Designation: C 1071 – 00

# Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)[1]

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## 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 the standard. The SI values in parentheses are for information only.

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:*

C 167 Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations[2]

C 168 Terminology Relating to Thermal Insulating Materials[2]

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus[2]

C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots[2]

C 411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation[2]

C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method[2]

C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus[2]

C 665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing[2]

C 1104/C 1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation[2]

C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus[2]

C 1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials[2]

C 1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings[2]

E 84 Test Method for Surface Burning Characteristics of Building Materials[3]

E 795 Practices for Mounting Test Specimens During Sound Absorption Tests[2]

G 21 Practice for Determining Resistance of Synthetic Polymer Materials to Fungi[4]

G 22 Practice for Determining Resistance of Plastics to Bacteria[4]

2.2 *Other Standards:*

NAIMA Fibrous Glass Duct Liner Standard[5]

SMACNA HVAC Duct Construction Standards[6]

UL 723 Test for Surface Burning Characteristics of Building Materials[7]

NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials[8]

NFPA 259 Standard Test Method for Potential Heat of Building Materials[8]

CAN/ULC-S102-M88 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies[9]

## 3. Terminology

3.1 For definitions of terms used in this specification, see Terminology C 168.

## 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

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[2] *Annual Book of ASTM Standards*, Vol 04.06.

[3] *Annual Book of ASTM Standards*, Vol 04.07.

[4] *Annual Book of ASTM Standards*, Vol 14.04.

[5] Available from North American Insulation Manufacturers Association, 44 Canal Center Plaza, Suite 310, Alexandria, VA 22314.

[6] Available from Sheet Metal and Air Conditioning Contractors National Association, Inc., 4201 Lafayette Center Drive, Chantilly, VA 22021-1209.

[7] Available from Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, Illinois 60062–2096.

[8] Available from National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269–9101.

[9] Available from Underwriters Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario, Canada M1R 3A9.

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of ½to 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 ½to 3 in. (13 to 76 mm) in ½-in. (13-mm) increments.

## 5. Ordering Information

5.1 Purchasers should 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).
5.1.6 Material weight should be obtained from supplier.

## 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 may be 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*— When tested in accordance with 12.3, the metal plate in contact with the back side (non-air surface side) of the insulation shall show no corrosion greater than the comparative plates in contact with sterile cotton which has been tested in the same manner.

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$^2$·°F or 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 not less than that in Table 2 at the specified frequencies.

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 Criteria C 390. Specific provisions for sampling shall be agreed upon between the purchaser and supplier as part of the purchase contract.

## 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 (see Criteria C 390).

## 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 C 167. Length and width shall be measured with a steel tape or ruler to ±1⁄16 in. (±2 mm).

**TABLE 1 Apparent Thermal Conductivity (maximum), Btu·in/h·ft$^2$·°F (W/m·K)**

| Mean Temperature, °F (°C) | Type I | Type II |
|---|---|---|
| 75 (24) | 0.31 (0.045) | 0.27 (0.039) |



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**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[A] |
|---|---|---|---|---|---|---|---|---|
| | | 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 |

[A] Noise Reduction Coefficient.

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

| | Length | Width | Thickness |
|---|---|---|---|
| Type I | −0, + 2 % of length | −0, + ¼(−0, +6) | ±⅛ (±3) |
| Type II | −⅛, + ⅜ (−3, +10) | ±⅛ (±3) | ±⅛ (±3) |

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 C 665.

12.4 *Water Vapor Sorption*—The water vapor sorption shall be determined in accordance with Test Method C 1104/C 1104M.

12.5 *Fungi Resistance*— The fungi resistance shall be determined in accordance with Test Method C 1338 and Standard Practice G 21.

12.6 *Temperature Resistance*—The temperature resistance shall be determined in accordance with Test Method C 411, with the air stream surface exposed to 250°F (121°C). Test at the maximum thickness supplied.

12.7 *Erosion Resistance Test*:

12.7.1 *Scope*—This method covers the evaluation of fibrous glass duct lining insulation for damage and progressive erosion due to contact with a moving air stream.

12.7.2 *Significance and Use*—This method provides a relatively simple and short term evaluation of in-use performance utilizing a multiplier (safety factor) of at least 2.5± 5 % times the rated maximum velocity of the material to account for variations in installation and for long term effects.

12.7.2.1 Initial blow-out of construction debris is specifically excluded from the evaluation.

12.7.3 *Procedure*—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.

12.7.3.1 The air velocity for purposes of the test is to be measured by a pitot tube and draft gage, or direct reading velometer, positioned in the center of the outlet end of the sample. Room air handled by the fan ranging in temperature between 40°F (4°C) and 100°F (38°C), may be employed.

12.7.3.2 The inlet of the fan used for the test shall be covered with a double layer of cheesecloth (14 to 15 square yards per pound (26 to 28 $m^2$/kg) and known to the trade as "count of 32 by 24").

12.7.3.3 A damper, if employed for regulating velocity in the duct system, is to be located ahead of the test section.

12.7.3.4 For a collecting screen, use a double layer of cheesecloth (the same type of cheesecloth as specified for the fan inlet) stretched taut on a frame sized to provide for an area not less than five times the inside cross-sectional area of the test section.

12.7.3.5 The test sample should not be exposed to a relative humidity greater than 70 % for 24 h prior to the test.

12.7.3.6 The air velocity for the test is dependent upon the use of the product. For this procedure the test velocity depends on the manufacturer's rated velocity for the product. The test air velocity is 2.5 ± 5 % times the product rated maximum use velocity.

12.7.3.7 Before installing the collecting screen, pass air through the lined test section at the test velocity for 1 h.

12.7.3.8 Then install the collecting screen 12 in. (305 mm) from the outlet end of the test section.

12.7.3.9 The test then is to proceed at test velocity and to continue for a period of 4 h. Examine the collecting screen for macroscopic particles at the end of each hour during the test period by taping the screen with the adhesive side of transparent tape, or tapes, in order to remove and record any eroded particles. At the end of the test period, there is to be no evidence of continued erosion, and interior surfaces of the sample are not to show evidence of cracking, flaking, peeling, or delamination. For the purpose of this requirement, continued erosion is considered to be either a constant or increasing rate of erosion.

12.7.4 *Precision and Bias*—No information is presented about either the precision or bias of this method for measuring erosion resistance since the test result is nonquantitative.

12.8 *Odor Emission*— The odor emission shall be determined in accordance with Test Method C 1304.

12.9 *Surface Burning Characteristics*—The surface burning characteristics shall be determined in accordance with Test Method E 84, UL 723, or NFPA 255. For Canada, the surface burning characteristics shall be determined in accordance with Test Method CAN/ULC-S102-M88.

12.10 *Apparent Thermal Conductivity*—The apparent thermal conductivity shall be determined in accordance with Test Method C 177, Test Method C 518, or Test Method C 1114 at 75°F (24°C) mean temperature and with a minimum temperature difference of 40°F (22°C). If Test Method C 518 is used



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the manufacturer shall certify that recent calibrations have been made.

12.11 *Sound Absorption Coefficients*—The sound absorption coefficients shall be determined in accordance with Test Method C 423, with a type "A" mounting as specified in Practice E 795.

12.12 *Bacteria Resistance*—The bacteria resistance shall be determined in accordance with Standard Practice G 22.

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 may be rejected. Rejection should be reported to the producer or supplier promptly and in writing.

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 may be accepted 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. When specified in the purchase order or contract, a report of the test result shall be furnished. (Refer to Criteria C 390 certification.)

## 16. Packaging and Package 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 face of the liner shall be marked with the following: type, thickness, and manufacturer.

## 17. Keywords

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

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