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Standard Specification for High-Temperature Fiber Blanket Thermal Insulation[1]

This standard is issued under the fixed designation C892; 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.

1. Scope

~~1.1This specification covers high-temperature fiber blanket thermal insulation for use at various temperatures from 1350°F (732°C) up to 3000°F (1649°C), except when used in high-temperature furnaces.~~

1.1 This specification covers high-temperature fiber blanket thermal insulation for use from ambient up to 3000°F (1649°C).

1.2 *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.*

1.3 When the potential exists that the installation or use of thermal insulation materials, accessories, and systems ~~may~~will pose safety or health problems, the manufacturers shall provide the user with 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 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units which are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C71 Terminology Relating to Refractories

C167 Test Methods for Thickness and Density of Blanket or Batt 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 ~~C201Test Method for Thermal Conductivity of Refractories~~

C209 Test Methods for Cellulosic Fiber Insulating Board

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

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

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

C1335 Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation

3. Terminology

3.1 *Definitions*—Terminology C71 and Terminology C168 shall be considered as applying to the terms used in this standard.

3.2 *Definitions of Terms Specific to This Standard:*

[1] 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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[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.

3.2.1 *fibers*—the fibers shall be refractory oxides, processed from a molten state into fibrous form.

3.2.2 *high-temperature fiber thermal insulation*— a thermal insulation, varying in flexibility, composed of refractory inorganic fibers, with or without binder added, and furnished in either flat sheets or rolls.

4. Classification

4.1 The general-type product governed by this specification is blanket or batt composed of inorganic refractory fibers.

4.2 *Types*—The product is separated into types based upon temperatures of use:

Type	Temperature of use, °F (°C), maximum
I	1350 (732)
II	1600 (871)
III	2400 (1316)
IV	2600 (1427)
V	3000 (1649)

4.3—*The product is separated into types based upon temperatures of use (Table 1).*

4.3 *Grades*—The product is separated into grades based upon its density:

Grade	Density, lb/ft^3(kg/m^3), nominal
3	3 (48)
4	4 (64)
6	6 (96)
8	8 (128)
12	12 (192)

—The product is separated into grades based upon its maximum Apparent Thermal Conductivity values (see Table 2) and minimum Tensile Strength values (see Table 3).

5. Ordering Information

5.1 High-temperature fiber blanket thermal insulation is normally purchased on the basis of brand name, type, grade, length, width, thickness, and total square footage as specified in the purchase order.

5.2 The type and grade for the intended service shall be as specified by the user with the assistance of the supplier where desirable.

5.3Inspection and sampling of the material may be specified by the purchaser.

5.3 The purchaser shall be permitted to specify, inspect and sample the material.

5.4 When a certification or test report, or both, is required, this shall be specified by the purchaser.

6. Physical and Mechanical Properties

6.1 *Materials and Manufacture*

6.1 *Composition*—High temperature fiber thermal insulation shall be composed of fibers, made of metallic oxides of, but not limited to, silicon, aluminum, calcium, and magnesium. The raw materials, processed from the molten state into spun fibers, are then mechanically interlocked through a needling process into insulation blanket felts with out the use of chemical binders.

7. Physical and Mechanical, and Chemical Properties Requirements

7.1 *Apparent Thermal Conductivity* shall conform to the requirements of Table 12 when tested in accordance with 10.1.211.1.2.

6.2*Density*shall conform to the requirements of 4.3 with a tolerance of+30,−15% of nominal density when tested in accordance with 10.1.1

7.2 *Tensile Strength*—shall conform to the requirements of Table 3 when tested in accordance with 11.1.5.

6.3*Temperature of Use*shall conform to the requirements of

7.3 *Flexibility*—shall be classified as flexible when tested in accordance with 11.1.8.

7.4 *Maximum Use Temperature*—shall conform to the requirements of 4.2 and Table2 when tested in accordance with 10.1.4when tested in accordance with 11.1.4.

TABLE 1 Apparent ThermalConductlassivfity, mcaximum Btuion./ h·ft^2·F (W/m·K) by Type

For Test Method C177

Grade	Mean Temperature, °F (°C)				
	400 (204)	800 (427) 1200 (649)		1600 (871)	2000 (1093)
3	0.66 (0.095)1.13 (0.163)	1.79 (0.258)2.76 (0.398)		4.20 (0.605)	
Type	Temperature of use, °F (°C)1.13 (0.163)1.79 (0.258)2.76 (0.398)4.20 (0.605), maximum				
4	0.62 (0.089)	1.03 (0.148)1.66 (0.239)		2.58 (0.372)	3.83 (0.552)
I	0.62 (0.089)	13 (0.148) 1.66 (0.239)		2.50 (72)	32)
6	0.54 (0.078)	0.94 (0.136)1.47 (0.212)		2.28 (0.329)	3.33 (0.480)
II	0.54 (0.078)	0.94 (0.16) 1.47 (0.212)		2.28 (0.329)	3.33 (80)
8	0.53 (0.076)	0.92 (0.133)1.41 (0.203)		2.02 (0.291)	2.72 (0.392)
12	0.53 (0.076)	0.91 (0.131)1.38 (0.199)		1.80 (0.259)	2.17 (0.313)

For Test Method C201, Modified[A]

Grade	Mean Temperature, °F (°C)				
	400 (204)	800 (427)	1200 (649)	1600 (871)	2000 (1093
3	0.54 (0.078)	1. 21 (0.175)	2.34 (0.338)	3.87 (0.558)	5.98 (0.862
III	0.54 (0.078)	1. 21 (0.175)	2.30.338)	3.87 (0.558)	5.98 (0.862
4	0.48 (0.0 69)	1.02 (0.147)	1.91 (0.275)	3.09 (0.446)	4.69 (0.676
IV	269)	1.00 (147)	1.91 (0.275)	3.09 (0.446)	4.69 (0.676
6	0.43 (0.062)	0.83 (0.120)	1.46 (0.211)	2.30 (0.332)	3.42 (0.493
V	0.43 (0.062)	0.83 (0.120)	1.46 (0.211)	2.30 (0.332)	3.42 (0.493
8	0.40 (0.058)	0.73 (0.105)	1.24 (0.179)	1.89 (0.273)	2.74 (0.395
8	0.40 (0.058)	0.73005)	1.24 (0.179)	1.89 (0.273)	2.74 (0.395
12	0.38 (0.055)	0.64 (0.092)	1.02 (0.147)	1.49 (0.215)	2.08 (0.300

[A]Refer to Annex A1 of this specification.

TABLE 4 3 WTensidle Sth Dimrensgth, Mionsimum

WiGradth, in. (mm)e	Teensile Straneength, % lb/in.^{2}(KPa)
12 (305)	−2, +10
3	1.0 (6.9)
18 (457)	−2, +10
4	1.5 (10.3)
24 (610)	−2, +10
6	2.0 (13.8)
36 (914)	−2, +10
8	3.0 (20.7)
39 (991)	−2, +10
10	4.0 (27.6)
42 (1067)	−2, +10 48 (1219) −2, +10
12	5.0 (34.5) −2, +10
72 (1829)	−2, +10

6.4Other physical and mechanical properties shall conform to the requirements of Table 2 when tested in accordance with Section 10

7.5 *Non-fibrous content (shot)*—shall be limited to a maximum of 30% by weight when testing in accordance with 11.1.3.

7.Dimensions, Weights, and Permissible Variations

7.1Rolls or flat sheets of blanket are normally furnished in standard dimensions as shown in Table 3,

7.6 *Linear Shrinkage*—shall be limited to a maximum of 5%, after exposure to the Maximum Use Temperature, in accordance with 11.1.4.

8. Dimensions, Mass, and Permissible Variations

8.1 Rolls or flat sheets of blanket are normally furnished in standard dimensions as shown in Table 4, and Table 5,Table 5, and Table 6.

7.2Sheets are normally furnished 4 by 8 ft (1219 by 2438 mm) at densities above 8 lb/ft^3 (128 kg/m^3).

7.3The standard length, width, and thickness combinations available are a function of the type and grade. Contact the supplier for information on standard or non-standard dimension and combinations.

8.Workmanship, Finish, and Appearance

8.1The insulation shall indicate good workmanship in fabrication by a uniform appearance, shall not have visible defects such as tears and holes that will adversely affect the service quality, and shall be free from foreign materials.

8.2 The standard length, width, and thickness combinations available are a function of the type and grade. Contact the supplier for information on standard or non-standard dimension and combinations.

8.3 The maximum density (determined in accordance with Test Method C167) specified in Table 4 for Grades 3, 4, 6, 8, 10, and 12 are for weight design purposes only.

TABLE 2 5 PThysical akned Mechanss Dical Requirementsions

PropertThickness, in. (mm)	RToleequiremeantsce
Non-fibrous content1⁄16 (shot), maximum, % (by weight)	30
1⁄16 (1.6)	+ 1⁄32 , −1⁄64 in. (+0.8, -0.4mm)
Linear shrinkage, maximum, %1⁄8 (at maximum use temperature)	
1⁄8 (3.2)	+ 1⁄16 , −1⁄32 in. (+1.6, -0.8mm)
53⁄16 (4.8)	+ 3⁄32 , −3⁄64 in. (+2.4, -1.2mm)
3⁄16 (4.8)	+ 3⁄32 , −3⁄64 in. (+2.4, -1.2mm)
Tensile strength, minimum, lb/in^{2}1⁄4 (KPa)	
1⁄4 (6.4)	+1⁄4 , −1⁄8 in. (+6.4, −3.2 mm)
Grade 33⁄8	1 .0 (6. 9)
3⁄8 (9.5)	+3⁄8 , −1⁄8 in. (+9.5, −3.2 mm)
Grade 41⁄2	1 .5 (10.3)
1⁄2 (12.7)	+1⁄2 , −1⁄8 in. (+12.7, −3.2 mm)
Grade 63⁄4	2 .0 (13.8)
3⁄4 (19.1)	+3⁄4 , −1⁄8 in. (+19.1, −3.2 mm)
Grade 8	3 .0 (20 .7)
1 (25.4)	+3⁄4 , −1⁄8 in. (+19.1, −3.2 mm)
Grade121⁄2	5 .0 (34.2 mm)
11⁄2 (38.1)	+3⁄4 , −1⁄8 in. (+19.1, −3.2 mm)
2 (51.0)	+3⁄4 , −1⁄4 in. (+19.6, −6.4 mm)