



THE MARK OF ENVIRONMENTAL RESPONSIBILITY

# **GS-54 RATIONALE**

**FOR PROPOSED GREEN SEAL™ STANDARD FOR**

## **Architectural Thermal Insulation Materials**

**February 3, 2016**

**Green Seal, Inc. • 1001 Connecticut Ave. NW, Ste. 872 • Washington, DC USA 20036-5525**

**(202) 872-6400 • FAX (202) 872-4324 • [greenseal.org](http://greenseal.org)**

©2016 Green Seal, Inc. All Rights Reserved

## Contents

Contents .....	2
Introduction.....	2
Standard Scope.....	4
Product-Specific Performance Requirements .....	5
Product-Specific Sustainability Requirements .....	7
Packaging Sustainability Requirements.....	15
Consumer Information and Labeling Requirements.....	16
Certification Requirements .....	17

## Introduction

Green Seal’s standards are intended to reflect the leadership tier of products in the current market, which protect human health and environment while meeting the expectations of purchasers for functional performance. The purpose is to identify a broad selection of products, available on the current market, that are preferable compared to the majority of products with respect to protection of human health and the environment while providing sufficient functional performance.

### **Market Need for a Green Seal Standard for Insulation Materials**

Green Seal’s goal is to provide purchasers with clear and reliable information so that they can easily choose a product that is environmentally preferable to the alternatives available in the market. Such information should be independently derived, cover significant impacts across all life cycle-stages of the product, and allow non-technical purchasers to make an informed decision. None of the labels and certifications that are currently available in the insulation market meets all of these requirements.

**Marketing Claims:** Insulation products carry many claims about their environmental benefits, but purchasers are often reluctant to take them at face value. Additionally, these claims are not necessarily based on a comprehensive evaluation of the complex ways in which these products may affect human health and the environment. Such manufacturer claims can create confusion regarding which products are actually environmentally preferable. Certification by Green Seal to this standard provides a science-based, life-cycle-based evaluation, as well as an independent verification of these claims.

## RATIONALE, PROPOSED GREEN SEAL STANDARD FOR ARCHITECTURAL INSULATION MATERIALS, GS-54

**Single Attribute Labels:** A number of single-attribute certifications are being used by insulation manufacturers, including for VOC emissions and recycled content. While each of these is important, none of these single-attribute certifications covers the significant impacts across all stages of the product's life cycle. The requirements proposed in GS-54 include multiple attributes across the life-cycle stages, and ensure that the insulation is environmentally preferable.

**EPDs and HPDs:** Many manufacturers and trade groups have published Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs) for insulation products. EPDs and HPDs are important tools to increase the transparency of the industry, and are encouraged by USGBC's LEED program. Despite their overall importance, these highly technical documents are not a particularly useful decision tool for most purchasers. In order to use an EPD as a decision-making tool, a purchaser would need to have the knowledge to interpret the data and the broader market context. This advanced level of information, which is necessary for evaluating whether a specific product is environmentally preferable, is not readily available to most purchasers. It is, however, an integral part of the requirements developed in GS-54 for evaluating products.

**Ecolabel Standards:** A number of multi-attribute, life-cycle standards are available for insulation materials. Most of these have been developed in other countries and are not intended for certification in the US market. The only other such standard for insulation in the North American market was most recently updated in 2005 by Ecologo, the Canadian ecolabel, and is now offered by ULE. This standard is missing significant requirements to ensure the proper functional performance of certified insulation materials, and does not address all significant health and environmental impacts.

### **This Rationale**

This document presents the rationale for the requirements that are included in the proposed standard. A separate Technical Review provides a detailed summary of the market for insulation materials manufactured and sold in the US. The details provided in the Technical Review provide the scientific basis and economic context for the requirements proposed for GS-54.

These documents are available on Green Seal's website, along with the proposed standard itself, at [greenseal.org/GreenBusiness/Standards/StandardsinDevelopment/GS54ArchitecturalInsulationMaterials](http://greenseal.org/GreenBusiness/Standards/StandardsinDevelopment/GS54ArchitecturalInsulationMaterials)

Interested parties are invited to register as stakeholders to receive updates and comment on the proposed standard at [collaborase.com/gs-54-development](http://collaborase.com/gs-54-development)

## **Standard Scope**

Buildings that are properly designed and constructed with high quality insulation materials will provide significant reductions in the amount of energy needed for heating and cooling throughout the lifetime of the building. All insulation materials available on the market today provide significant savings in energy by reducing the need for heating and cooling, thereby saving natural resources, reducing the emission of greenhouse gases and other pollutants, and saving money. They also provide greater comfort for occupants and extend the life of interior finishes. Thus, by their very purpose, all effective insulation products provide environmental benefits over the lifetime of the building. Products that provide thermal resistance (i.e., reduce the transfer of heat energy through them) are the most widely used type of insulation in structures.

Thermal insulation materials are prevalent throughout the construction industry and are used in many applications: residential, commercial, institutional, and more. Each of these applications has specific requirements for function and cost, and, therefore, requires a different type of insulation material. Insulation materials that are appropriate for residential purposes are often not a cost-effective choice for commercial applications. Similarly, materials that are appropriate for an external roof in a large institutional structure, for example, may not be the best choice for an attic in a family home.

Furthermore, each type of insulation material has its own benefits for performance, health, and cost-effectiveness. Therefore, none of the categories of insulation materials can be excluded from consideration as an environmentally-preferable choice; the major ecolabel standards for insulation materials (such as the Australian and New Zealand ecolabels) recognize this. The proposed standard is intended to reflect this concept and therefore provides criteria for a wide range of insulation materials.

Some of the health and performance concerns that have been raised in connection with some types of insulation materials have to do with incorrect installation. It must be recognized that the correct installation of insulation materials is generally beyond the direct control of manufacturers, and, therefore, this standard does not set requirements for installation and use of thermal insulation materials. However, since correct installation is essential for the protection of human health and for the proper functioning of the materials, we propose a requirement that manufacturers emphasize the importance of proper installation and make installation instructions available to purchasers, as relevant for each type of insulation material.

**Content from Proposed Standard:**

**1.0 SCOPE**

This standard establishes environmental, health, and performance requirements for architectural insulation materials that provide thermal resistance and are used in buildings. Insulation materials may be in the form of batts, blankets, rolls, boards, blown-in / loose fill, spray foam, rigid foam, low-density foam, or rigid fiber.

The scope includes products made from fiberglass, rock wool, and other mineral wools; polyurethane; polystyrene; polyisocyanurate; paper, wood, and other cellulose materials; denim and other fabrics; vermiculite; perlite; animal wool, and other materials that provide thermal resistance.

Products that contain insulation materials (e.g., insulation materials with facing, structural insulating panels, insulated concrete forms, or foam-core panels) and other architectural thermal-resistance materials may also be considered for certification provided that the product meets all of the relevant requirements in this standard.

The scope of the standard excludes reflective insulation and radiant barriers, as well as insulation materials that are used for non-architectural purposes, such as mechanical insulation and those materials used in ovens, cryogenic vessels, aircraft, marine vessels, or automobiles. Also excluded are secondary products, e.g., jacketing, sheathing, moisture barriers.

## **Product-Specific Performance Requirements**

Green Seal defines an environmental leadership product as one that meets the expectations of the consumer and has a reduced environmental and health impact when compared to most other products on the market. If a product does not function or perform as needed, the resources that went into that product are wasted. Therefore, functional performance is a prerequisite for sustainability. Unlike many other products, the primary function of insulation (thermal resistance) provides an environmental benefit: increased energy efficiency for buildings. The measurement for thermal resistance is commonly known as the “R-value.” This standard does not establish requirements for thermal resistance, since these are specified by the industry specifications.

In addition to thermal resistance, insulation products are tested for other functions, safety and durability. The industry-identified relevant characteristics and test methods for each insulation product category are included in ASTM specifications. Green Seal proposes that a product meet

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

the required R-values and all of the other performance measures that are identified in the ASTM specification for that product category, if one exists.

**Content from Proposed Standard:**

**2.0 PRODUCT-SPECIFIC PERFORMANCE REQUIREMENTS**

**2.1 Industry Standard Specifications.** The product shall meet the requirements for R-Value and all other requirements in the ASTM specification for its product category (Appendix 2), or equivalent.

Fabric insulation shall meet the specifications for cellulose.

Many insulation products are designed to provide additional functions beyond thermal resistance, but these functions are not the same for all products. An important function for many applications is fire safety: the resistance to flame spread and smoke development. Other important examples include the ability to bear compressive loads when used as a structural element, permeability to water vapor, impermeability to water, and resistance to uplift for roof panels. Products that make claims regarding core performance parameters on the product labeling or in marketing materials must demonstrate that they can meet those claims.

**Content from Proposed Standard:**

**2.3 Functional Claims.** The product shall be tested for each performance parameter in this section that is included on the product labeling or marketing materials. Each test shall demonstrate that the product performs as well or better than a *benchmark product* in its product class using the listed method or an equivalent.

**2.2.1 Compressive Strength.** ASTM C165.

**2.2.2 Flexural Strength.** ASTM C203.

**2.2.3 Sound Absorption (Noise Reduction Coefficient).** ASTM C423.

**2.2.4 Water Vapor Transmission (permeance).** ASTM E96.

**2.2.5 Corrosivity/Corrosion Under Insulation.** ASTM C1617.

**2.2.6 Resistance to Freeze/Thaw Cycles.** ASTM C1512.

**2.2.7 Fungi Resistance.** ASTM C1338-14.

**2.2.8 Roof Insulation Panels: Uplift Resistance.** ASTM E907.<sup>1</sup>

**2.2.9 Fire Safety – Fire Spread and Smoke Development.** ASTM E84, NFPA 255, UL 723, or equivalent.

<sup>1</sup> This standard method shall be used even though it has been withdrawn by ASTM.

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

Another option provided in the standard is to demonstrate that the product performs as well as or better than a benchmark product – and that the comparison is conducted using an objective, scientifically-validated method. This option provides additional flexibility for specialty products.

**Content from Proposed Standard:**

**2.4 Alternative Performance Requirements.** Alternatively, the product shall demonstrate that it performs as well as or better than a *benchmark product* in its product class for

- thermal resistance (R-Value), tested according to the requirements in the FTC requirements for Marketing of Insulation materials, 16 CFR 460.5.<sup>2</sup>
- the other key parameters required for it to fulfill the intended function(s), as defined in the appropriate subsections of Section 2.0.

This comparison shall be conducted using an objective, scientifically-validated method conducted under controlled and reproducible laboratory conditions. Test methodology and results shall be documented in sufficient detail.

## Product-Specific Sustainability Requirements

### Recycled Content:

The use of recycled materials can significantly reduce the environmental impact of a product; fewer raw materials are needed for the manufacturing process and waste is diverted from landfills. There are many types and sources of recycled content in the insulation industry: post-industrial content from mining sources (for slag wool insulation), recovered plastic from factory waste (EPS and XPS), and post-consumer content from blue jeans (cotton insulation) or old newspapers (cellulose insulation).

In some cases, manufacturers incorporate only a certain amount of recycled content because there are limited amounts of such content available or because incorporation of higher levels of recycled content can reduce the quality and effectiveness of the final product.

Some industries produce large amounts of post-industrial content, as in mining, where there is a large supply of slag that can be incorporated into rock wool. The large supply of old blue jeans and newspapers likewise allows denim-based and paper-based insulation products to have very high levels of recycled content. Fiberglass, however, is limited in the US due to the lower rates of glass recycling. Though there is a significant amount available, plastic foam products cannot

---

<sup>2</sup> [http://www.ecfr.gov/cgi-bin/text-idx?rgn=div5;node=16%3A1.0.1.4.61#se16.1.460\\_15](http://www.ecfr.gov/cgi-bin/text-idx?rgn=div5;node=16%3A1.0.1.4.61#se16.1.460_15)

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

incorporate high amounts of recycled material without reducing the effectiveness or quality of their insulation products.

**Content from Proposed Standard:**

**3.0 PRODUCT-SPECIFIC HEALTH AND ENVIRONMENTAL REQUIREMENTS**

**3.1 Recycled Content.** The product shall contain at least the following amounts of recovered content:

<b>Material</b>	<b>% Recovered Material</b>
Rock Wool	75
Fiberglass	40
Extruded Polystyrene	20
Expanded Polystyrene	10
Paper Cellulose	80
Cotton	80
Spray Foam	None
Perlite	25

**Global Warming Potential (GWP) and Ozone Depletion Potential (ODP)**

Blowing agents are gases that are used to create plastic-based products, including polystyrene- and polyurethane-based foams, both in manufacturing plants and on building sites. The blowing agents can escape into the atmosphere from the insulation materials during those processes and as the product ages. Historically, many of the gases used as blowing agents contributed to the destruction of the stratospheric ozone layer until gases with high ODP were banned. Many blowing agents also have high GWP and may therefore contribute significantly to climate change.

All insulation products manufactured in the US currently have an ODP of zero, since ozone-depleting compounds were banned during the late 1980s. Even so, a requirement for zero ODP is necessary in the standard because it may be used by manufacturers outside the US who may still be using blowing agents with ozone depletion potentials (for example, chlorofluorocarbons). A note about the zero ODP requirement is listed in the standard to clarify that it is intended for manufacturers outside the US in order to prevent the certification of products that contain materials that are prohibited in the US.

Leadership foam products use blowing agents with lower global warming potentials. Green Seal proposes to allow blowing agents with a GWP of 140 and below in order to reflect the current selection of blowing agents in use, all of which have GWPs that do not exceed 140. An exception is proposed for extruded polystyrene (XPS) foam until January 1, 2021, allowing



**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

blowing agents with a GWP of up to 1,500. This exemption recognizes that the XPS industry has not yet made the transition to lower GWP blowing agents, and is consistent with the timetable set by the EPA's Significant New Alternatives Policy (SNAP) Program to transition away from the commonly used blowing agents, e.g., HFC-134a, HFC-245fa, and HFC-365mfc.<sup>3</sup>

**Content from Proposed Standard:**

**3.2 Global Warming Potential.** Blowing agents shall have a 100-year Global Warming Potential rating that does not exceed 140, as established in the IPCC Fourth Assessment Report (AR4).<sup>4</sup>

**Exemption:** Blowing agents for extruded polystyrene foam may have a Global Warming Potential that does not exceed 1500<sup>5</sup>, until January 1, 2021.

**3.3 Ozone Depletion Potential.** Blowing agents shall have an Ozone Depletion Potential of zero as defined by the EPA, following the Montreal Protocol and its appendices.<sup>6</sup>

**Volatile Organic Compound (VOC) Content**

Inhaling VOCs can be hazardous to the health of building occupants. Although individual products may emit minute levels of VOCs, the combination of VOCs from all products in office buildings and homes can cause respiratory issues for occupants.

To protect building occupants and insulation installers, Green Seal proposes to require the verification of low emissions which we define as meeting the criteria of California's Section 01350.

Manufacturers can demonstrate that their insulation product meets Section 01350 through independent laboratory testing or independent certifications that meet California Section 01350.

---

<sup>3</sup> [http://www3.epa.gov/ozone/snap/download/SNAP\\_Regulatory\\_Factsheet\\_July20\\_2015\\_revised\\_508.pdf](http://www3.epa.gov/ozone/snap/download/SNAP_Regulatory_Factsheet_July20_2015_revised_508.pdf)

<sup>4</sup> [https://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/ch2s2-10-2.html](https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html), Table 2.14 from the column titled "100-yr" (not "SAR (100-yr)").

<sup>5</sup> This value is intended to allow the use of HFC-134a, HFC-245fa, and HFC365mfc.

<http://www.epa.gov/snap/substitutes-polystyrene-extruded-boardstock-and-billet>

<sup>6</sup> Ozone Depleting Chemicals have been phased out in the United States. This criterion is included to prevent certification of products that contain materials that are prohibited in the U.S.

**Content from Proposed Standard:**

**3.4 Volatile Organic Compound (VOC) Emissions.** Products that are not explicitly labeled for use in external portions of commercial structures<sup>7</sup> shall meet the requirements of the emission testing method for California Specification 01350,<sup>8</sup> using a relevant scenario (classroom, office, or residential).

**Raw Material Sourcing for Paper Facings**

The major environmental impact for raw materials is the mining of sand and the extraction of petroleum and natural gas for polymeric components. Non-sustainable extraction of these raw materials could lead to environmental damage and the depletion of non-renewable resources. In the US, sourcing of these materials must comply with regulations implemented to protect natural resources. Therefore, a requirement for the sourcing of these raw materials is not required.

Some insulation materials contain paper or wood elements. Green Seal proposes to require that these materials must be sourced from sustainably managed forests or from recovered paper, either pre-or post-consumer. Sustainably-sourced fiber can be chosen based on certification from SFI, FSC, ATFS, and other PEFC-recognized labels.

**Content from Proposed Standard:**

**3.5 Raw Material Sourcing.** Virgin wood fibers shall be *sustainably sourced, recovered material*, or a combination.

**Definitions:**

**Recovered Material.** Includes both *pre-consumer* and *post-consumer* recycled materials.

**Sustainably Sourced.** Products made from wood-based fiber that is sustainably derived, as certified by FSC (Forest Stewardship Council), SFI (Sustainable Forestry Initiative), ATFS (American Tree Farm System), other PEFC (Programme for the Endorsement of Forest Certification)-recognized labels, or equivalent.

<sup>7</sup> e.g., intended for roofs, external walls, etc., and not intended for schools or residences.

<sup>8</sup> See Appendix 3. [https://www.cdph.ca.gov/programs/IAQ/Documents/cdph-iaq\\_standardmethod\\_v1\\_1\\_2010%20new1110.pdf](https://www.cdph.ca.gov/programs/IAQ/Documents/cdph-iaq_standardmethod_v1_1_2010%20new1110.pdf)

## Bleaching

The manufacturing of many paper products includes the industrial bleaching of fibers. Several insulation products include paper products for facings (fiberglass or slag wool), or are made directly from paper sources (cellulose insulation). Green Seal proposes to prohibit the bleaching of any materials that are to be incorporated into the final insulation product.

Industrial bleaching with chlorine is hazardous to the environment and can be hazardous to human health. During the process, harmful byproducts are released including dioxins, furans, polychlorinated biphenyls, and other chemicals that are highly persistent and toxic. These chemicals pose serious harm to wildlife, in particular fish and bird species, and also to human health. Bleaching without chlorine is preferable, but still requires resources, energy, and the handling of hazardous materials (e.g., ozone, peroxides). Since the bleaching of insulation does not provide functional benefits, it should be avoided.

### Content from Proposed Standard:

**3.6 Bleaching.** All materials shall not be bleached during the process of manufacturing the insulation.

## Prohibited and Restricted Substances

Insulation products may contain hazardous substances, including polybrominated diphenyl ether (PBDE) flame retardants, brominated paraffin flame retardants, short-chain (C10-C13) chlorinated paraffin flame retardants, chemical compounds containing formaldehyde (e.g., formaldehyde, urea-formaldehyde, phenol-formaldehyde and urea-extended phenol formaldehyde), triclosan, the heavy metals tin, lead, mercury, cadmium, chromium, antimony, and selenium, and the following phthalates: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, and diethyl phthalate. These ingredients are not required for the functionality of insulation products because cost-effective alternatives are widely used in the industry. Green Seal proposes to prohibit these substances from being intentionally added to insulation products.

Green Seal's standards are also intended to reduce the exposure to chemicals-of-concern, and to eliminate them from the economy wherever possible and regardless of any particular exposure scenario, thus leading to a greener economy. However, since the standards are intended to reflect the products that are available on today's market, hazardous chemicals can be eliminated only so far as the current market provides. We therefore propose to limit the exposure to chemicals that are classified as known or probable carcinogens, reproductive toxins, respiratory sensitizers, mutagens, toxins, and those with specific organ toxicity. The specific lists identifying these chemical classes are provided in Section 3.7 of the proposed GS-54 (please see below). The GHS (Globally Harmonized System of Classification and Labeling of Chemicals) is included on

## RATIONALE, PROPOSED GREEN SEAL STANDARD FOR ARCHITECTURAL INSULATION MATERIALS, GS-54

this list because it has been incorporated into OSHA's regulations, and now governs the safety data sheets and labeling of products in the US, including insulation materials.

The proposed standard establishes these prohibitions for components present in the product at 0.1% by weight or more, and for components present in blowing agents at 1.0% by weight or more. Human exposure to hazardous substances that may be present in insulation materials can occur during the manufacturing, installation, and in-use stages in the life cycle of insulation, and to a lesser extent during the end-of-life phase. For insulation products, there are many protective circumstances that reduce the potential for exposure. During the manufacturing stage, factory conditions are geared to the protection of workers through the implementation of industrial hygiene measures. The proper installation of insulation materials requires protective gear and practices, including masks, respirators, protective suits, restricted areas and waiting times before unprotected people may enter the work area. This is especially true for insulation products that are manufactured on site or those that contain potentially hazardous substances.

Once the insulation materials are installed, most of them are closed inside the building envelope and direct contact with occupants is limited. The major significant exposure pathway for occupants under these conditions is from VOCs that may be emitted into the indoor air of the structure. This exposure pathway is addressed in GS-54 by the VOC requirements in Section 3.4, and does not, therefore, need to be addressed by restricting chemicals of concern. Finally, the end-of-life stage exposures will also be minimized by proper practices during renovations and demolition, which also include protective gear.

Because these reduced exposures are the likely scenarios for insulation products, sufficient protection of health and greening of the economy will be provided by evaluating known and probable carcinogens (IARC Class 1 and 2A, NTP Group K & R, EPA IRIS A and B, GHS Category 1 & 2), and Category 1 respiratory sensitizers, mutagens, reproductive toxins, and organ toxins.

The additional evaluation of other categories, such as possible carcinogens, mutagens, or reproductive toxins will add a significant burden for evaluation that is unlikely to add significant protection. For the same reason, an evaluation threshold at a trace level of 0.1% by weight in the final product has been chosen as an adequate level of protection for these chemicals of concern. This level is identical to that set by the GHS as the cut-off value / concentration limit for disclosing chemical information on SDS for respiratory and skin sensitization, mutagenicity, carcinogenicity, and reproductive toxicity.

There are two significant exposure pathways to potential hazards from insulation materials during the installation phase; these are inhalation and dermal exposure. At least one of these pathways is relevant to all types of insulation products covered by this standard. For this reason, we propose to include those hazard categories for carcinogenicity and toxicity if inhaled or in contact with the skin (GHS codes H310, H330, and H350i).

A different evaluation threshold is proposed for blowing agents, since they are components of insulation materials that may be retained in the final product incompletely and inconsistently. For this reason, it is impossible to reliably evaluate the proportion of blowing agent in the final

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

product and set an evaluation threshold. We are proposing to evaluate the components of blowing agents instead, and set a threshold for them at 1% by weight of the blowing agent. This level reflects the fact that blowing agents are only a component of the final product, and this level will provide protection for installers and occupants who may come in contact with them.

Exemptions from these prohibitions are proposed for substances that are in widespread use as functional components, and do not have effective alternatives. One substance is methylene diphenyl diisocyanate (MDI), a major component of polyurethane-based foams that is classified as a respiratory sensitizer. There are currently no effective substitutes for MDI for these products, and, therefore, we allow this exemption specifically for foam products. Other exemptions are established for sodium borate and boron oxide (classified as reproductive toxins), which are present in fiberglass and are used as flame retardants and for pest control in a number of insulation materials.

It should be noted that, although some sources may list glass fibers as carcinogens, they are not prohibited in this standard. IARC evaluated man-made mineral fibers in 2002 and specifically categorized all of the fibers found in insulation materials to be “not classifiable as to their carcinogenicity to humans (Group 3).” Because mineral fibers are such an important component of insulation materials, a note to this effect was included in the standard to prevent any confusion on this point.

**Content from Proposed Standard:**

**3.7 Prohibited and Restricted Substances.** *Components* present in the insulation product at 0.1% by weight or more, and *components* present in blowing agents at 1.0% by weight or more,

- shall not be classified as known or probable carcinogens by IARC (Class 1 or 2A),<sup>9</sup> the National Toxicology Project (Group K and R), EPA Integrated Risk Information System (Group A, B1, or B2), or OSHA (29 CFR 1910.1003(a)(1))<sup>10</sup>;
- shall not be listed by California Proposition 65<sup>11</sup> as a reproductive toxin;
- and shall not carry the following GHS hazard codes:<sup>12</sup>

H310 acute toxicity if inhaled (Category 1 & 2)  
H330 acute toxicity in contact with skin (Category 1 & 2)  
H334 respiratory sensitization (Category 1)  
H340 may cause genetic defects; mutagenicity (Category 1A & 1B)  
H350 may cause cancer (Category 1A & 1B)  
H350i may cause cancer by inhalation (Category 1A & 1B)

<sup>9</sup> <http://monographs.iarc.fr/ENG/Classification/index.php>

<sup>10</sup> [https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10007](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10007)

<sup>11</sup> The Safe Drinking Water and Toxic Enforcement Act of 1986.

[http://oehha.ca.gov/prop65/prop65\\_list/Newlist.html](http://oehha.ca.gov/prop65/prop65_list/Newlist.html)

<sup>12</sup> as listed by the European Chemical Agency, <http://echa.europa.eu/information-on-chemicals/cl-inventory-database>

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

H351	suspected of causing cancer (Category 2)
H360	reproductive toxicity (Category 1A & 1B)
H370	specific target organ toxicity (Category 1)

**Exemption:** MDI (methylene diphenyl diisocyanate, CAS 101-68-8) is allowed as a functional ingredient in spray polyurethane foam and polyisocyanurate foam products.

**Exemption:** Sodium borate (CAS 1330-43-4; 1303-96-4; 13840-56-7) and boron oxide (CAS 1303-86-2) are allowed as functional ingredients up to 30% in the product.

**Note:** According to IARC (2002),<sup>13</sup> “insulation glass wool (i.e., fiberglass), continuous glass filament, rock (stone) wool and slag wool are not classifiable as to their carcinogenicity to humans (Group 3)”, and are therefore not prohibited.

The following *components* shall not be *intentionally introduced* into the product:

- Polybrominated diphenyl ether (PBDE) flame retardants
- Brominated paraffin flame retardants
- Short-chain (C10-C13) chlorinated paraffin flame retardants
- Chemical compounds containing formaldehyde, including formaldehyde, urea-formaldehyde, phenol-formaldehyde and urea-extended phenol formaldehyde
- Triclosan
- Compounds containing the heavy metals tin, lead, mercury, cadmium, chromium, antimony, and selenium
- The following phthalates: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate

The following substances are prohibited under other restrictions in the standard:

- Asbestos (at 0.1% and above)
- Arsenic (at 0.1% and above)
- CFCs, HCFCs, HFCs<sup>14</sup>
- Tris(1,3-dichloro-2-propyl)phosphate (TDCPP) (CAS 13674-87-8) (at 0.1% and above)
- Tris(2-chloroethyl)phosphate (TCEP) (CAS 115-96-8) (at 0.1% and above)
- Acrylamide (CAS 79-06-1)

<sup>13</sup> <http://monographs.iarc.fr/ENG/Monographs/vol81/mono81.pdf>

<sup>14</sup> The requirements for Global Warming Potential and Ozone Depletion effectively prohibit CFCs, HCFCs, and HFCs.

## Embodied Energy

Some categories of insulation materials require large amounts of energy to manufacture, most notably fiberglass and mineral wool. This expenditure of energy is, however, recouped a number of times over due to the efficiency and lifespan of these materials compared to some alternatives.

The calculation of embodied energy is more complicated than simply dividing the energy bills of the factory by the amount of insulation material produced. Evaluating the amount of embodied energy for individual insulation products is expected to be complex and time-consuming, and not practical for verification under Green Seal's certification process. This requirement is reserved in order to emphasize its importance in the life cycle of insulation materials and reserve the option for incorporating it in the future.

### Content from Proposed Standard:

**3.8 Embodied Energy.** Reserved.

## Packaging Sustainability Requirements

Packaging can also have a significant impact on human health and the environment. Insulation materials come in a variety of packaging, including plastic wrap, paper, cardboard, and metal drums. Plastic wrap, or shrink wrap, is generally made of low density polyethylene (LDPE) or high density polyethylene (HDPE). Green Seal requires this type of plastic packaging to be recyclable in order to reduce the waste that ends up in landfills. Additionally, Green Seal prohibits the intentional addition of phthalates and halogenated substances to packaging materials.

Paper and cardboard packaging must be recyclable and must be made from at least 10% of recovered materials, be made from sustainably-sourced fibers, or a combination of the two. These options will limit the overall environmental impact by reducing the amount of resources consumed, while not negatively impact the protective function of paper and cardboard packaging.

### **4.0 PACKAGING REQUIREMENTS**

**4.1 Plastic Package.** Plastic packaging shall be recyclable and shall not contain *intentionally introduced* phthalates or halogenated substances.

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

**4.2 Paper and Cardboard Package.** Fibers used for these packages shall be *sustainably sourced*, made from a minimum of 10% *recovered material*, or a combination of *sustainably sourced* virgin fibers and *recovered materials*.

**4.3 Heavy Metal Restrictions.** The heavy metals lead, mercury, cadmium, and hexavalent chromium shall not be *intentionally introduced* in the packaging above 0.1% by weight.

Metal drums are the common packaging for professionally-installed spray foam insulation products. The drums are often reconditioned or recycled as scrap metal, and are not usually accepted by solid waste facilities. For this reason, there are no practical requirements that can be set for recycled content, recyclability, or take-back programs.

## **Consumer Information and Labeling Requirements**

Labeling and accessible consumer information are vital for the safe and effective use of insulation. Improper installation of insulation materials can damage their effectiveness in saving energy, and may negatively harm the health of installers and building occupants. In order to protect these populations, the proposed standard requires manufacturers to provide instructions for the proper installation of their product, and also include recommendations for appropriate equipment for personal protection. Some options include printed instructions and prominent directions to a website with further information. The labels and marketing materials must also include warnings about potential respiratory problems and recommendations that the product be installed only by certified professionals (especially for spray foam products), in order to ensure proper function of the insulation for the lifetime of the building and the health and safety of the installers and building occupants. Additionally, information must be provided on proper storage, disposal, reuse or recycling, and re-installation guidelines.

### **5.0 CONSUMER INFORMATION AND LABELING REQUIREMENTS**

**5.1 Instructions for Proper Installation.** The product manufacturer shall offer training materials on the proper installation of the product, any required safety measures, and any recommended personal protection equipment for each stage of the installation, up to and including the entry of unprotected occupants. The manufacturer may provide this material or direct the purchaser to materials provided by a distributor or a competent third party, e.g., a professional trade group.

Installation instructions for insulation products shall comply with the relevant ASTM or other industry-accepted Standard Practice.



**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

- Loose fill (cellulose and mineral fiber): ASTM C1015
- Mineral fiber batts and blankets (light frame construction): ASTM C1320
- Spray Polyurethane Foam: Guidance Documents from the Spray Foam Coalition,<sup>15</sup> the Center for the Polyurethane Industry's (CPI) website,<sup>16</sup> the Spray Polyurethane Foam Alliance,<sup>17</sup> or equivalent.

Product manufacturers shall make the appropriate product and/or equipment training information, including Safety Data Sheets (SDSs) and technical data sheets, available electronically as well as in hard copy.

**5.2 Label: Warnings.**

For Spray Polyurethane Foam products, the manufacturer shall include prominent recommendations that installation should be performed only by certified contractors.

Products that contain respiratory sensitizers shall include on the label and in marketing materials a statement that "This product contains material that may cause or aggravate asthma."

**5.4 Label: Disposal Directions.** The manufacturer's label shall have explicit disposal, recycling, or reuse instructions, including appropriate precautions and recommendations for the use of personal protective equipment.

## Certification Requirements

In accordance with other Green Seal standards, the proposed standard includes requirements for the use of the Certification Mark. The Mark may only appear in conjunction with the certified product on the product's packaging, marketing materials, or websites. The Mark cannot appear with other claims unless those claims have been verified and approved by Green Seal, in order to not modify the meaning of the Certification Mark or mislead consumers.

A Statement of Basis for Certification must appear in the vicinity of the Certification Mark. The Statement of Basis is fully compliant with the most recent version of the FTC Green Guides. Specific wording is provided by Green Seal and can be altered only with prior written approval from Green Seal.

<sup>15</sup> <http://polyurethane.americanchemistry.com/Spray-Foam-Coalition/Guidance-on-Best-Practices-for-the-Installation-of-Spray-Polyurethane-Foam.pdf>

<sup>16</sup> <http://www.spraypolyurethane.org/>

<sup>17</sup> e.g., [http://www.sprayfoam.org/files/docs/HealthSafety/SPF\\_2015\\_Exterior%20HealthSafetyQA\\_Formatted.pdf](http://www.sprayfoam.org/files/docs/HealthSafety/SPF_2015_Exterior%20HealthSafetyQA_Formatted.pdf) and many others.

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

**6.0 CERTIFICATION REQUIREMENTS**

**6.1 Certification Mark.** The Green Seal® Certification Mark may appear on the product, packaging, secondary documents, and promotional materials, only in conjunction with the certified product. Use of the Mark must be in accordance with *Rules Governing the Use of the Green Seal Certification Mark*<sup>18</sup>.

The Green Seal Certification Mark shall not be used in conjunction with any modifying terms, phrases, or graphic images that might mislead consumers as to the extent or nature of the certification.

Green Seal must review all uses of the Certification Mark prior to printing or publishing.

**6.2 Use With Other Claims.** The Green Seal Certification Mark shall not appear in conjunction with any human health or environmental claims, unless verified and approved in writing by Green Seal.

**6.3 Statement of Basis for Certification.** Wherever the Green Seal Certification Mark appears, it shall be accompanied by a description of the basis for certification. The description shall be in a location, style, and typeface that are easily readable.

The description shall read as follows, unless an alternate version is approved in writing by Green Seal:

This product meets Green Seal™ Standard GS-54 based on energy efficiency, recovered material content, and protective limits on VOCs, greenhouse gas emissions, and toxic materials. GreenSeal.org/GS54.
---

For products that do not have requirements for recovered material content:

This product meets Green Seal™ Standard GS-54 based on energy efficiency, and protective limits on VOCs, greenhouse gas emissions, and toxic materials. GreenSeal.org/GS54.
---

For products that do not contain blowing agents:

This product meets Green Seal™ Standard GS-54 based on energy efficiency, recovered material content, and protective limits on VOCs and toxic materials. GreenSeal.org/GS54.
--

<sup>18</sup> <http://www.greenseal.org/TrademarkGuidelines>

**ANNEX A – DEFINITIONS** (Normative)

Note that the defined terms are italicized throughout the standard.<sup>19</sup>

**Batt.** Blanket insulation manufactured to dimensions as required by a specific application.

**Benchmark Product.** A product used for comparison in performance testing; for the purposes of this standard this is considered a national market-leading product, typically selected from the top three or four selling brands or companies for its product class from nation-wide data.<sup>20</sup>

**Blanket Insulation.** A relatively flat and flexible insulation in coherent sheet form furnished in units of substantial area.

**Block Insulation.** Rigid insulation preformed into rectangular units.

**Cellulosic Fiber.** Insulation composed principally of cellulose fibers usually derived from paper, paperboard stock, or wood, with or without binders.

**Component.** Any constituent of a product that is intentionally added or present as contaminant. For products comprised of multiple parts that are mixed on site (multi-component products), any threshold applies to the total weight of all parts added together (i.e., the combined parts).

**Intentional Introduction.** The act of deliberately using a material where its continued presence is desired in the final product to provide a specific characteristic, appearance, or quality. Intentional introduction does not include the use of the material as a processing aid or intermediate during manufacturing, where the presence of a residual of that material in the final product is not desired or deliberate.

**Loose Fill Insulation.** Insulation in granular, nodular, fibrous, powdery, or similar form designed to be installed by pouring, blowing, or hand placement.

**Primary Package.** Package material that physically contains and contacts the product.

**Recovered Material.** Includes both pre-consumer and post-consumer recycled materials.

**Pre-Consumer Material.** Material diverted from a waste stream during the manufacturing process, excluding material such as rework, regrind, or scrap generated in a process and capable of being reused within the same process that generated it.

<sup>19</sup> Definitions for insulation materials are taken from ASTM C168-15, <http://www.astm.org/Standards/C168.htm>

<sup>20</sup> It is recommended that manufacturers discuss their product testing with Green Seal before the testing is performed to ensure that the choice of comparison product(s) is appropriate.

**RATIONALE, PROPOSED GREEN SEAL STANDARD FOR  
ARCHITECTURAL INSULATION MATERIALS, GS-54**

**Post-Consumer Material.** Material that has completed its intended end use and would otherwise be disposed of as solid waste. Post-consumer material does not include materials, agricultural residue, or by-products generated from, and commonly reused within, an original manufacturing and fabrication process.

**Recyclable.** The package can be collected in a substantial majority of communities, separated or recovered from the solid waste stream and used again, or reused in the manufacture or assembly of another package or product through an established recycling program.

**Sustainably Sourced.** Products made from wood-based fiber that is sustainably derived, as certified by FSC (Forest Stewardship Council), SFI (Sustainable Forestry Initiative), ATFS (American Tree Farm System), other PEFC (Programme for the Endorsement of Forest Certification)-recognized labels, or equivalent.

**Thermal Insulation.** A material or assembly of materials used to provide resistance to heat flow.