



# Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)<sup>1</sup>

This standard is issued under the fixed designation C1071; 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 U.S. Department of Defense.*

## 1. Scope

1.1 This specification covers fibrous glass insulation used as a thermal and sound absorbing liner for interior surfaces of ducts, plenums, and other air handling equipment that handle air up to 250°F (121°C).

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:<sup>2</sup>

- 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
- C390 Practice for Sampling and Acceptance of Thermal Insulation Lots
- C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- C423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- 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

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

C1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials

C1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings

C1617 Practice for Quantitative Accelerated Laboratory Evaluation of Extraction Solutions Containing Ions Leached from Thermal Insulation on Aqueous Corrosion of Metals

E84 Test Method for Surface Burning Characteristics of Building Materials

E795 Practices for Mounting Test Specimens During Sound Absorption Tests

E2231 Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics

G21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

G22 Practice for Determining Resistance of Plastics to Bacteria (Withdrawn 2002)<sup>3</sup>

### 2.2 Other Standards:

CAN/ULC-S102 Method of Test for Surface Burning Characteristics of Building Materials and Assemblies<sup>4</sup>

NAIMA Fibrous Glass Duct Liner Standard<sup>5</sup>

NFPA 259 Test Method for Potential Heat of Building Materials<sup>6</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* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

<sup>5</sup> Available from North American Insulation Manufacturers Association (NAIMA), 44 Canal Center Plaza, Suite 310, Alexandria, VA 22314, <http://www.naima.org>.

<sup>6</sup> Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

SMACNA HVAC Duct Construction Standards<sup>7</sup>  
 UL 181 Factory-Made Air Ducts and Air Connectors<sup>4</sup>  
 UL 723 Test for Surface Burning Characteristics of Building Materials<sup>4</sup>

### 3. Terminology

3.1 For definitions of terms used in this specification, see Terminology C168.

### 4. Classification

4.1 The insulation covered by this specification shall be of the following types:

4.1.1 *Type I*—Blanket in roll form up to 200 ft (61 m) in length, 36 to 72 in. (914 to 1829 mm) in width, and thicknesses of ½ to 3 in. (13 to 76 mm), in ½-in. (13-mm) increments.

4.1.2 *Type II*—Board in sheet form, up to 120 in. (3048 mm) in length, up to 48 in. (1219 mm) in width, and thicknesses of ½ to 3 in. (13 to 76 mm) in ½-in. (13-mm) increments.

### 5. Ordering Information

5.1 Purchasers shall select the preferred options permitted herein and include the following information in procurement documents:

5.1.1 Title, designation, and year of this specification.

5.1.2 Type of insulation (see 4.1).

5.1.3 Length, width, and thickness required (see 4.1).

5.1.4 Packaging required (see 16.1).

5.1.5 Marking required (see 16.2 and 16.3).

### 6. Materials and Manufacture

6.1 *Basic Material*—The basic material shall be made from glass processed from the molten state into fibrous form with a binder added to form dimensionally stable insulation. Asbestos shall not be used as an ingredient or component part of the product.

6.2 *Air Stream Surface*—Depending on the insulation surface characteristics and service air velocity, the air stream surface is plain or coated with a temperature resistant coating or faced with a plain or coated fibrous mat or fabric.

### 7. Physical Requirements

7.1 *Corrosiveness – Steel Only*—When tested in accordance with 12.3 per Specification C665, any corrosion resulting from the unfaced insulation in contact with steel plates shall be judged to be no greater than the comparative plates in contact with sterile cotton.

7.1.1 *Alternative Test – Steel Only*—When tested in accordance with 12.3.1 per Practice C1617, the mass loss corrosion rate of the unfaced insulation extract shall not exceed that of the 5-ppm chloride solution.

7.2 *Water Vapor Sorption*—When tested in accordance with 12.4, the water vapor sorption of the insulation shall not be more than 3 % by weight.

7.3 *Fungi Resistance*—When tested in accordance with 12.5, the insulation shall be observed as having no fungal growth.

7.4 *Temperature Resistance*—When tested in accordance with 12.6, the air stream surface shall have no evidence of flaming, glowing, smoldering, visible smoke, or delamination, cracking, deformation or reduction in thickness.

7.5 *Erosion Resistance*—When tested in accordance with 12.7, the insulation shall not break away, crack, peel, flake off, or show evidence of delamination or continued erosion when air is passed through typical duct sections at a velocity specified in 12.7.

7.6 *Odor Emission*—When tested in accordance with 12.8, a detectable odor of objectionable nature recorded by more than two of the five panel members shall constitute failure of the material.

7.7 *Surface Burning Characteristics*—When tested in accordance with 12.9, the air stream surface of the insulation shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50.

7.8 *Apparent Thermal Conductivity*—When tested in accordance with 12.10, the apparent thermal conductivity (*k*) of the insulation, expressed as Btu-in/h-ft<sup>2</sup> ·°F (W/m·K) for the specified thickness shall not exceed the values shown in Table 1.

7.9 *Sound Absorption Coefficients*—When tested in accordance with 12.11, the insulation shall have sound absorption coefficients and noise reduction coefficients not less than shown in Table 2.

7.10 *Bacteria Resistance*—When tested in accordance with 12.12, the insulation shall be observed as having no growth.

7.11 *Combustion Characteristics*—When tested in accordance with 12.13, the material shall have a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg).

### 8. Dimensional Tolerances

8.1 After conditioning for a minimum of 24 h at 70± 3°F (21 ± 1.6°C) and 50 ± 5 % relative humidity, the insulation shall conform to the dimensional tolerances listed in Table 3.

### 9. Workmanship, Finish, and Appearance

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

### 10. Sampling

10.1 The insulation shall be sampled in accordance with Practice C390. Specific provisions for sampling shall be agreed upon between the purchaser and supplier as part of the purchase contract.

**TABLE 1 Apparent Thermal Conductivity (maximum),  
Btu-in/h-ft<sup>2</sup> ·°F (W/m·K)**

Mean Temperature, °F (°C)	Type I	Type II
75 (24)	0.28 (0.040)	0.25 (0.036)

<sup>7</sup> Available from Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219, <http://www.smacna.org>

**TABLE 2 Sound Absorption Coefficients (min) Using a Type “A” Mounting**

NOTE 1—This data is based on round-robin tests. Data on Type “A” mounting is for comparison only and is not meant to indicate characteristics in duct service.

	Thickness, in. (mm)	Frequency, Hz						NRC <sup>A</sup>
		125	250	500	1000	2000	4000	
Type I	½ (13)	0.02	0.07	0.18	0.37	0.52	0.67	0.30
	1 (25)	0.04	0.19	0.35	0.55	0.69	0.72	0.45
	1½ (38)	0.08	0.31	0.58	0.75	0.82	0.81	0.60
	2 (51)	0.16	0.42	0.76	0.85	0.85	0.83	0.70
Type II	1 (25)	0.02	0.20	0.52	0.72	0.82	0.84	0.55
	1½ (38)	0.05	0.40	0.77	0.88	0.88	0.86	0.75
	2 (51)	0.12	0.57	0.90	0.95	0.95	0.92	0.85

<sup>A</sup> Noise Reduction Coefficient.

**TABLE 3 Dimensional Tolerance, in. (mm)**

	Length	Width	Thickness
Type I	–0, + 2 % of length	–0, + ¼ (–0, +6)	±½ (±3)
Type II	–½, + ¾ (–3, +10)	±½ (±3)	±½ (±3)

## 11. Qualification Requirements

11.1 The following requirements shall be employed for the purpose of initial material or product qualification:

- 11.1.1 Corrosiveness,
- 11.1.2 Water vapor sorption,
- 11.1.3 Fungi resistance,
- 11.1.4 Temperature resistance,
- 11.1.5 Erosion resistance,
- 11.1.6 Odor emission,
- 11.1.7 Surface burning characteristics,
- 11.1.8 Apparent thermal conductivity,
- 11.1.9 Sound absorption coefficients,
- 11.1.10 Bacteria resistance, and
- 11.1.11 Combustion characteristics.

11.2 The manufacturer shall furnish a certificate of compliance for qualification requirements upon request.

## 12. Test Methods

12.1 Conduct tests for temperature resistance, erosion resistance, surface burning characteristics, and sound absorption on the air stream surface side.

12.2 *Dimensions*—The thickness shall be measured in accordance with Test Methods C167. Length and width shall be measured with a steel tape or ruler to ±¼ in. (±2 mm).

12.3 *Corrosiveness*—The corrosiveness shall be tested in accordance with the method for testing the corrosiveness of mineral fiber batt and blanket insulation in Specification C665 using only steel plates

12.3.1 *Alternative Test – Steel Only*—Determine the mass loss corrosion rate in accordance with Practice C1617.

12.4 *Water Vapor Sorption*—The water vapor sorption shall be determined in accordance with Test Method C1104/C1104M.

12.5 *Fungi Resistance*—The fungi resistance shall be determined in accordance with Test Method C1338 and Practice G21.

12.6 *Temperature Resistance*—The temperature resistance shall be determined in accordance with Test Method C411, with the air stream surface exposed to 250°F (121°C). Test at the maximum thickness supplied.

12.7 *Erosion Resistance Test*—The erosion resistance shall be determined using the erosion test of UL 181.

12.7.1 *Sample Preparation*—For material intended for rectangular duct, install a sample of 1-in. (25-mm) thick insulation in a 12 by 12-in. (305 by 305-mm) sheet metal duct in an L-shaped assembly. For material intended for circular duct, install a sample of 1-in. (25-mm) thick insulation in a 14-in. (356-mm) diameter metal duct in an L-shaped assembly. The length of the upstream and downstream legs of the assembly shall be between 6 and 9 ft (1.8 m and 2.7 m). The 90° bend shall be made with an elbow as employed for installation. Because the installation details will affect the test results, the installation shall be in accordance with the NAIMA Fibrous Glass Duct Liner Standard or SMACNA HVAC Duct Construction Standards. Connect the assembly to a fan by means of a transformation piece to provide for uniform air entry to the test specimen. The fan must be able to generate the required test velocities.

12.8 *Odor Emission*—The odor emission shall be determined in accordance with Test Method C1304.

12.9 *Surface Burning Characteristics*—The surface burning characteristics shall be determined in accordance with Test Method E84 or UL 723. For Canada, test in accordance with Test Method CAN/ULC-S102. When the referenced Canadian document in this specification is referred to in applicable Canadian building codes, the editions, referenced by those building codes, shall govern. The test specimen preparation and mounting procedures shall be in accordance with Practice E2231

12.10 *Apparent Thermal Conductivity*—The apparent thermal conductivity shall be determined in accordance with Test Method C177, Test Method C518, or Test Method C1114 at 75°F (24°C) mean temperature and with a minimum temperature difference of 40°F (22°C). If Test Method C518 is used the manufacturer shall certify that recent calibrations have been made.

12.11 *Sound Absorption Coefficients*—The sound absorption coefficients and noise reduction coefficients shall be determined in accordance with Test Method C423, with a type “A” mounting as specified in Practice E795.

12.12 *Bacteria Resistance*—The bacteria resistance shall be determined in accordance with Standard Practice G22.

12.13 *Combustion Characteristics*—The materials potential heat value shall be determined in accordance with NFPA 259.

## 13. Inspection

13.1 The following requirements shall be employed for the purpose of acceptance sampling of lots or shipment of qualified materials:

- 13.1.1 Dimensions,
- 13.1.2 Workmanship,
- 13.1.3 Packaging, and
- 13.1.4 Marking.

13.2 Inspection of the materials shall be made as agreed upon between the purchaser and the supplier as part of the purchase contract.

#### **14. Rejection and Rehearing**

14.1 Material that fails to conform to the requirements of the agreed upon specification shall be subject to rejection. Rejection should be reported to the manufacturer or supplier promptly in writing. The manufacturer and supplier shall have the right to verify rejected products.

14.2 Upon the request of the purchaser in the contract or order the certification of an independent third party indicating conformance to the requirements of this specification shall be acceptable instead of the manufacturer's certification.

#### **15. Certification**

15.1 When specified in the purchase order or contract, a producer's or supplier's certification shall be furnished to the

purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements.

#### **16. Packaging and Marking**

16.1 *Packaging*—Unless otherwise specified, the insulation shall be packed in the manufacturer's standard commercial container. The insulation shall be packed to insure carrier acceptance and safe delivery at destination in containers complying with the rules and regulations applicable to the mode of transportation.

16.2 *Container Marking*—Unless otherwise specified, each container shall be plainly marked with the supplier's name, type, dimensions, and quantity.

16.3 *Material Marking*—As a minimum, the air stream surface of the liner shall be marked with the following: type, thickness, R-value and manufacturer.

#### **17. Keywords**

17.1 duct; duct lining; fibrous glass; plenum; sound absorbing insulation; thermal insulation

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