



Standard Specification for Fibrous Glass Blanket Insulation (Aircraft Type)¹

This standard is issued under the fixed designation C 800; 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 composition, size, dimensions, and physical properties of glass fiber blanket thermal and acoustical insulation for use up to 700°F (370°C) in aircraft applications. For specific applications, the maximum temperature shall be agreed upon between the supplier and the purchaser.

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 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

- 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 Thermal Insulation Lots
- C 411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- C 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- C 552 Specification for Cellular Glass Thermal Insulation

- C 1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
- C 1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation
- C 1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials
- C 1511 Test Method for Determining the Water Retention (Repellency) Characteristics of Fibrous Glass Insulation (Aircraft Type)
- C 1559 Test Method for Determining Wicking of Fibrous Glass Blanket Insulation (Aircraft Type)
- D 5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
- F 1110 Test Method for Sandwich Corrosion Test

2.2 Other Standards

- 14 CFR FAR (Federal Aviation Regulations) 25.853 Appendix F, Part I³
- 14 CFR FAR (Federal Aviation Regulations) 25.856(a) Appendix F, Part IV³

3. Terminology

3.1 *Definitions*—Terminology C 168 shall be considered as applying to the terms used in this specification. Definitions in Test Method C 522 shall be considered as applying to the acoustical terms used in this standard.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *Wetting*—A condition where the water has penetrated into the insulation and fills the spaces between the fibers.

4. Classification

4.1 Fibrous glass blanket insulation covered by this specification shall be classified into Types based on temperature limits, Classes based on acoustical properties, Grades based on nominal density and Groups based upon thickness as shown in Table 1.

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 Available from, National Archives and Records Administration 8601 Adelphi Road College Park, MD 20740-6001.

TABLE 1 Types, Classes, Grades and Groups

| Type 1— For Use to 450°F (232°C) ClassAA | | | | | | | |
|--|--------------------|-------------------|---|---------------------------------------|-------------------|------|-------|
| Nominal Density | | Maximum Density | | Color (unless otherwise specified) | Nominal Thickness | | |
| Grade | lb/ft ³ | kg/m ³ | lb/ft ³ (kg/m ³) | | Group | in. | (mm) |
| A | 0.34 | (5.5) | 0.39 (6.33) | Medium gray | 1 | 0.38 | (9.5) |
| B | 0.42 | (6.7) | 0.48 (7.71) | Amber | 2 | 0.50 | (13) |
| C | 0.50 | (8.0) | 0.58 (9.2) | Medium gray | 3 | 1.00 | (25) |
| D | 0.60 | (9.6) | 0.69 (11.0) | Green | 4 | 1.50 | (38) |
| E | 1.20 | (19) | 1.38 (21.9) | Medium gray | 5 | 2.00 | (51) |
| F | 1.50 | (24) | 1.73 (27.6) | Amber | | | |
| G | 1.00 | (16) | 1.15 (18.4) | Orange | | | |

| Class B | | | | | | | |
|-----------------|--------------------|-------------------|---|-------|-------------------|------|-------|
| Nominal Density | | Maximum Density | | Color | Nominal Thickness | | |
| Grade | lb/ft ³ | kg/m ³ | lb/ft ³ (kg/m ³) | | Group | in. | (mm) |
| A | 0.50 | (8.0) | 0.58 (9.2) | Amber | 1 | 0.38 | (9.5) |
| B | 0.60 | (9.6) | 0.69 (11.0) | Amber | 2 | 0.50 | (13) |
| C | 1.00 | (16) | 1.15 (18.4) | Amber | 3 | 1.00 | (25) |
| | | | | | 4 | 2.00 | (50) |

| Type II—For Use to 700°F (370°C) | | | | | | | |
|----------------------------------|--------------------|-------------------|---|--------------------|-------------------|------|-------|
| Class AA | | | | | | | |
| Nominal Density | | Maximum density | | Color | Nominal Thickness | | |
| Grade | lb/ft ³ | kg/m ³ | lb/ft ³ (kg/m ³) | | Group | in. | (mm) |
| A | 0.60 | (9.6) | 0.69 (11.0) | White to light tan | 1 | 0.38 | (9.5) |
| B | 1.00 | (16) | 1.15 (18.4) | White to light tan | 2 | 0.50 | (13) |
| C | 3.00 | (48) | 3.45 (55.2) | White to light tan | 3 | 1.00 | (25) |

4.2 The insulation shall be either water repellent or non-water repellent.

5. Ordering Information

5.1 The type, class, grade, and group suited to the conditions of intended service shall be specified by the purchaser after consultation with the supplier. Type refers to service temperature, class refers to thermal/acoustical properties, grade refers to nominal density and group refers to thickness of insulation.

5.2 It shall also be specified whether the insulation is to be water repellent or non-water repellent.

6. Materials and Manufacture

6.1 Composition:

6.1.1 Fiber shall be glass processed from a molten state into fibrous form.

6.1.2 Binder shall be of a type and quantity to provide the properties and performance listed in this specification. Additives can be included to provide a degree of water repellency.

6.1.3 This product is typically supplied unfaced.

6.1.4 The basic product can also be obtained in uncured form for molding into special shapes other than blanket. However, not all requirements in this specification apply. The purchaser shall consult the supplier and agree on the portions of this specification and conditions that are applicable.

6.2 For sizes and densities other than those listed, the purchaser shall consult the material supplier.

7. Physical Requirements

7.1 The insulation shall conform to the requirements described in 7.2-7.11 and Tables 1-5.

TABLE 2 Other Properties

| Property | Requirement, max |
|---|------------------|
| <i>Wicking:</i> | |
| Before Aging and Before Leaching, in. (mm) | ¼ (6.4) |
| After Aging, in. (mm) | ¼ (6.4) |
| After Leaching, in. (mm) | ¼ (6.4) |
| <i>Water Repellency, lb. (kg):</i> ^A | 0.044 (0.020) |

^A Average of three test specimens.

7.2 *Density*—The insulation shall conform to the requirements shown in Table 1. The insulation shall have a maximum density tolerance when tested in accordance with 11.6 of + 15%, with no minimum limit.

7.3 *Handleability*—Each piece of insulation shall be sufficiently coherent to permit transportation and installation as a unit.

7.4 *Burning Characteristics*—The insulation shall conform to the requirements in FAR 25.853, Appendix F, Part I and the encapsulated insulation blanket shall conform to the requirements in FAR 25.856(a) in accordance with 11.1. If required, unfaced blankets are tested with alternative methods or requirements recognized by airframe manufacturers to demonstrate and maintain product consistency.

7.5 *Wicking (water-repellent insulation only)*—The insulation shall conform to the requirements in Table 2, when test in accordance with 11.2.

7.6 *Odor Emission*—A detectable odor of objectionable nature recorded by more than two of the five panel members shall constitute failure of the material, when tested in accordance with 11.3.

TABLE 3 Apparent Thermal Conductivity, max, Btu in./(h-ft²·°F) (W/(m·K))

| Class AA | | | | | |
|--------------------------|--|--|---|--|----------------------------------|
| Mean Temperature °F (°C) | Type I, Grades A&B (0.34pcf and 0.42pcf) | Type I Grades C&D (0.5pcf and 0.6pcf) and Type II Grade A (0.6pcf) | Type I Grades E&F (1.2pcf and 1.5pcf) | Type I, Grade G (1.0pcf) and Type II, Grade B (1.0pcf) | Type III, Grade C (3.0pcf) |
| 25(-3.9) | 0.26 (0.039) | 0.24 (0.035) | 0.22 (0.032) | 0.23 (0.033) | 0.22 (0.032) |
| 50(10.0) | 0.29 (0.041) | 0.26 (0.038) | 0.23 (0.033) | 0.24 (0.035) | 0.23 (0.033) |
| 75 (23.9) | 0.31 (0.044) | 0.28 (0.040) | 0.24 (0.035) | 0.25 (0.036) | 0.24 (0.035) |
| 100 (37.8) | 0.33 (0.047) | 0.30 (0.043) | 0.25 (0.036) | 0.26 (0.039) | 0.25 (0.036) |
| 200 (93.3) | 0.45 (0.065) | 0.40 (0.057) | 0.32 (0.046) | 0.34 (0.049) | 0.30 (0.043) |
| 300 (148.9) | 0.61 (0.087) | 0.52 (0.075) | 0.40 (0.057) | 0.43 (0.062) | 0.35 (0.051) |
| 400 (204.4) ^A | | 0.69 (0.100) | | 0.55 (0.079) | 0.42 (0.061) |
| 500 (260.0) ^A | | 0.91 (0.132) | | 0.70 (0.101) | 0.51 (0.073) |

| Class B | | | |
|---------------------------|--------------|--------------|--------------|
| Mean Temperature, °F (°C) | Grade A | Grade B | Grade C |
| 25 (-3.9) | 0.30 (0.043) | 0.29 (0.041) | 0.25 (0.036) |
| 50 (10.0) | 0.33 (0.047) | 0.31 (0.044) | 0.28 (0.040) |
| 75 (23.9) | 0.36 (0.053) | 0.34 (0.050) | 0.30 (0.043) |
| 100 (37.8) | 0.41 (0.058) | 0.37 (0.054) | 0.32 (0.046) |
| 200 (93.3) | 0.62 (0.089) | 0.55 (0.079) | 0.43 (0.062) |
| 300 (148.9) | 0.94 (0.135) | 0.81 (0.118) | 0.59 (0.086) |

^AThese mean temperatures apply to Type II insulation only.

TABLE 4 Transverse Airflow Resistance

| Type I | Airflow Resistance, Min. Rayls (N/m ²)(m/s) | | | | |
|-----------|---|---------|---------|---------|---------|
| | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 |
| Class AA: | | | | | |
| Grade A | | | 350 | | |
| Grade B | | 200 | 350 | | |
| Grade C | | | 1000 | | |
| Grade D | | 340 | 680 | 1020 | 1360 |
| Grade E | 1500 | | | | |
| Grade F | 1100 | | | | |
| Grade G | | 1220 | 2240 | | |
| Class B: | | | | | |
| Grade A | | 50 | 100 | | 200 |
| Grade B | | 70 | | | |
| Grade C | | 140 | 290 | | 580 |
| Type II | | | | | |
| Class AA: | | | | | |
| Grade A | | 340 | 680 | | |
| Grade B | | | 2000 | | |
| Grade C | | 3000 | | | |

7.7 *Service Temperature*—The insulation shall conform to the requirements in **Table 1**, when tested in accordance with **11.7**.

7.7.1 Insulation shall be serviceable up to the maximum temperature limitations as long as limited mechanical properties are required. At maximum or near-maximum service temperatures, some deterioration of the binder is possible over extended periods of time.

7.8 *Apparent Thermal Conductivity*—Values shall not exceed those in **Table 3**, when tested in accordance with **11.9**.

7.9 *Specific Transverse Airflow Resistance*—The insulation shall conform to the requirements in **Table 4**, when tested in accordance with **11.4**.

7.10 *Breaking Strength*—The insulation shall conform to the requirements in **Table 5**, when tested in accordance with **11.5**.

7.11 *Water Repellency (water-repellent insulation only)*—The insulation shall conform to the requirements of **Table 2**, when tested in accordance with **11.8**.

7.12 The insulation shall be rated 0 (no visible corrosion) when tested per the requirements of Test Method **F 1110** on non-clad aluminum (2024T3).

8. Dimensions and Permissible Variations

8.1 *Length and Width*—The average measured length and width shall not differ from the manufacturer's standard dimensions by more than the following:

Length—6 in. (152 mm), with excess permitted;

Width ±0.5 in. (13 mm).

8.2 *Thickness*—Insulation shall recover to within the following values of the nominal thickness:

Less than 1-in. (25.1-mm) thick ± 20 %

when tested per the requirements within C 167.

1 in. (25.4 mm) or greater in thickness ± 0.25 in. (6.4 mm)

8.3 *Dimensions shall be tested in accordance with 11.6.*

8.4 *Standard Sizes*—As agreed upon between customer and manufacturer.

9. Workmanship, Finish, and Appearance

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

10. Sampling

10.1 The insulation shall be sampled in accordance with Practice **C 390**. Specific provision for sampling shall be as

TABLE 5 Breaking Strength-lb/in. (N/m) minimum

| Type 1 | Group 1 | | Group 2 | | Group 3 | | Group 4 | | Group 5 | |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| Class AA: | MD ^A | XMD ^A | MD ^A | XMD ^A | MD ^A | XMD ^A | MD ^A | XMD ^A | MD ^A | XMD ^A |
| Grades A | | | | | 0.6 (105) | 0.3 (52) | | | | |
| Grades B | | | 0.3 (52) | 0.1 (18) | 0.8 (140) | 0.3 (52) | | | | |
| Grades C | | | | | 1.0 (175) | 0.4 (70) | | | | |
| Grades D | | | 0.5 (88) | 0.4 (70) | 1.0 (175) | 0.8 (140) | 1.2 (210) | 1.0 (175) | 1.5 (263) | 1.3 (228) |
| Grades E | 1.5 (263) | 0.8 (140) | | | | | | | | |
| Grades F | 1.8 (316) | 0.8 (140) | | | | | | | | |
| Grade G | | | 0.6(105) | 0.5(88) | 1.2 (210) | 0.9 (158) | | | | |
| Class B: | | | | | | | | | | |
| Grade A | | | 0.5(88) | 0.5(88) | 1.0 (175) | 1.0 (175) | | | 1.3 (228) | 1.3 (228) |
| Grade B | | | 0.5(88) | 0.5 (88) | | | | | 2.5 (438) | 2.5 (438) |
| Grade C | | | 1.0(175) | 1.0 (175) | 2.0 (350) | 2.0 (350) | | | | |
| Type II | | | | | | | | | | |
| Class AA: | | | | | | | | | | |
| Grade A | | | 0.5(88) | 0.3 (52) | 1.0 (175) | 0.5(88) | | | | |
| Grade B | | | | | 1.2 (210) | 0.6 (105) | | | | |
| Grade C | | | 2.0 (350) | 1.0 (175) | | | | | | |

^AMD= Machine Direction (length direction)
XMD= Cross machine direction (width direction)

agreed upon between the purchaser and the supplier as part of the purchase contract.

11. Test Methods

11.1 Burning Characteristics:

Testing shall be conducted according to and burning characteristics shall meet the appropriate section of FAR (Federal Aviation Regulation) 25.853, Appendix F Part I and the encapsulated insulation blanket shall conform to the requirements in FAR 25.856(a) flame propagation test in Appendix F, Part IV.

11.2 *Wicking*—Determine wicking in accordance with Test Method C 1559.

11.3 *Odor Emission*—Determine odor emission in accordance with Test Method C 1304.

11.4 *Specific Transverse Airflow Resistance*—Determine the specific transverse airflow resistance, r_t (of a nonisotropic homogeneous material), in SI rayls (newton/m²)/(m/s), in accordance with Test Method C 522. The term rayl is commonly used only in the metric system; therefore, no inch-pound customary units are given.

NOTE 1—Many literature references use cgs rayls (1 cgs rayl = 10 SI rayls).

11.5 *Breaking Strength*—Determine the breaking strength in accordance with Test Methods D 5034, except as follows:

11.5.1 The face of each jaw shall measure 1.0 ± 0.1 in. by 3.0 ± 0.1 in. (25.4 ± 2.54 mm by 76.2 ± 2.54 mm). Each sample shall measure 4.0 ± 0.2 in. by 6.0 ± 0.2 in. (101.6 ± 5.08 mm by 152.4 ± 5.08 mm) so that material overlaps the jaw and three superimposed pieces are broken at the same time. The distance between the jaws (known as the gage length) shall be 3.0 ± 0.2 in. (76.2 ± 5.08 mm) at the start of the test.

11.5.2 Report the average of five determinations of three specimens each as the breaking strength.

11.5.3 Calculate the breaking strength as follows:

$$\text{Breaking Strength} = \frac{\text{Breaking Force}}{\text{Jaw Length} \times 3} \quad (1)$$

11.6 *Thickness and Density*—Determine thickness and density in accordance with Test Methods C 167.

11.7 *Service Temperature*—The maximum service temperature of the insulation shall be evaluated in accordance with Test Method C 411.

11.8 *Water Repellency*:

Determine water repellency in accordance with Test Method C 1510.

11.9 *Apparent Thermal Conductivity*:

11.9.1 Determine in accordance with Test Methods C 177 or C 518.

11.9.2 Temperatures of test shall be in accordance with Practice C 1058.

11.9.3 See Practice C 1045 for requirements and guidelines for the determination of thermal transmission properties.

12. Qualification Requirements

12.1 The following requirements are generally employed for the purpose of initial material or product qualification:

- 12.1.1 Density,
- 12.1.2 Handleability,
- 12.1.3 Burning Characteristics,
- 12.1.4 Wicking,
- 12.1.5 Odor Emission,
- 12.1.6 Maximum Service Temperature,
- 12.1.7 Apparent Thermal Conductivity,
- 12.1.8 Specific Transverse Airflow Resistance, and

12.1.9 Breaking Strength.

13. Inspection

13.1 The following requirements are generally employed for purposes of acceptance sampling of lots or shipments of qualified insulation:

- 13.1.1 Density,
- 13.1.2 Water Repellency (water-repellent material only),
- 13.1.3 Dimensions, and
- 13.1.4 Workmanship.

14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of the specification may be rejected. Rejection shall be reported to the manufacturer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the manufacturer or supplier can make claim for a rehearing.

14.2 In case of rejection, the manufacturer or supplier shall have the right to reinspect the rejected shipment and resubmit the lot after removal of that portion of the shipment not conforming to the specified requirements.

15. Packaging and Package Marking

15.1 *Packaging*—Unless otherwise agreed or specified between the purchaser and the manufacturer or supplier, the insulation shall be packaged in the manufacturer's standard commercial containers.

15.2 *Marking*—Unless otherwise specified, containers shall be marked with the supplier's name and designation, type, class, size and thickness, and quantity of the material contained.

16. Keywords

16.1 aircraft; aircraft insulation; airflow resistance; fibrous glass; fibrous glass insulation; thermal insulating materials-blanket; transverse; water repellency; wicking

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