



## EVALUATION GUIDELINE FOR COTTON FIBER INSULATION

**EG81**

**Effective March 1, 2004**

### 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 document has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the document. The guideline has been approved 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 guideline, while reports issued prior to this date may be in compliance with this guideline or with the previous edition. If the guideline is an updated version from the previous edition, a solid vertical line (|) in the margin within the guideline 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 guideline may be further revised as the need dictates.

ICC-ES may consider alternate guidelines, provided the report applicant submits valid data demonstrating that the alternate guidelines are at least equivalent to the guidelines 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 guidelines set forth in this document, or that it can be demonstrated that valid alternate guidelines are equivalent to the guidelines 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.

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# EVALUATION GUIDELINE FOR COTTON FIBER INSULATION

## 1.0 INTRODUCTION

**1.1 Purpose:** The purpose of this evaluation guideline is to establish requirements for cotton fiber insulation to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2003 *International Building Code*<sup>®</sup> (IBC) and the 2003 *International Residential Code*<sup>®</sup> (IRC). Bases of recognition are IBC Section 104.11 and IRC Section R104.11. The applicable code section in the IBC is Section 719; and in the IRC is Section R316.

**1.2 Scope:** Cotton fiber insulation is unfaced batt insulation used as concealed thermal insulation in walls, floors, ceilings, attics and crawl spaces, and as a component of a fire-resistance-rated assembly.

**1.3 Codes and Reference Standards:** Where standards are referenced in this guide, these standards shall be applied consistently with the code upon which compliance is based.

### 1.3.1 Codes:

**1.3.1.1** 2003 *International Building Code*<sup>®</sup> (IBC), International Code Council.

**1.3.1.2** 2003 *International Residential Code*<sup>®</sup> (IRC), International Code Council.

### 1.3.2 Reference Standards (ASTM International):

**1.3.2.1** ASTM B 152/152M-00, Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar.

**1.3.2.2** ASTM E 84-01, Test Methods for Surface Burning Characteristics of Building Materials.

**1.3.2.3** ASTM E 119-00, Test Methods for Fire Tests of Building Construction and Materials.

**1.3.2.4** ASTM C 167-98 (2003), Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulation.

**1.3.2.5** ASTM C 177-97, Standard Test Method for Steady-State Heat Flux in Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

**1.3.2.6** ASTM C 518-02e1, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

**1.3.2.7** ASTM C 739-03e1, Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.

**1.4 Definition: Cotton Fiber Insulation:** An unfaced batt insulation consisting of a blend of recycled-cotton and polyester fibers treated with a borate solution to resist flame and smoke development and inhibit mold, mildew, bacteria and fungi growth.

## 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, and fastening methods.

**2.1.3 Packaging and Identification:** A description of the method of packaging and field identification of the batt

insulation. Identification provisions must include the evaluation report number, FSI (flame-spread index), SDI (smoke-developed index) and *R*-values of the product.

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

**2.2 Testing Laboratories:** Testing laboratories shall comply with Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

**2.3 Test Reports:** Test reports shall comply with the ICC-ES Acceptance Criteria for Test Reports (AC85).

**2.4 Product Sampling:** Products shall be sampled in accordance with Section 3.2 of AC85.

## 3.0 TEST AND PERFORMANCE REQUIREMENTS

**3.1 Surface-burning Characteristics:** The cotton fiber insulation shall be tested for surface-burning characteristics to document flame-spread index and smoke-developed index. The test methods are noted in Section 4.1 of this guideline.

**3.2 Thermal Transmission Properties:** The cotton fiber insulation shall be tested to document the thermal resistance, *R*-values. The test methods are noted in Section 4.2 of this guideline.

**3.3 Material Properties:** The cotton fiber insulation shall be tested to document the following physical properties: thickness and density, corrosiveness, fungi resistance, and moisture absorption. The test methods are noted in Section 4.3 of this guideline.

**3.4 Fire-resistance-rated Assemblies:** When cotton fiber insulation is used in a fire-resistance-rated assembly, fire testing of the assembly shall be performed to determine the fire-resistance rating. The test methods are noted in Section 4.4 of this guideline.

## 4.0 TEST METHODS

**4.1 Surface-burning characteristics:** Surface-burning characteristics of the insulation shall be tested in accordance with ASTM E 84. The insulation shall be supported by 1/4-inch-diameter (6.3 mm) supporting metal rods spaced 24 inches (609.6 mm) on center. The metal rod shall be inserted through insulation of thickness 1 inch (25.4 mm) or greater, at approximately 1/4 inch (6.3 mm) from the surface to be exposed to the flame. Specimens shall be tested in the initial batt form. The test shall be performed for all insulation densities for which recognition is sought.

**Conditions of Acceptance:** The product shall have a flame-spread index not exceeding 25 and smoke-developed index not exceeding 450.

**4.2 Thermal Resistance:** Thermal resistance of the cotton insulation shall be determined by tests conducted in accordance with ASTM C 518. Thermal-resistance values shall be based on a mean test temperature of 75°F ± 5°F (23.9°C ± 2.8°C). Evidence of calibration in accordance with the standard must be certified and properly documented in the test report. This includes a description of the control samples used and the last date of calibration prior to testing of the cotton insulation. Thermal resistance, when determined in accordance with ASTM C 177 (guarded hot plate), is permitted with proper documentation.

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**Conditions of Acceptance:** Recognition of thermal-resistance values for a range of thicknesses of cotton insulation shall be established by tests at the thinnest and thickest and at mid-thicknesses to establish a representative curve for interpolation purposes. The description of test samples shall include details of air spaces, if so tested. Thermal-resistance values will be related to test samples. Testing at the minimum condition will apply for all greater densities and thicknesses.

**4.3 Material Properties:** The cotton fiber insulation shall be tested for the physical properties given in Sections 4.3.1, 4.3.2, 4.3.3, and 4.3.4 of this guideline.

**4.3.1 Thickness and Density:** Thickness and density shall be determined by tests conducted in accordance with ASTM C 167. Five specimens shall be selected from one representative roll or bundle of insulation. All five specimens shall be tested by dropping them twice along both long dimensions as per the standard. At least 5 minutes shall be allowed for each specimen to reach equilibrium before the thickness is measured.

**Conditions of Acceptance:** Thickness and density are reported in the product evaluation report and are determined as follows: Specimen thickness is determined from the average of measurements taken at five different points specified in ASTM C 167. Density is determined by one of the equations as specified in ASTM C 167.

**4.3.2 Corrosiveness:** Corrosiveness of the insulation shall be tested in accordance with ASTM C 739. A minimum of six specimens, each weighing 0.7 ounce (20 grams), shall be used for each test. Each of the six tests shall be conducted using the following metal coupon specimens:

**4.3.2.1** Two aluminum coupons, Type 3003 bare aluminum, zero temper.

**4.3.2.2** Two copper coupons, ASTM B 152, Type ETP, Carbon No. 110 soft copper.

**4.3.2.3** Two steel coupons, low carbon, commercial quality, cold rolled, less than 30 carbon content, shim steel. Each coupon shall be 2 inches by 2 inches (50.8 mm by 50.8 mm) by 0.003 inch (0.076 mm) in thickness, and free of tears, punctures or crimps. Distilled or deionized water shall be used for the test mixture. Specimens shall be placed in a preconditioned humidity chamber maintained at  $120^{\circ}\text{F} \pm 3^{\circ}\text{F}$  ( $48.9^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$ ) and  $97 \pm 1.5$  percent relative humidity for  $336 \pm 4$  hours. A continuous 24-hour strip chart recording, showing the 336-hour exposure conditions, must be included in the test report.

**Conditions of Acceptance:** After testing in the above manner, there shall be no perforations in metal coupons when examined over a 40-watt lightbulb.

**4.3.3 Fungi-resistance:** Mold and mildew (fungus) resistance shall be tested in accordance with ASTM C 739. One sample shall be selected from each of three

representative rolls or bundles. Test condition is to be maintained at  $86^{\circ}\text{F}$  ( $30^{\circ}\text{C}$ ) and at a minimum relative humidity of 95 percent for 28 days. A continuous strip chart recording of chamber conditions must accompany the test report. Test chambers shall be kept closed during incubation period, except during inspection. Samples are examined visually after incubation period under 40X magnification to determine extent of mold growth and deterioration.

**Conditions of Acceptance:** Mold growth must be confined to the inoculated area with no significant growth within.

**4.3.4 Moisture Absorption:** Moisture absorption shall be tested in accordance with ASTM C 739. Specimen is weighed in a 9-by-9-by-5-inch (233 by 233 by 127 mm) or 0.23-cubic-foot (6.6 L) container. The container filled with the insulation specimen is to be preconditioned in a humidity chamber at  $120^{\circ}\text{F} \pm 2^{\circ}\text{F}$  ( $49^{\circ}\text{C}$ ) and 50 percent relative humidity to a constant weight, and weighed to determine the initial conditioned weight. Humidity shall then be increased to  $90 \pm 2$  percent and maintained for 24 hours. The specimen in the container is then reweighed. The weight gain is determined as a percentage of the initial conditioned weight.

**Conditions of acceptance:** The weight gain of the specimen shall not exceed 15 percent.

**4.4 Fire-resistance-rated Assembly:** The cotton fiber insulation shall be tested as a component of a fire-resistance-rated assembly, wall, floor-ceiling, or roof-ceiling construction under ASTM E 119.

**Conditions of Acceptance:** The fire-resistance-rated assembly shall be completely described in the product evaluation report with the hourly rating. The cotton fiber insulation shall be limited to use in the specific assembly tested and described in the evaluation report.

## 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 evaluation guideline.

## 6.0 EVALUATION REPORT RECOGNITION

The following are conditions of use for cotton fiber insulation covered by this guideline:

**6.1** The insulation shall not be installed over recessed light fixtures that are not insulated or against any heat-producing appliance.

**6.2** The insulation shall not be used in a fire-resistance-rated assembly unless its performance is documented by tests under Section 4.4 of this guideline. ■