Maximum Use Temperature °F (°C) See Paragraph 6.2.1 - <b>Warning</b>	Up to 450 (232)	Up to 450 (232)	Up to 450 (232)	Up to 850 (454)	Up to 1000 (538)	Up to 1000 (538)	Up to 1200 (649)
Apparent Thermal Conductivity Max. Btu-in./h-ft <sup>2</sup> -°F (W/m-K) Mean Temperatures							
°F (°C)							
75 (24)	0.36 (0.052)	0.31 (0.045)	0.26 (0.038)	0.25 (0.036)	0.31 (0.045)	0.26 (0.038)	0.25 (0.036)
100 (38)	0.39 (0.056)	0.33 (0.048)	0.28 (0.040)	0.27 (0.039)	0.33 (0.048)	0.28 (0.040)	0.27 (0.039)
200 (93)	0.55 (0.079)	0.44 (0.063)	0.36 (0.052)	0.34 (0.049)	0.44 (0.063)	0.36 (0.052)	0.34 (0.049)
300 (149)	0.76 (0.110)	0.60 (0.087)	0.46 (0.066)	0.43 (0.062)	0.60 (0.087)	0.46 (0.066)	0.43 (0.062)
400 (204)				0.55 (0.079)	0.89 (0.128)	0.60 (0.087)	0.55 (0.079)
500 (260)				0.70 (0.101)	1.10 (0.159)	0.80 (0.115)	0.70 (0.101)
600 (316)					1.50 (0.216)	1.05 (0.151)	0.89 (0.128)
700 (371)							1.13 (0.163)
Water Vapor Sorption <sup>B</sup> % by Weight, 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 Index, max	50	50	50	50	50	50	50

<sup>4</sup> Additional physical property requirements, refer to Section 7.

<sup>B</sup> Water sorption characteristics may change after the product is subject to elevated temperatures within normal service conditions.

6.2.1 The purchaser shall specify whether the insulation shall be supplied plain or with facing, and if faced, shall specify the type and its requirements.

**(Warning—**The user of this specification is advised that the maximum use temperature of facing and adhesives may be lower than the maximum use temperature of the insulation. The user of this specification shall ensure that sufficient insulation thickness is installed so that none of these accessory items (facings and adhesives) are exposed to temperatures above their maximum use temperature. Practice C 680 can be used to determine surface temperatures.)

6.2.2 The vapor retarder facings shall be in accordance with specification C 1136.

6.2.3 Typical facing is as follows (others are available):

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

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

6.2.3.3 Aluminum foil, reinforced fiber glass 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 Property Requirements

7.1 The insulation shall be classified as flexible, when tested in accordance with 11.7.

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

7.3 *Odor Emission*— A detectable odor of objectionable nature recorded by more than two of the five panel members shall constitute rejection of the material when tested in accordance with 11.5.

7.4 *Corrosiveness to Steel*—When tested and evaluated in accordance with 11.6, any corrosion resulting from the unfaced insulation in contact with steel plates shall be judged to be no greater than for comparative plates in contact with sterile cotton.

**(Warning—**There are facing adhesives that can cause corrosion to steel when in contact with water or water vapor and the steel. Currently, there is no test method available to satisfy every potential corrosion application.)

7.5 *Non-Fibrous (Shot) Content* —The averaged maximum shot content of rock or slag mineral fiber products, Types I through VII as shown in Table 1, shall not exceed 30 % by weight as defined in 11.1. Non-fibrous content is not applicable to glass mineral fiber products.

7.6 *Maximum Use Temperature*—Shall be tested in accordance with 11.3, the insulation with facing shall not warp, flame or glow during hot surface exposure. No evidence of melting or fiber degradation shall be evident upon post-test inspection.

7.7 *Maximum Exothermic Temperature Rise*—Shall be tested in accordance with 11.3, the mid-point temperature shall not at any point in time exceed the hot surface temperature by more than 200°F (111°C). The 200°F (111°C) criterion applies during heat-up as well as steady state conditions. Exceeding this limit shall constitute non-compliance to specification and rejection.

## 8. Dimensions and Permissible Variations

8.1 The standard sizes and tolerances of mineral fiber blanket insulation are listed in Table 2. Specific sizes and tolerances shall

**TABLE 2 Sizes and Tolerances<sup>A</sup>**

Mineral Fiber Blanket		
	Sizes	Tolerances
Length		
Rolls	50 ft. (15 m)	-0 in., excess permitted
	75 ft. (23 m)	
	100 ft. (30 m)	
	150 ft. (48 m)	
	200 ft. (61 m)	
Blanket	24 in. (610 mm)	±½ in. (12.7 mm)
	36 in. (914 mm)	
	48 in. (1219 mm)	
	96 in. (2438 mm)	
Width		
Rolls	24 in. (610 mm)	±½ in. (12.7 mm)
	48 in. (1219 mm)	
	96 in. (2438 mm)	
Blanket	12 in. (305 mm)	±½ in. (12.7 mm)
	24 in. (610 mm)	
	36 in. (914 mm)	
	48 in. (1219 mm)	
Thickness		
	1 in. (25.4 mm) to 6 in. (152 mm) in ½ in. (12.7 mm) increments	-½ in. (3.2 mm) excess permitted

<sup>A</sup>Other sizes available upon request.