ACCEPTANCE CRITERIA FOR POLYESTER LOOSE-FILL AND BLANKET INSULATIONS

AC187

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PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

> The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (**❙**) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (**➜**) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

ACCEPTANCE CRITERIA FOR POLYESTER LOOSE-FILL AND BLANKET INSULATIONS

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for polyester loose-fill and blanket insulations to be recognized in ICC Evaluation Service, Inc. (ICC-ES), evaluation reports under the 2003 *International Building Code*® (IBC), the 2003 *International Residential Code*® (IRC), the BOCA® *National Building Code*/1999 (BNBC), the 1999 *Standard Building Code*© (SBC) and the 1997 *Uniform Building Code*™ (UBC). The bases of recognition are IBC Section 104.11, IRC Section R104.11, BNBC Section 106.4, SBC Section 103.2 and UBC Section 104.2.8.

1.2 Scope: This criteria is limited to polyester insulation materials located on or within floor-ceiling and roof-ceiling assemblies, walls, crawl spaces or attics. The products are limited to use in areas where the ambient air temperature is limited to 180˚F (82˚C), maximum.

1.3 Codes and Reference Standards:

1.3.1 2003 *International Building Code*®, International Code Council.

1.3.2 2003 *International Residential Code*®, International Code Council.

1.3.3 BOCA® *National Building Code*/1999 (BNBC).

1.3.4 1999 *Standard Building Code*© (SBC).

1.3.5 1997 *Uniform Building Code*™.

1.3.6 ASTM C 167-03, Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations, ASTM International.

1.3.7 ASTM C 177-97, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-hot-plate Apparatus, ASTM International.

1.3.8 ASTM C 518-02, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus, ASTM International.

1.3.9 ASTM C 653-02, Guide for Determination of the Thermal Resistance of Low-density Blanket-type Mineral Fiber Insulation, ASTM International.

1.3.10 ASTM C 665-01, Specification for Mineral-fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing, ASTM International.

1.3.11 ASTM C 687-02, Practice for Determination of Thermal Resistance of Loose-fill Building Insulation, ASTM International.

1.3.12 ASTM C 739-03, Specification for Cellulosic Fiber Loose-fill Thermal Insulation, ASTM International.

1.3.13 ASTM C 1104-00, Test Method for Determining the Water Vapor Sorption of Unfaced Mineral-fiber Insulation, ASTM International.

1.3.14 ASTM C 1304-01, Test Method for Assessing the Odor Emission of Thermal Insulation Materials, ASTM International.

1.3.15 ASTM C 1338-00, Test Method for Determining the Fungi Resistance of Insulation Materials and Facings, ASTM International.

1.3.16 ASTM C 1363-97, Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus, ASTM International.

1.3.17 ASTM D 1929-01, Test Method for Ignition Determining Temperature of Plastics, ASTM International.

1.3.18 ASTM E 84-04, Test Methods for Surface Burning Characteristics of Building Materials, ASTM International.

1.3.19 ASTM E 970-00, Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source, ASTM International.

1.3.20 CAN/ULC S102.2-88, Surface Burning Characteristics of Building Materials and Assemblies, Underwriters Laboratories of Canada.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description: Complete information concerning material specifications, thickness, size and the manufacturing process.

2.1.2 Installation Instructions: Installation details and limitations, fastening methods, joint treatments, and face treatments.

2.1.3 Packaging and Identification: A description of the method of packaging and field identification of the insulation materials. Identification provisions shall include the evaluation report number.

2.1.4 Field Preparation: A description of the methods of field-cutting, application and finishing.

2.2 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

2.3 Test Reports: Test reports shall comply with AC85.

2.4 Product Sampling: Products for testing shall be sampled in accordance with Section 3.2 of AC85. Upon submission of initial, qualifying test data to ICC-ES, the report applicant shall submit an affidavit certifying that the product tested is representative of the standard manufactured product for which recognition is being sought. Alternately, the report applicant may choose to have the product sampled independently by an accredited quality control agency (in lieu of the affidavit).

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 General: For recognition under the IBC only, the insulation materials shall be shown not to be subject to an increase in the flame-spread index or smoke-developed index beyond the limits established in this criteria through the effects of age, moisture, or other atmospheric conditions.

3.2 Loose-fill Insulation: Reports of the following tests shall be submitted:

3.2.1 Density: Density shall be determined in accordance with Section 4.1 of this criteria. The density determined shall be equal to or less than the design density of the manufacturer.

The density shall be determined for each thickness (*t*), at 2-inch (51 mm) intervals, within the range of thicknesses to be recognized in the evaluation report. Three test specimens shall be measured for each thickness.

3.2.2 Thermal Resistance: The thermal conductivity of the insulation shall be determined in accordance with ASTM C 177 or ASTM C 518 over the density range determined in accordance with Section 3.2.1 of this criteria. Section 7.1 of ASTM C 687 shall be followed for sample preparation. The mean temperature shall be 75˚F (23.9˚C) and the temperature difference shall be a minimum of 40˚F (22˚C). A minimum of five thermal conductivity values shall be determined, at the lowest and highest densities and at three evenly spaced intervals between the lowest and highest values. Test specimen thickness shall be 6 inches (152 mm). An expression for the apparent thermal conductivity (λ) as a function of density (D), having the form $\lambda = a + bD + c/D$, shall be determined in accordance with ASTM C 653, except that the number of test points shall be as noted in this criteria.

Thermal resistance (*R*) values for thicknesses of horizontally applied material within the range tested in accordance with Section 4.1.1.1 of this criteria shall be computed using the following equations:

$$\lambda = A + B \cdot D + C/D$$

$$D = a + b \cdot t$$

$$R = t/\lambda$$

3.2.3 Water Vapor Sorption: The insulation materials shall be tested in accordance with ASTM C 1104. The water vapor sorption shall not be more than 5 percent by weight.

3.2.4 Odor Emission: The insulation materials shall be tested in accordance with ASTM C 1304. A detectable odor of objectionable nature recorded by more than two of the five panel members shall constitute failure.

3.2.5 Corrosiveness: The insulation materials shall be tested in accordance with Section 9 of ASTM C 739. The composition of the insulation material shall be such that after testing, no perforation of the 3-mil (0.076 mm) metal specimens is observed over a 40-watt appliance lightbulb. Notches extending into the coupon 3 mm or less from any edge shall be ignored.

3.2.6 Fungi Resistance: The insulation materials shall be tested in accordance with ASTM C 1338. If the growth on two or more of the replicate test items is greater than that on the comparative item, the test item shall be considered to fail.

3.2.7 Ignition Properties: The insulation materials shall be tested in accordance with ASTM D 1929. The insulation materials shall have a self-ignition temperature of 650˚F (343˚C) or greater.

3.2.8 Flame-spread Characteristics: The insulation materials shall be tested in accordance with UBC Standard 8-1, Section 8.105.6 (UBC) or CAN/ULC S102.2 (IBC, IRC). The insulation materials shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 450.

3.2.9 Critical Radiant Flux: The insulation materials shall be tested in accordance with ASTM E 970. The critical radiant flux shall be equal to or greater than 0.12 W/cm^2 (0.11 Btu/ft^2-s). All values shall be reported to two significant digits.

3.3 Blanket Insulation: Reports of the following tests shall be submitted:

3.3.1 Density: Density shall be determined in accordance with ASTM C 167. The density determined shall be equal to or less than the design density of the manufacturer.

3.3.2 Thermal Resistance: The insulation blanket shall be tested in accordance with ASTM C 518, ASTM C 177 or shall be derived from measurements made in accordance with ASTM C 1363, at the density determined in accordance with Section 3.3.1 of this criteria. 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 be calculated from the thermal conductance values using Practice C 687. The *R*-value shall be reported in the evaluation report.

3.3.3 Water Vapor Sorption: The insulation blanket shall be tested in accordance with ASTM C 1104. The water vapor sorption shall not be more than 5 percent by weight.

3.3.4 Odor Emission: The insulation blanket shall be tested in accordance with ASTM C 1304. A detectable odor of objectionable nature recorded by more than two of the five panel members shall constitute failure.

3.3.5 Corrosiveness: The insulation blanket shall be tested in accordance with Section 13.8 of ASTM C 665. The composition of the insulation material shall be such that after testing, no perforation of the 3-mil (0.076 mm) metal specimens is observed over a 40-watt appliance lightbulb. Notches extending into the coupon 3 mm or less from any edge shall be ignored.

3.3.6 Fungi Resistance: The insulation blanket shall be tested in accordance with ASTM C 1338. If the growth on two or more of the replicate test items is greater than that on the comparative item, the test item shall be considered to fail.

3.3.7 Ignition Properties: The insulation blanket shall be tested in accordance with ASTM D 1929. The insulation materials shall have a self-ignition temperature of 650˚F (343˚C) or greater.

3.3.8 Flame-spread Characteristics: The insulation blanket shall be tested in accordance with UBC Standard 8-1 (UBC) or ASTM E 84 (IBC, IRC, BNBC and SBC). The insulation materials shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 450.

3.3.9 Critical Radiant Flux: The insulation blanket shall be tested in accordance with ASTM E 970. The critical radiant flux shall be equal to or greater than 0.12 W/cm^2 (0.11 Btu/ft^2-s). All values shall be reported to two significant digits.

4.0 TEST METHODS

4.1 Density of Loose-fill Insulation Materials: Based on ASTM C 519 (discontinued):

4.1.1 Apparatus:

4.1.1.1 Loose Fill Insulation Containers: The containers shall have inside dimensions of not less than 18 by 14 inches (457 by 355 mm). The depth of the containers shall be a minimum of 4 inches (102 mm) and shall include the range of installation thicknesses for which recognition is sought. The container shall be closed on the bottom.

4.1.1.2 Insulation Thickness Indicator: A depth gage as described in ASTM C 167 shall be used to measure the thickness of the fill.

4.1.1.3 Scales: Scales shall have an accuracy of at least 0.5 percent of the sample weight.

4.1.1.4 Blowing Machine: The automatic pneumatic blowing machine shall be designed for blowing the specific material to be tested utilizing 150 feet (46 m) of at least 3-inch-diameter (76.2 mm) flexible corrugated blowing hose.

4.1.2 Conditioning: Condition samples for at least 24 hour at 50 ± 2% relative humidity and 73 ± 2°F (23 ± 1.1°C) and test under ambient conditions.

4.1.3 Sample Preparation:

4.1.3.1 Blowing Samples (To be used when fibrous insulations are recommended by the manufacturer for installation by blowing):

4.1.3.1.1 The loose fill insulation container shall be located on a level floor in front of an operator directing the blowing hose.

4.1.3.1.2 The horizontal distance between the end of the flexible hose from which the insulation is blown and the container shall be between 7 and 8 feet (2.1 and 2.4 m).

4.1.3.1.3 The end of the flexible blowing hose shall be held in a horizontal position at a height from 3 to 5 feet (0.9 to 1.5 m) above the surface upon which the container is resting.

4.1.3.1.4 A package of insulation shall be fed into the hopper of the blowing machine. Blowing time will vary, depending upon the size of the package containing the insulation.

4.1.3.1.5 When the velocity of the insulation being blown is sufficient to fill the container, make the specimen.

4.1.3.1.6 Level off the top surfaces of the blown sample by hand. The nature of the blown insulation is such that it cannot be screeded as is done with sand; therefore, care shall be taken not to compact the insulation or leave large voids in the surface of the material.

4.1.3.2 Poured Samples: For fibrous loose fill insulation, which is recommended *only* for pouring-in-place, the package of insulation is opened and poured directly into the loose fill insulation container and leveled off in a similar manner.

4.1.4 Procedure:

4.1.4.1 After the container of loose fill insulation has been prepared, determine the insulation thickness using the depth gage (see Section 4.1.1.2). Five measurements are taken for each container of insulation, one near each corner and one in the center. The average of the five measurements establishes the thickness. The volume determined using this average thickness and the insulation weight are used to calculate the density, *D*.

4.1.4.2 Fresh material is used to repeat the test for a total of three times.

4.1.4.3 The tare weight of the insulation container is determined by placing the empty container on the scales (see Section 4.1.1.3) and reading the weight. After the filling and leveling operations, the insulation-filled container is re-weighed. Calculate the insulation weight in pounds.

4.1.5 Calculations:

4.1.5.1 Calculate the insulation weight, W_l, as follows:

$$W_l = W_f - W_t$$

where:

W_l = Insulation weight, lb (kg).

W_f = Weight of filled container, lb (kg).

W_t = Weight of empty container, lb (kg).

4.1.5.2 Calculate the density for each specimen from the average thickness as follows:

$$D = W_l / V$$

where:

D = Density, lb/ft^3 (kg/m^3).

W_l = Weight of insulation, lb (kg).

V = Volume of container, ft^3 (m^3).

4.1.5.3 The density (D) of the test sample shall be represented by the following equation where the parameters a and b are determined from the measured data using the Method of Least Squares: $D = a + bt$. D at a thickness of 4 inches (102 mm) shall be used for thicknesses less than 4 inches (102 mm).

4.1.6 Report: The individual and average density of the five tests shall be reported, in pounds per cubic foot (kg/m^3), in accordance with Section 4.1.5.2, and the density of the test sample in accordance with Section 4.1.5.3. Calculations used to establish the density of the test sample shall be included. The report shall include the method of sample preparation, that is, *blown* or *poured*.

5.0 QUALITY CONTROL

5.1 A quality control manual complying with the ICC-ES Acceptance Criteria for Quality Control Manuals (AC10) shall be submitted.

5.2 Third-party follow-up inspections are not required under this acceptance criteria.■