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Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation¹

This standard is issued under the fixed designation C 764; 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 and physical properties of nodulated mineral fiber thermal insulation for use in attics or enclosed spaces in housing and other framed buildings.

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

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

B 152/B 152M Specification for Copper Sheet, Strip, Plate, and Rolled Bar

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 518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C 687 Practice for Determination of Thermal Resistance of Loose-Fill Building Insulation

C 870 Practice for Conditioning of Thermal Insulating Materials

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

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

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

C 1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

C 1374 Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation

C 1574 Guide for Determining Blown Density of Pneumatically Applied Loose-Fill Mineral Fiber Thermal Insulation

E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750C

E 970 Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source

G 1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology C 168.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *settled density*—The mass per unit volume of a loose-fill insulation after which time or forces, or both, have exerted their effect upon thickness.

3.2.1.1 *Discussion*—The settled density is determined using long term aging studies in attics.

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.

4. Classification

- 4.1 The nodulated mineral fiber thermal insulation shall be of the following types and classes:
- 4.1.1 *Type I*—Pneumatic application.
- 4.1.2 *Type II*—Poured application.

5. Ordering Information

5.1 Both types of nodulated mineral fiber thermal insulation are intended for use as thermal insulation in open spaces, such as attics and enclosed spaces, such as walls, in housing and buildings at ambient temperatures. Type I is used for pneumatic application (blown or conveyed by an air stream through a hose and discharged over the area to be insulated). Type II is used for application by pouring in place.

6. Materials and Manufacture

6.1 *Basic Material*— The basic material shall be fibers made from mineral substances such as rock, slag, or glass processed from the molten state into an incombustible fibrous form.

6.2 *Manufacture*— The fibers shall be mechanically processed into nodules, and are permitted to be treated to provide improved processing and handling characteristics suitable for installation by pouring or pneumatic applications.

7. Physical Properties

7.1 *Thermal Characteristics*—The standard thermal resistance values normally recommended for open application are expressed in °F·h·ft²/Btu (K·m²/W). Typical values are shown in Table 1. *R* values others than those listed in Table 1 shall be as agreed upon between the supplier and the purchaser. The thermal resistance *R* for the average of any (four) randomly selected samples shall not be more than 5 % below the mutually agreed upon *R* value when tested in accordance with 12.2, nor shall any single specimen be more than 10 % below the mutually agreed upon *R* value.

7.2 *Critical Radiant Flux*—Mineral fiber loose fill when tested in accordance with 12.3 shall have a critical radiant flux-flame propagation resistance $\geq 0.12 \text{ W/cm}^2$ (.11 Btu/ft²·s).

7.3 *Combustion Characteristics* —Mineral fiber loose fill when tested in accordance with 12.4 shall not have a recorded temperature rise of more than 54°F (30°C); shall have no flaming after the first 30 s; and, if the specimen weight loss exceeds 50 % during the test, the recorded temperature of the specimen during the test shall not rise above the furnace air temperature at the beginning of the test, and there shall be no flaming of the specimen.

7.4 *Water Vapor Sorption*—The water vapor sorption of the insulation shall not be more than 5 % by weight when tested in accordance with 12.5.

7.5 *Odor Emission*— A detectable odor of a strong objectionable nature recorded by more than two of the five panel members shall constitute rejection of the material when tested in accordance with 12.6.

7.6 *Corrosiveness*— When tested in accordance with 12.7, the metal plates that are in contact with the insulation shall show no corrosion greater than the comparative plates that are in contact with sterile cotton that has been tested in the same manner.

7.7 *Fungi Resistance*—When tested in accordance with 12.8, the insulation shall have growth no greater than that observed on the white birch tongue depressor comparative material.

TABLE 1 Coverage Chart

NOTE 1—Chart is occasionally given in metric units.

<i>R</i> Value at 75°F Mean Temperature	Maximum Net Coverage		Minimum Thickness		Minimum Weight per ft ²
To obtain an insulation resistance (<i>R</i>) of: $\frac{h \cdot ft^2 \cdot ^\circ F}{Btu}$	Minimum bags per 1000 ft ² of net area (bags/MSF)	Maximum ft ² coverage per bag (ft ²)	Installed insulation to be not less than: (in.)	Settled thickness not to be less than: (in.)	The weight per ft ² of installed insulation to be not less than: (lbs/ft ²)
Attic:					
11					
13					
15					
19					
22					
26					
30					
33					
38					
44					
49					
60					
Sidewalls ^A : <i>R</i> —					

^A Optional information for products intended for sidewall application.

8. Other Requirements

8.1 *Qualification Requirements*—The following requirements are generally emphasized for purposes of initial material product requirements:

- 8.1.1 Thermal resistance,
- 8.1.2 Critical radiant flux,
- 8.1.3 Combustion characteristics,
- 8.1.4 Water vapor sorption,
- 8.1.5 Odor emission,
- 8.1.6 Corrosiveness, and
- 8.1.7 Fungi Resistance.

8.2 *Inspection Requirements*—The following requirements are generally emphasized for purposes of acceptance sampling of lots of qualified thermal insulation:

- 8.2.1 Minimum bag weight, and
- 8.2.2 Workmanship.

9. Workmanship

9.1 Mineral fiber nodulated insulation shall be free of foreign materials and shall be clean and dry. The insulation shall not have visible defects that will adversely affect the service quality.

10. Significance and Use

10.1 This specification covers products that are used in buildings. While products that comply with this specification are used in various constructions, they are adaptable primarily, but not exclusively, to wood frame constructions.

11. Sampling—Sampling and Conditioning

11.1 Sampling of the insulation shall be in accordance with Practice C 390. Specific provisions for sampling shall be agreed upon between the purchaser and supplier.

11.2 Condition the test samples in accordance with Practice C 870.

12. Test Methods

12.1 *Blown Density*—Determine the blown density in accordance with Guide C 1574.

12.2 *Thermal Resistance*—Using samples prepared in accordance with 12.1 and adjusted to the settled density, the thermal conductivity or thermal conductance shall be determined in accordance with Test Method C 518, Test Method C 177, or derived from measurements made by Test Method C 1363. The mean temperature shall be 75°F (23.9°C) and the temperature difference shall be a minimum of 40°F (22°C). The thermal resistance shall then be calculated from the thermal conductance values using Practice C 687. See Note 1.

NOTE 1—The thermal resistance is a function of mean temperature. As an option, determine the thermal resistance at additional mean temperatures as agreed upon by the purchaser and the manufacturer.

12.3 *Critical Radiant Flux*—The critical radiant flux of the insulation shall be determined in accordance with Test Method E 970.

12.4 *Behavior of Materials in a Vertical Tube Furnace at 1382°F (750°C)*—The behavior of mineral fiber loose-fill insulation in a vertical tube furnace at 1382°F (750°C) shall be determined in accordance with Test Method E 136.

12.5 *Water Vapor Sorption*—The water vapor sorption of the test specimen shall be determined in accordance with Test Method C 1104/C 1104M.

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

12.7 *Corrosiveness:*

12.7.1 *Scope*—This test method provides a qualitative measure of the corrosiveness of mineral fiber insulation by comparison to a control.

12.7.2 *Summary of Test Method:*

12.7.2.1 Individually sandwich five each of specially cleaned steel, copper, and aluminum test plates between pieces of insulation. Hold the insulation uniformly against each side of the test plate with wire screens and rubber bands.

12.7.2.2 Sandwich an equal number of cleaned metal test plates between pieces of washed sterile cotton in an identical manner.

12.7.2.3 Vertically suspend the samples in a humidity test chamber at $95 \pm 3\%$ relative humidity and temperature of $120 \pm 3^\circ\text{F}$ ($49 \pm 2^\circ\text{C}$) for time periods determined by the type of metal being tested. Steel is tested for 96 ± 2 h. Copper and aluminum are tested for 720 ± 5 h.

12.7.2.4 After the appropriate test period, compare the test plates exposed to the insulation to the control plates exposed to sterile cotton for severity of corrosion. The insulation is considered to have passed this test if the corrosion attributed to the insulation is not significantly worse than that of the washed sterile cotton controls. The criterion for acceptance is predetermined through the use of non-parametric statistics and a 90 % confidence level ($\alpha = 0.10$).