Seal and Insulate with ENERGY STAR® Program

Draft Definitions and Testing Requirements for Residential Insulation
Version 1.0 (Rev. Feb-2013)

Note: EPA has released this draft clarification for the purpose of implementing minor changes in the Definitions and Testing Requirements Version 1.0 and the Partnership Commitments in response to stakeholder requests. Red font indicates the changes within the document.

Proposed Changes to the Definitions and Testing Requirements Version 1.0

- Remove Section 2.B, under "Testing Requirements," to avoid redundancy.
- Add Section 2.B.a.2.ii to specify loose fill insulation sample thickness requirements.
- Correct the section title for "Product Type 4" on pg. 7 to "Reflective Facing" rather than "Foil Facing", thus aligning with the product definitions on pg. 2.
- Add CAN/ULC S102.2, "Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies" as an accepted test method for surface burning characteristics.
- Correct the numbering format under Section 3.

Comments or questions regarding the proposed minor changes may be sent to insulation@energystar.gov by **February 8, 2013.**

This document identifies the definitions[1] and testing requirements for manufacturers of residential insulation products participating in the 'Seal and Insulate with ENERGY STAR' Program. Manufacturers of residential insulation must manufacture at least one product that meets these definitions and testing requirements to partner with ENERGY STAR and be granted access to a 'Seal and Insulate with ENERGY STAR' educational graphic.

General Definitions

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.[2]

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.

Insulation Product Definitions

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.

[1] 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.
[2] Based on the *Federal Trade Commission's (FTC) Title 16 Code of Federal Regulations (CFR) Part 460* definition.

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), polyisocyanurate, or polyurethane. The product may or may not be faced.

Radiant Barrier Product Definitions

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.

Reflective Insulation Product Definitions

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.

Insulation with Reflective Facing Product Definitions

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

Structural Insulation Systems Definitions

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.

Insulation Performance Definitions

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 [$(h \cdot ft^2 \cdot °F)/Btu$].

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.

Scope of Included Products

Manufacturers of products which meet the definition of **Insulation Product**, **Reflective Insulation Product**, and/or **only the foam insulation portion of an ICF product** as specified herein may be granted access to the Seal and Insulate with ENERGY STAR Educational Graphic. Products listed in the "Excluded Products" section are not included. Products shall also meet the following 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 Seal and Insulate with ENERGY STAR Educational Graphic with marketing that targets the residential market.

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. Small volume two-component low-pressure or one component (OCF) foam used primarily for air sealing

E. Paints and coatings (interior, exterior, or Interior Radiation Control Coatings [IRCCs])

F. Exterior finishing systems (e.g., siding, Exterior Insulation Finish Systems [EIFS], Stucco, manufactured home or crawlspace skirting)

G. Interior finishing systems (e.g., drywall, stucco, bead board, fabric surfaces)

H. Fenestration covers (e.g., curtains, shades, drapes, shutters, awnings, blinds, films, storm window)

I. House wraps or weather barriers

J. Radiant barrier products

K. Structural Insulated Panels (SIPs)

L. Insulated Concrete Form (ICF) assembly or system

Testing Requirements

1) 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.

B. Unless otherwise specified herein or in the test procedure, compliance with eligibility limits shall be evaluated using exact values without any benefit from rounding.

2) R-Value Test Requirements

A. 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 product label, fact sheet, ad, or other promotional material for that insulation.

c. Rounding off R-values: R-values for the purpose of evaluating compliance with the minimum R-value requirement must be rounded to the nearest tenths place.

~~B. 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[3]. The Certification Body may grant an exemption for testing and meeting Surface Burning Characteristic criteria if the product is exempt from such testing in the International Codes.~~

B. Representative samples of each product line shall be selected for testing per the following requirements:

a. Insulation Product: The sample must have identical chemical and physical properties as the line 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 installation thicknesses:

i. For Spray or Pour Foam Insulation, samples shall be tested at both a 1-inch (25.4 mm) thickness and at the maximum thickness permitted by the test procedure, but at not less than 3.5 inches (88.9 mm).

ii. For Loose Fill Insulation, samples shall be tested at the minimum thickness intended for sale and at the maximum thickness permitted by the test procedure, but at not less than 3.5 inches (88.9 mm), and at one additional mid thickness to establish a representative curve for interpolation purposes. This applies to pneumatically applied, poured in, or dense pack cellulose, and self supporting products at each design density.

b. Foam Portion of an ICF Assembly: The foam insulation sample must exclude the concrete portion of the ICF assembly. The sample must have identical chemical and physical properties as the line 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.

c. Reflective Insulation Product: The sample must have identical chemical and physical properties as the line intended for sale. The manufacturer must provide details of the specific system, air gap, enclosure, orientation and calculations used to test and determine the R-value.

d. Insulation with Reflective Facing Product: The sample must have identical chemical and physical properties as the line 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 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, orientation and calculations used to test and determine the R-value must be specified.

C. The most current versions of the tests specified shall be used to determine the product R-value[3].

D. The following R-Value test requirements shall be applied to the 4 product types:

Product Type 1 - Insulation Product: R-Value Test Requirements

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

  Or

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

  Or

- ASTM C 1363, *Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus*

  Or

- ASTM C 1114, *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus*

Testing Requirement Details:

1) The tests 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:

[3] The test procedures and test conditions provided herein are the same as those required by the FTC 16 CFR Part 460.5, "*Labeling and Advertising of Home Insulation – R-value Tests"* unless otherwise stated.

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:

(1) For rigid board insulation of the materials described above:
   i. Conditioning at 140° F (60° C) dry heat, ± 2° F (1° C), for 90 days.[4]
   ii. Aging at 70° F ± 10° F (21.1° C ± 5.5° C) in free air for a two-year period.[4]

(2) For spray or pour applied materials of the materials described above:
   i. Conditioning at 140° F (60° C) dry head ±2° F (1° C) for 90 days.[5]
   ii. Aging at 73° F ± 2° F (23° C ± 1° C) and 50 ± 5 percent relative humidity for 180 days ± 5 days.[5]

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."*

Product Type 2 – Reflective Insulation (Single Sheet System): R-Value Test Requirements

- ASTM E 408, "*Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques"*

Or

- ASTM C 1371, "*Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers"*

Testing Requirement Details:

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.

Product Type 3 – Reflective Insulation R-Value (Multiple Sheet System): R-Value Test Requirements

[4] International Code Council - Evaluation Services (ICC-ES) AC12 – *"Acceptance Criteria for Foam Plastic Insulation"*
[5] International Code Council - Evaluation Services (ICC-ES) AC377 – *"Acceptance Criteria for Spray-Applied Foam Plastic Insulation"*

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

  Testing Requirement Details:

  1) The test 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.

  2) Test panel: Must be constructed according to ASTM C 1224, *"Standard Specification for Reflective Insulation for Building Applications."*

  3) Test conditions: Utilize the test conditions specified in ASTM C 1224.

  4) Calculating R-Value: To get the R-value from the results of the tests, use the formula specified in ASTM C 1224.

  5) Reporting R-Value: An R-value will be reported for each specific heat flow direction and enclosed air space of specified depth.

Product Type 4 – Insulation with ~~Foil~~ Reflective Facing: R-Value Test Requirements

- Test the system, with its air space, under ASTM C 1363, *"Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus,"* utilizing the testing requirements specified in "Product Type 1 - Insulation Product: R-Value Test Requirements"

  Or

- 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 "Product Type 2 – Reflective Insulation (Single Sheet System): R-Value Test Requirements"

3) Surface Burning Characteristics Test Requirements

~~G.~~ A. Insulation product/product family must also demonstrate the surface burning characteristics of flame-spread index and smoke-development index as required by the most current International Codes.[6] The Certification Body may grant an exemption for testing and meeting Surface Burning Characteristic criteria if the product is exempt from such testing in the International Codes.

~~H.~~ B. The sample must have identical chemical and physical properties as the line 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.

~~I.~~ C. The most current versions of these tests specified shall be used to determine the Surface Burning Characteristics:

Flame-spread Index and Smoke-developed Index Tests

- ASTM E 84, *"Standard Test Method for Surface Burning Characteristics of Building Materials"*

  Or

[6] *International Building Code (IBC), International Residential Code (IRC)*

- UL 723, *"Standard Test Method for Surface Burning Characteristics of Building Materials"*

  Or

- CAN/ULC S102.2, *"Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies"* for loose fill insulation only when required by the International Codes.[7]

[7] *International Building Code (IBC), International Residential Code (IRC)*