



## Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings<sup>1</sup>

This standard is issued under the fixed designation C 991; 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.

### 1. Scope

1.1 This specification covers the classification, composition, and physical properties of flexible glass fiber insulation for use as interior surface of walls and roofs of metal buildings.

1.2 The basic insulation blanket is designed to be post-processed by a laminating process that applies an adhesive bonded facing to provide the interior finish and vapor retarder requirements for the building envelope.

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 the standard. The values given in parentheses are provided for information only.

1.5 The following safety caveat pertains to the Test Method section of this specification: *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<sup>2</sup>
- C 168 Terminology Relating to Thermal Insulating Materials<sup>2</sup>
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus<sup>2</sup>
- C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots<sup>2</sup>
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of

- The Heat Flow Meter Apparatus<sup>2</sup>
- C 653 Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral Fiber Insulation<sup>2</sup>
- C 1104 Test Method for Determining Water Vapor Sorption of Unfaced Mineral Fiber Insulation.<sup>2</sup>
- C 1136 Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation<sup>2</sup>
- C 1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings<sup>2</sup>
- E 84 Test Method for Surface Burning Characteristics of Building Materials<sup>3</sup>
- E 96 Test Methods for Water Vapor Transmission of Materials<sup>2</sup>
- 2.2 *Other Referenced Documents:*
  - CAN/ULC-S102-M88 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies<sup>4</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms relating to insulation, refer to Terminology C 168.

### 4. Classification

4.1 The flexible 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 resilient flexible blanket or batt.

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

### 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 12.

### 6. Physical Properties

#### 6.1 *Type I Material:*

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.06.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.07.

<sup>4</sup> Available from Underwriters Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario Canada M1R 3A9.



6.1.1 *Thermal Resistance*—The thermal resistance of the pre-processed insulation from nine randomly selected specimens, three specimens from each of three rolls, shall be not less than 100% of the R-value agreed upon between the purchaser and the supplier. Use Test Method C 177 or C 518 at 75°F (23.9°C) with a minimum temperature difference of 40°F (20°C) for determining apparent thermal conductivity. Use Test Methods C 167 to determine the average thickness for each roll.

NOTE 1—See Guide C 653. The thermal resistance is a function of mean temperature. As an option, the thermal resistance may be determined at additional mean temperatures as agreed upon by the purchaser and the manufacturer.

6.1.2 *Surface Burning Characteristics*—The surface burning characteristics, determined in accordance with Test Method E 84. For Canada, test in accordance with CAN/ULC-S102-M88. Results shall be no greater than:

Flame spread 25  
Smoke developed 50

For Canada, test in accordance with CAN/ULC-S102-M88.

6.1.3 *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 C 1104.

6.1.4 *Fungi Resistance*—When tested in accordance with the procedure set forth in Test Method C 1338, the insulation shall exhibit no growth.

6.1.5 *Dimensional Tolerances*—The average measured length and width shall not differ from the manufacturer's standard dimensions, when determined in accordance with Test Methods C 167, (Note 2) by more than the following:

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

NOTE 2—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 meet the requirements of 6.1 except it shall be faced on one side with a suitable vapor retarder and exhibit the following.

6.2.2 *Thermal Resistance*—The thermal resistance of the post-processed insulation from nine randomly selected specimens, three specimens from each of three rolls, shall be not less than 90 % of the R-value agreed upon between the purchaser and the supplier. Use Test Method C 177 or C 518 at 75°F (23.9°C) with a minimum temperature difference of 40°F (20°C) for determining apparent thermal conductivity. Use Test Methods C 167 to determine the average thickness for each roll.

6.2.3 *Surface Burning Characteristics*—Determine the surface burning characteristics on the facing side of the composite material.

6.2.4 *Humid Aging*—The material, when tested in accordance with 9.1, shall not exhibit (a) corrosion of the facing, (b) delamination of the facing, or (c) lack of adhesion of facing to insulation.

6.2.5 The water vapor permeance of the facing shall not be greater than 1.0 perm ( $5.7 \times 10^{-11}$  kg/Pa·s·m<sup>2</sup>) when tested in

accordance with the Desiccant Method of Test Methods E 96, with a chamber temperature of 73.4°F (23°C) and 50 % relative humidity.

NOTE 3—Specific permeance requirements shall be determined by the designer based on the requirements of the conditioned space. Better permeance performance (lower water vapor permeance), or determination of performance at different conditions than stated in 6.2.5, shall be specified by the designer when necessary.

6.2.6 *Facing Properties*—Although other facing properties are not part of this specification, properties required in Specification C 1136 may be pertinent to application or performance.

## 7. Workmanship

7.1 Both Type I and Type II material shall indicate good workmanship in fabrication and shall not have visible defects which adversely affect its serviceability.

## 8. Sampling

8.1 Quality control records, maintained by the manufacturer, will usually suffice in the relationship between the purchaser and the manufacturer. If they mutually agree to accept lots on the basis of quality control records, no further sampling is required.

8.2 If the above procedure is not acceptable, sampling shall be in conformance with Criteria C 390.

## 9. Test Method

### 9.1 *Humid Aging:*

9.1.1 *Apparatus*—A humidity cabinet capable of maintaining conditions of 120 ± 3°F (49 ± 1°C) 95 % ± 3 % relative humidity.

9.1.2 *Test Specimen*—A minimum of three 12 by 12 in. (300 by 300 mm) by total insulation thickness with facing adhered shall be selected.

9.1.3 *Procedure*—Place the test specimens in the humidity cabinet in such a manner that the facing is not in contact with any portion of the cabinet. Test duration shall be 30 days.

9.1.4 *Report*—The report shall include the following:

9.1.4.1 *Facing corrosion*—Any evidence of corrosion if the facing is a laminated construction containing metal foil,

9.1.4.2 *Facing Delamination*—Delamination of facing if it is a laminated construction, and

9.1.4.3 *Facing Adhesion*—Whether the facing remained firmly adhered to the insulation.

9.1.5 *Precision and Bias*—This test method is subjective in nature and does not have measured parameters that are subject to numerical tolerances on precision and bias.

## 10. Inspection

10.1 Inspection of the material shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

## 11. Rejection and Rehearing

11.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of



dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

## **12. Certification**

12.1 When specified in the purchase order or contract, a producer's, supplier's or independent third party's certification shall be furnished to the purchaser indicating 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 results shall be furnished.

## **13. Health and Safety Hazards**

13.1 The manufacturer shall provide the users with information regarding any hazards and recommended protective measures to be employed for safe installation and use of the material.

## **14. Product Marking**

14.1 Unless otherwise specified, the package shall be marked with the seller's name and designation, length, width, thickness, *R*-value, total number of square feet, manufacturing date code, surface burning characteristics and, if applicable, type of facing.

## **15. Packaging**

15.1 Unless otherwise agreed or specified between the purchaser and the manufacturer or seller, the insulation shall be packed in the manufacturer's standard commercial container.

15.2 If there is residual moisture in the product at the time of packaging, the package shall be suitably vented to allow for the dissipation of the moisture.

## **16. Storage**

16.1 The material shall be stored in accordance with the manufacturer's recommendations unless otherwise agreed upon between the purchaser and manufacturer.

16.2 If there are no manufacturers' recommended storage requirements, the material shall be stored in such a manner as to protect the package from direct sunlight, and from weather and temperature extremes. Temperature limitations may apply to some facings.

## **17. Keywords**

17.1 faced insulation; metal building; thermal insulation

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