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## Standard Specification for Fibrous Glass Thermal Insulation and Sound Absorbing Blanket and Board for Military Applications<sup>1</sup>

This standard is issued under the fixed designation C 1139; 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.

### 1. Scope

1.1 This specification covers unfaced flexible fibrous glass blanket and faced board used for thermal and sound absorbing insulation at temperatures up to 450°F (232°C) for military applications as a replacement for MIL-I-22023D.

~~1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.~~

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1.2 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.

1.3 This specification measures and describes the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

1.4 The following hazard caveat pertains only to the test method section of this specification. *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:<sup>2</sup>

C 167 Test Methods for Thickness and Density of Blankets 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 Criteria Practice for Sampling and Acceptance of Preformed Thermal Insulation Lots

C 411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

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

C 612 Specification for Mineral Fiber Block and Board Thermal Insulation

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

C 1101/C 1101M Test Methods for Classifying the Flexibility or Rigidity of Mineral Fiber Blanket and Board Insulation

E 84 ~~Test Method for Surface Burning Characteristics of Building Materials~~ Test Method for Surface Burning Characteristics of Building Materials

E 176 Terminology of Fire Standards

E 2231 Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics

#### 2.2 U.S. Military Standards:

MIL-STD-167-1 Mechanical Vibrations of Shipboard Equipment (Type I Environmental and Type II Internally Excited)<sup>3</sup>

MIL-Y-1140 Yarn, Cord, Sleeving, Cloth and Tape-Glass<sup>3</sup>

<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.

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

<sup>3</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

MIL-A-3316 Adhesives, Fire Resistant, Thermal Insulation<sup>3</sup>

### 3. Terminology

3.1 Definitions—Terminology C 168 and Terminology E 176 shall apply to the terms used in this specification.

### 4. Classification

4.1 The fibrous glass felt shall be of the following types and grades:

Type I, Unfaced Thermal Blanket	Nominal Density, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )
Grade 1	0.75 (12)
Grade 2	1.00 (16)
Grade 3	1.50 (24)
Grade 4	2.00 (32)
Grade 5	2.50 (40)
Grade 6	3.00 (48)
Type II, Unfaced Sound Absorbing Blanket	Nominal Density, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )
Grade 1	0.75 (12)
Grade 2	1.00 (16)
Grade 3	1.50 (24)
Grade 4	2.00 (32)
Grade 5	2.50 (40)
Grade 6	3.00 (48)
Type III, Faced, Thermal and Sound Absorbing Board	Density shall be 2.8 (45) lb/ft <sup>3</sup> (kg/m <sup>3</sup> )

### 5. Ordering Information

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

### 6. Materials and Manufacture

#### 6.1 Composition:

6.1.1 ~~The insulation shall be composed of glass, processed from a molten state into a fibrous form, bonded with a chemical binder. Asbestos shall not be used as an ingredient or component part of the product.~~

6.1.1 The insulation shall be composed of glass, processed from a molten state into a fibrous form, bonded with a chemical binder.

6.1.2 The facing shall be a polyester film reinforced with glass yarns (MIL-I-1140). The laminating adhesive shall conform to the requirements of MIL-A-3316. ~~Asbestos shall not be used as an ingredient or component part of the product.~~

### 7. Physical Requirements

7.1 A 1-in. (25-mm) thick sample of the insulation shall be flexible when tested in accordance with 11.1. ~~stm-c1139-08~~

7.2 The insulation shall be of the nominal density specified for its grade with a tolerance of  $\pm 10\%$ . Density shall be determined in accordance with 11.2.

7.3 *Maximum Temperature of Use*—When tested in accordance with 11.10 at the insulation's maximum use temperature of 450°F (232°C), the insulation shall not crack, warp, flame, glow, smolder, or show evidence of fused fibers.

7.4 The nonfibrous material (shot) content shall not be greater than 1.5 % by weight when tested in accordance with 11.3.

7.5 *Binder Content*—When tested in accordance with 11.4, the binder content shall not exceed 30 % by weight.

7.6 *Corrosiveness to Steel*—When tested in accordance with 11.6, steel plates in contact with the insulation shall show no corrosion greater than comparative plates in contact with sterile cotton.

7.7 *Surface Burning Characteristics Type I and II*—The insulation shall have a flame spread index not greater than 25 and a smoke developed index not greater than 50 when tested in accordance with ~~Test Method E84~~ 11.7.

7.8 *Quarter Scale Room Fire Test of Type III*—Type III shall meet the requirements of the Quarter-Scale Room-Fire Test Method described in 11.12.

7.9 *Apparent Thermal Conductivity*—The thermal conductivities for Type I, Grade 1 through 6 and Type III materials shall not exceed the values shown in Table 1. Thermal conductivity shall be determined by Test Methods C 177 or C 518.

7.10 *Vibration Resistance of Type II Materials*—There shall be a maximum of 0.50 % weight loss and the insulation shall not settle and lose thickness when subjected to the vibration test described in 11.9.

7.11 *Acoustical Performance of Type II Materials*—The coefficients of absorption shall be not less than those shown in Table 2 when Type II material is tested in accordance with 11.8.

7.12 *Kerfing*—Type III panels shall be capable of being kerfed with a 90° V-groove to facilitate bending when the panel is folded to a right angle. The facing material shall be flexible to form a neat square corner at the kerfed joint (see 11.11).

7.13 *Flashover Time*—Flashover time shall not occur within 10 min when tested in accordance with 11.12.4.5.

### 8. Dimensions and Permissible Variations

8.1 The standard sizes and tolerances of Types I, II, and III materials are listed in Table 3.

**TABLE 1 Type I and Type III Thermal Insulation Blanket Physical Requirements**

Type I	Type I Grade 1	Type I Grade 2	Type I Grade 3	Type I Grade 4	Type I Grade 5	Type I Grade 6	Type III
Nominal Density (lb/ft <sup>3</sup> )	0.75	1.0	1.5	2.0	2.5	3.0	2.8
Thermal Conductivity, max Btu-in./h ft <sup>2</sup> ·°F (W/m·K)							
Mean Temperature, ° F (°C)							
25 (–4)	0.27 (0.039)	0.26 (0.037)	0.24 (0.035)	0.22 (0.032)	0.22 (0.032)	0.22 (0.032)	0.22 (0.032)
50 (10)	0.29 (0.042)	0.28 (0.040)	0.26 (0.037)	0.24 (0.035)	0.23 (0.033)	0.23 (0.033)	0.23 (0.033)
75 (24)	0.32 (0.046)	0.30 (0.043)	0.27 (0.039)	0.25 (0.036)	0.24 (0.035)	0.24 (0.035)	0.24 (0.035)
100 (38)	0.35 (0.050)	0.32 (0.046)	0.29 (0.042)	0.27 (0.039)	0.26 (0.037)	0.25 (0.036)	0.26 (0.037)
200 (93)	0.49 (0.071)	0.43 (0.062)	0.38 (0.055)	0.34 (0.049)	0.31 (0.045)	0.30 (0.043)	0.31 (0.045)
300 (149)	0.70 (0.101)	0.58 (0.083)	0.50 (0.072)	0.44 (0.063)	0.38 (0.055)	0.37 (0.053)	0.38 (0.055)

**TABLE 2 Coefficients of Sound Absorption Minimum, Using a Type “A” Mounting (Types II and III)**

NOTE 1— Data on Type “A” Mounting is for comparison only and not meant to indicate characteristics in service.

Nominal Insulation Thickness, in. (mm)	Frequency, Hz						Noise Reduction Coefficient (NRC)
	125	250	500	1000	2000	4000	
Type II, All Grades							
0.75 (19)	0.04	0.10	0.20	0.40	0.55	0.55	0.30
1.0 (25)	0.06	0.20	0.45	0.65	0.65	0.64	0.50
2.0 (51)	0.15	0.40	0.75	0.75	0.75	0.70	0.65
3.0 (75)	0.20	0.60	0.90	0.80	0.80	0.75	0.80
4.0 (100)	0.25	0.65	0.95	0.85	0.85	0.80	0.85
Type III							
2 (51)	0.43	0.96	1.00	0.70	0.51	0.35	0.80

**TABLE 3 Type I, II, and III Tolerances for Standard Sizes**

	Standard Sizes Types I and II		Tolerances
	Length ft (m)	Width in. (cm)	
Length ft (m)	4 (1.22), 8 (2.43)		±¼ in. (0.64 cm)
	50 (15.24), 75 (22.86), 100 (30.49), 150 (45.73), 200 (61)		±6 in. (15.24 cm)
Width in. (cm)	24 (61.68), 36 (91.44), 48 (122), 72 (183)		±¼ in. (0.64 cm)
	Thickness in. (cm)	0.75 (1.9), 1.0 (2.54), 1.5 (3.8), 2.0 (5.1), 2.5 (6.35), 30 (7.62), 3.5 (8.9), 4.0 (10.2)	±⅙ in. (0.32 cm)
Standard Sizes Types III			Tolerances
Length, in. (cm)	36 (91.44), 48 (122)		±¼ in. (0.64 cm)
Width, in. (cm)	24 (61.68)		±¼ in. (0.64 cm)
Thickness, in. (cm)	0.75 (1.9), 1.0 (2.54), 1.5 (3.8), 2.0 (5.1)		±⅙ in. (0.32 cm)

## 9. Workmanship, Finish, and Appearance

9.1 The insulation units shall indicate good workmanship and shall not have defects that adversely affect their installation and service qualities.

## 10. Sampling

10.1 Inspection and qualification shall be in accordance with ~~Criteria C 390~~ Practice C 390. Other provisions for sampling can be agreed upon between the purchaser, seller, and manufacturer.

## 11. Test Methods

11.1 *Flexibility—Rigidity*—Test in accordance with Test Method C 1101/C 1101M.

11.2 *Density*—Test in accordance with Test Methods C 167.

11.3 *Nonfibrous Shot Content*—Test in accordance with the Annex in Specification C 612.

11.4 *Test Method for Determining Binder Content:*

11.4.1 *Scope*—This test method provides a test to determine the amount of organic binder present in the insulation.