



# ENERGY STAR<sup>®</sup> Program Requirements Specification for Labeling Insulation Products

## Eligibility Criteria Version 1.0

Following is **DRAFT 1 Version 1.0** specification for ENERGY STAR labeled residential insulation products. A product shall meet all of the identified criteria if it is to be labeled with the Seal and Insulate with ENERGY STAR mark.

### 1 Definitions<sup>1</sup>

#### 1.1 General

- A. **Insulation:** Any material mainly used to slow down heat flow. It may be mineral or organic, fibrous, cellular, or reflective (aluminum foil). It may be in rigid, semi-rigid, flexible, or loose-fill form.<sup>2</sup>
- B. **Facing:** A thin covering adhered to the surface of insulation prior to field installation. Facings may include, but are not limited to kraft paper, metal foil, or polymer.
- C. **Residential Buildings:** Single family homes (attached or unattached), multifamily buildings with 4 units or fewer, or multifamily buildings (condominiums, apartments) with 3 stories or less in height above grade.

#### 1.2 Mass Insulation Products

- A. **Blanket Insulation:** A relatively flat and flexible insulation in coherent sheet form furnished in units of substantial area. Product materials may include, but are not limited to mineral fiber, typically of rock, slag, or glass, and natural fibers such as cotton and wool. The product may or may not be faced.
- B. **Spray or Pour Foam Insulation:** A thermal insulating material that is sprayed or poured (as a gel or foamy liquid) into place, and expands or sets into a cellular foam and cures at the point of installation through a chemical reaction. Foamed materials include, but are not limited to polyurethane, polyisocyanurate, phenolic, and cementitious insulation.
- C. **Loose Fill Insulation:** Insulation in granular, nodular, fibrous, powdery, or similar form designed to be installed by pouring, blowing, or hand placement. Materials may include, but are not limited to fiber glass, cellulose, cotton, or wool.
- D. **Board Insulation:** Semi-rigid insulation preformed into rectangular units having a degree of suppleness particularly related to their geometrical dimensions. Typical materials include, but are not limited to fiberglass, expanded polystyrene (EPS), extruded polystyrene (XPS), or polyurethane. The product may or may not be faced.

<sup>1</sup> Definitions in this document have been adopted from ASTM C168-10, "Standard Terminology Relating to Thermal Insulation" where possible and may have been modified to add clarity for program purposes.

<sup>2</sup> Based on the *Federal Trade Commission's (FTC) Title 16 Code of Federal Regulations (CFR) Part 460* definition.

### 1.3 Radiant Barrier Products

- A. Radiant Barrier: A reflective material, such as a foil, that reduces radiant heat transfer across open air spaces by use of one or more surfaces of high reflectance and low emittance. The reflective material shall have an emissivity of 0.1 or less, and may or may not be factory-applied to a rigid or insulating material. This product is marketed for installation in open attic spaces.

### 1.4 Reflective Insulation Products

- A. Reflective Insulation: Insulation that reduces radiant heat transfer across an enclosed air space by use of one or more surfaces of high reflectance and low emittance. The reflective material shall have an emissivity of 0.1 or less, and may or may not be factory-applied to a rigid or substrate material. This product is marketed for installation within an enclosed wall or similar cavity and has a measureable R-value associated with the product or system.
  - 1. Single Sheet System: A reflective insulation product that is a single sheet of material which may have a reflective surface on one or both sides.
  - 2. Multiple Sheet System: A reflective insulation product assembled with multiple layers of reflective material with an air gap between each sheet.

### 1.5 Mass Insulation with Reflective Facing Products

- A. Mass Insulation with Reflective Facing: An assembly consisting of a core insulating material as defined in the Mass Insulation Products section of this document and also has a reflective facing such as a foil attached to at least one side.

### 1.6 Structural Insulation Systems

- A. Insulated Concrete Forms (ICFs): Comprised of rigid plastic foam forms that hold concrete in place during curing and remain in place afterwards to serve as thermal insulation for concrete walls. The insulating foam is commonly expanded polystyrene (EPS) or extruded polystyrene (XPS).
- B. Structural Insulated Panels (SIPs): A factory constructed system comprised of sheathing, typically OSB, and filled with thermal insulating spray foam.

### 1.7 Insulation Performance

- A. R-value: The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area. For the purposes of this program, Imperial units will only be accepted  $[(h \cdot ft^2 \cdot ^\circ F)/Btu]$ .
- B. Smoke-Development Index: The characteristic of a material to emit smoke when exposed to flame or fire compared to red oak and inorganic cement.
- C. Flame-Spread Index: The characteristic of a material to resist the spreading of flames when exposed to flame or fire compared to red oak and inorganic cement.

## 2 Scope

**2.1 Included Products:** Products that meet the definition of **Mass Insulation, Reflective Insulation,** and **only the foam insulation portion of an ICF product** as specified herein are eligible to be labeled with the Seal and Insulate with ENERGY STAR mark. Products listed in Section 2.2 are excluded. Products shall also meet the following eligibility criteria:

- A. Products shall be designed and marketed with the main purpose of insulating a whole wall, ceiling, roof deck, or floor system.
- B. Products must be marketed and sold in the United States.
- C. Products shall be marketed primarily for use in Residential Buildings as defined herein. Products that are marketed for non-residential buildings may ONLY associate the ENERGY STAR label with marketing that targets the residential market.

**2.2 Excluded Products:**

- A. Duct insulation or wrap
- B. Pipe insulation or wrap
- C. Products primarily marketed as air sealing materials and not as insulation
- D. Paints and coatings (interior, exterior, or Interior Radiation Control Coatings [IRCCs])
- E. Exterior finishing systems (e.g., siding, Exterior Insulation Finish Systems [EIFS], Stucco, manufactured home or crawlspace skirting)
- F. Interior finishing systems (e.g., drywall, stucco, bead board, fabric surfaces)
- G. Fenestration covers (e.g., curtains, shades, drapes, shutters, awnings, blinds, films, storm window)
- H. House wraps or weather barriers
- I. Radiant barrier products
- J. Structural Insulated Panels (SIPs)
- K. Insulated Concrete Form (ICF) assembly or system

## 3 Labeling Criteria

A. Significant Digits and Rounding:

- a. All calculations shall be carried out with actual measured or observed values. Only the final result of a calculation shall be rounded. Calculated results shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.
- b. Unless otherwise specified, compliance with specification limits shall be evaluated using exact values without any benefit from rounding.

B. R-Value Criteria: Manufacturer shall have the R-value of their product/product family tested as prescribed by Section 4 and meet the following criteria:

- a. Minimum R-Value: Insulation products shall have an R-value greater than or equal to R-3.0. in the thicknesses in which they are sold to consumers. This minimum will not apply to insulation products of variable depth or thickness, such as blown, sprayed, or loose fill products.
  - b. R-Value Tolerance: No individual specimen of the insulation sold shall have an R-value more than 10% below the R-value shown in a label, fact sheet, ad, or other promotional material for that insulation.
  - c. Rounding off R-values: R-values shown in labels, fact sheets, ads, or other promotional materials shall be rounded to the nearest tenth. However, R-values of 10 or more may be rounded to the nearest whole number.
- C. Surface Burning Characteristics Criteria: Insulation product/product family shall be tested as prescribed by Section 4 of this document and must demonstrate the surface burning characteristics of flame-spread index and smoke-development index as required by the most current International Codes.<sup>3</sup>

## 4 Testing Requirements

### 4.1 R-Value Test Requirements

- A. Representative samples of each product line shall be selected for testing per the following requirements:
  - a. Mass Insulation: For the labeling of a product line, the sample must be identical to the line that is intended for sale.
    - 1. For products sold at a predetermined thickness such as Blanket Insulation and Board Insulation, recognition of thermal-resistance values for a range of thicknesses shall be established at the thinnest, thickest and mid-thicknesses, to establish a representative curve for interpolation purposes. Each sample may or may not have a facing, and each facing may be different.
    - 2. For products having variable installed thicknesses such as Spray or Pour Foam Insulation and Loose Fill Insulation, samples must be prepared as stated in the notes section in Table 1 and tested at the maximum installed thickness intended for sale.
  - b. Foam Portion of an ICF Assembly: The foam insulation sample must exclude the concrete portion of the ICF assembly. For the labeling of a product line, the sample must be identical to the line that is intended for sale. Recognition of thermal-resistance values for a range of thicknesses shall be established at the thinnest, thickest and mid-thicknesses, to establish a representative curve for interpolation purposes.
- B. Reflective Insulation: For the labeling of a product line, the sample must be identical to the line that is intended for sale. The manufacturer must provide details of the specific system, air gap, enclosure, and orientation used to determine the R-value.
- C. Mass Insulation with Reflective Facing: For the labeling of a product line, the specimen must be identical to the line which is intended for sale. Recognition of thermal-resistance values for a range of thicknesses shall be established at the thinnest, thickest and mid-thicknesses, to establish a representative curve for interpolation purposes. Each specimen must have the same

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<sup>3</sup> *International Building Code (IBC), International Residential Code (IRC)*

reflective facing. If the reflective facing is marketed as contributing to the R-value of the total assembly via an air gap, the specific system, enclosure, and orientation must be specified.

- B. The most current versions of the tests specified in Tables 1 - 4 shall be used to determine the product R-value:

**Table 1 - Mass Insulation R-Value Test Requirements<sup>4</sup>**

Product Type	Test Method Reference
Mass Insulation	<ul style="list-style-type: none"> <li data-bbox="605 453 1409 541">• ASTM C 177, <i>Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus</i></li> <li data-bbox="1008 575 1040 606" style="text-align: center;">Or</li> <li data-bbox="605 640 1365 728">• ASTM C 518, <i>Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus</i></li> <li data-bbox="1008 762 1040 793" style="text-align: center;">Or</li> <li data-bbox="605 827 1409 915">• ASTM C 1363, <i>Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus</i></li> <li data-bbox="1008 949 1040 980" style="text-align: center;">Or</li> <li data-bbox="605 1014 1386 1066">• ASTM C 1114, <i>Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus</i></li> </ul>

Testing Requirements:

- 1) The tests in this table may be used for determining the R-Value of the foam insulation portion of an ICF product.
- 2) The tests must be done on the insulation material alone (excluding any airspace).
- 3) Testing Temperature: The tests shall be done at a mean temperature of 75° F and with a temperature differential of 50° F plus or minus 10° F.
- 4) Calculating R-value: R-values (“thermal resistance”) based upon heat flux measurements according to ASTM C 177 or ASTM C 518 must be reported only in accordance with the requirements and restrictions of ASTM C 1045, “*Standard Practice for Calculating Thermal Transmission Properties from Steady-State Conditions.*”
- 5) Aging and Settling Samples:
  - a) For polyurethane, polyisocyanurate, and extruded polystyrene, the tests must be done on samples that fully represent the effect of aging on the product's R-value. To age the sample, follow the procedure in paragraph 4.6.4 of GSA Specification HH-I-530A, or another reliable procedure such as the following:

<sup>4,8,9,10</sup> The test standards and test conditions are the same as those required by the FTC 16 CFR Part 460.5, “*Labeling and Advertising of Home Insulation – R-value Tests*” unless stated otherwise.

Testing Requirements Continued:

- i. Conditioning at 140° F (60° C) dry heat,  $\pm 2^\circ$  F ( $1^\circ$  C), for 90 days.<sup>5</sup>
  - ii. Aging at 70° F  $\pm 10^\circ$  F (21.1° C  $\pm 5.5^\circ$  C) in free air for a two-year period.<sup>6</sup>
- b) For loose-fill cellulose, the tests must be done at the settled density determined under paragraph 8 of ASTM C 739, "Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."
  - c) For loose-fill mineral wool, self-supported, spray-applied cellulose, and stabilized cellulose, the tests must be done on samples that fully represent the effect of settling on the product's R-value.
  - d) For self-supported spray-applied cellulose, the tests must be done at the density determined pursuant to ASTM C 1149, "Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation."

**Table 2 – Reflective Insulation (Single Sheet System) R-Value Test Requirements<sup>7</sup>**

Product Type	Test Method Reference
Radiant Insulation (Single Sheet System)	<ul style="list-style-type: none"> <li>• ASTM E 408–71, "Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques"</li> </ul> <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> <li>• ASTM C 1371–04a, "Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emisometers"</li> </ul>

Testing Requirements:

- 1) Testing Temperature: You must use the R-value shown for 50° F, with a temperature differential of 30° F.
- 2) Calculating R-Value: To get the R-value for a specific emissivity level, air space, and direction of heat flow, use the tables in the most recent edition of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers' (ASHRAE) Fundamentals Handbook, if the product is intended for applications that meet the conditions specified in the tables.

<sup>5,6</sup> International Code Council - Evaluation Services (ICC-ES) AC12 – "Acceptance Criteria for Foam Plastic Insulation"

**Table 3 – Reflective Insulation R-Value (Multiple Sheet System) Test Requirements<sup>8</sup>**

Product Type	Test Method Reference
Radiant Insulation (Multiple Sheet System)	<ul style="list-style-type: none"> <li>ASTM C 1363, <i>Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus</i></li> </ul>
<p>Testing Requirements:</p> <ol style="list-style-type: none"> <li>The test in this table may be used to determine the product R-Value of a Single Sheet System that does not meet the applications specified in the R-value tables in the ASHRAE Fundamentals Handbook.</li> <li><u>Test panel</u>: Must be constructed according to ASTM C 1224, <i>“Standard Specification for Reflective Insulation for Building Applications,”</i></li> <li><u>Test conditions</u>: Utilize the test conditions specified in ASTM C 1224.</li> <li><u>Calculating R-Value</u>: To get the R-value from the results of the tests, use the formula specified in ASTM C 1224.</li> <li><u>Reporting R-Value</u>: An R-value will be reported for each specific heat flow direction and enclosed air space of specified depth.</li> </ol>	

**Table 4 – Mass Insulation with Foil Facing R-Value Test Requirements<sup>9</sup>**

Product Type	Test Method Reference
Mass Insulation with Foil Facing	<ul style="list-style-type: none"> <li>Test the system, with its air space, under ASTM C 1363, <i>“Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus,”</i> utilizing the testing requirements specified in notes section of Table 1 - <i>Mass Insulation R-Value Test Requirements</i>.</li> </ul> <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> <li>Add up the tested R-value of the material and the R-value of the air space. To get the R-value for the air space, you must follow the rules in Table 2 – <i>Reflective Insulation (Single Sheet System) R-Value Test Requirements</i>.</li> </ul>

**4.2 Surface Burning Characteristics Test Requirements**

- A. For the labeling of a product line, the representative product line must be identical to the line which is intended for sale. The determination of a specimen used to represent a product family shall be made by the Certification Body using acceptable established protocols.

B. The most current versions of the tests specified in Table 5, shall be used to determine the Surface Burning Characteristics:

**Table 5 – Surface Burning Characteristics Test Requirements**

Metric	Test Method Reference
Flame-spread Index	<ul style="list-style-type: none"> <li>• ASTM E 84, “<i>Standard Test Method for Surface Burning Characteristics of Building Materials</i>”</li> </ul>
Smoke-developed Index	<ul style="list-style-type: none"> <li>• ASTM E 84, “<i>Standard Test Method for Surface Burning Characteristics of Building Materials</i>”</li> </ul> <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> <li>• UL 723, “<i>Standard Test Method for Surface Burning Characteristics of Building Materials</i>”</li> </ul>
<p>Testing Requirements:</p> <ol style="list-style-type: none"> <li>1) See ASTM E 84 for references to other standards providing mounting guidance to perform the required test for different types of materials.</li> </ol>	

## 5 Effective Date

The ENERGY STAR Insulation Specification shall take effect on XX. To be labeled as ENERGY STAR, a product shall meet the ENERGY STAR specification in effect on the date of manufacture. The date of manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

## 6 Future Specification Revisions

EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that the ENERGY STAR labeling of the product is not automatically granted for the life of a product line.