



Designation: C991 – 23

Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings¹

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1. Scope

1.1 This specification covers the classification, composition, and physical properties of flexible fibrous glass insulation for use in metal building roofs and walls.

1.2 The basic insulation blanket is designed to be post-processed by a laminating process that applies an adhesive bonded facing.

1.3 The thermal values measured in accordance with this specification for both pre-processed and post-processed insulation are for the insulation only and do not include the effects of air-film surface resistance, changes in mean temperature, or compression of insulation at the framing members of the building, through metal conductance of fasteners and other parallel heat-transfer paths due to design or installation techniques.

1.4 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.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

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.

- 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
 - C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - C653 Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral Fiber Insulation
 - C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
 - C755 Practice for Selection of Water Vapor Retarders for Thermal Insulation
 - C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
 - C1104/C1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation
 - C1136 Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - 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
 - E136 Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C
 - E2988 Practice for Specimen Preparation and Mounting of Flexible Fibrous Glass Insulation for Metal Buildings to Assess Surface Burning Characteristics
- 2.2 *Other Referenced Document:*
- CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies³

³ Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

3. Terminology

3.1 *Definitions*—For definitions of terms relating to insulation, refer to Terminology **C168**.

4. Classification

4.1 The flexible fibrous glass insulation is furnished in two types, as follows:

4.1.1 *Type I*—Glass processed from the molten state into fibrous form, bonded with a thermosetting resin, and formed into a blanket or batt.

4.1.2 *Type II*—Type I material supplied with a suitable facing adhered to one surface.

NOTE 1—Facing properties are not part of this specification. The designer is referred to Practice **C755** and Specification **C1136** for guidance in selecting water vapor permeance and other physical property requirements.

5. Ordering Information

5.1 Type I material shall be ordered by specifying thermal resistance value, length, and width.

5.2 Type II material shall be ordered by specifying thermal resistance value, type of facing, facing permeance, length, width, number of tabs, and tab width.

5.3 Certification, when required, shall be in accordance with Section **11**.

6. Physical Properties

6.1 *Type I Material:*

6.1.1 The unfaced insulation shall meet the following requirements:

6.1.1.1 *Thermal Resistance*—The average R-value of nine tests, one each performed on three randomly selected specimens from each of three rolls, shall be not less than 103 % of the R-value agreed upon by the purchaser and the supplier.

(1) The average thickness of each roll shall be determined by Test Method **C167** and the lesser of measured or labeled thickness tested.

(2) The thermal resistance of the pre-processed (unlaminated) insulation shall be determined in accordance with Guide **C653**, using Practice **C1045** and either Test Method **C177** or **C518** at a mean temperature of 75°F (23.9°C) with a minimum temperature difference of 40°F (22°C) for determining the apparent thermal conductivity.

NOTE 2—See Guide **C653**. The thermal resistance is a function of temperature. As an option, the thermal resistance may be determined at additional temperatures as agreed upon by the purchaser and the manufacturer.

6.1.2 *Surface Burning Characteristics*—The unfaced insulation shall exhibit a flame spread index not exceeding 25 and a smoke developed index not exceeding 50 when tested in accordance with either Test Method **E84**, with specimens prepared and mounted per Practice **E2988**, or with CAN/ULC **S102**, depending on the applicable code requirements.

6.1.3 *Combustion Characteristics*—The material shall pass the requirements of Test Method **E136**.

6.1.4 *Water Vapor Sorption*—The water vapor sorption from exposure to water vapor shall not be greater than 0.2 % by

volume when determined in accordance with the procedure set forth in Test Method **C1104/C1104M**.

6.1.5 *Fungi Resistance*—When tested in accordance with the procedure set forth in Test Method **C1338**, the insulation shall exhibit no growth.

6.1.6 *Corrosiveness:*

6.1.6.1 When tested in accordance with the procedure in Specification **C665**, the metal plates in contact with the insulation shall show no greater corrosion than that observed on the comparative plates in contact with sterile cotton.

6.1.6.2 *Alternative Test (for steel only)*—When tested in accordance with the procedure in Practice **C1617**, the mass loss corrosion rate of the unfaced insulation extract shall not exceed that of the 5 ppm chloride solution.

NOTE 3—The testing of other metals such as copper and aluminum is being evaluated using Practice **C1617**. The task group will continue to investigate the potential for using this practice as an alternative to section 13.8 of Specification **C665** for these metals.

6.1.7 *Odor Emission*—When tested in accordance with Test Method **C1304**, the insulation shall not emit a detectable odor objectionable to more than two of the five panel members.

6.1.8 *Dimensional Tolerances*—The average measured length and width shall not differ from the manufacturer's standard dimensions, when determined in accordance with Test Methods **C167**, (**Note 4**) by more than the following:

Length, – 0 in. (–0 mm)
Width, – 1/8 in. (–3 mm)

NOTE 4—Normally, a slight excess in all dimensions will be permitted. However, the purchaser may elect to specify a maximum tolerance to meet further processing requirements.

6.2 *Type II Material:*

6.2.1 Type II shall consist of a Type I blanket laminated with a facing.

6.2.1.1 The facing shall meet the requirements of Specification **C1136** for corrosion resistance, fungi resistance, and non-leachability (permanence) of flame retardants, as certified by the facing supplier.

6.2.2 The faced insulation shall meet the following requirements:

6.2.2.1 *Thermal Resistance*—The average R-value of nine tests, one each performed on three randomly selected specimens from each of three rolls, shall be not less than 95 % of the R-value agreed upon by the purchaser and the supplier.

(1) The average thickness of each roll shall be determined by Test Method **C167** and the lesser of measured or labeled thickness tested.

(2) The thermal resistance of the post-laminated insulation shall be determined in accordance with Guide **C653**, using Practice **C1045** and either Test Method **C177** or Test Method **C518** at 75°F (23.9°C) with a minimum temperature difference of 40°F (22°C) for determining the apparent thermal conductivity.

6.2.2.2 *Surface Burning Characteristics*—The faced insulation shall exhibit a flame spread index not exceeding 25 and a smoke developed index no exceeding 50 when tested on the facing side in accordance with either Test Method **E84**, with