



## What's "Green" Mean? The Current Insulation Situation

A White Paper Prepared by



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**Section One:****The Need To Define "Green" Insulation**

More and more consumers are looking to buy or build homes that are considered "green." A September, 2007 "Green Building Survey" done by *Professional Builder* included these startling statistics: "A quarter of all respondents said green building is extremely important to their market strategy, and 45 percent said it was somewhat important. Seventy two percent of those who build one to 10 homes a year felt it was extremely or somewhat important, while 66 percent of those who build more than 10 homes a year did. There's no huge difference between those who build exclusively custom homes, production homes or a mix of both — all hover around 70 percent. 'Green building has had an effect on homes sales,' according to 48 percent of respondents."<sup>1</sup> In that same issue of *Professional Builder*, senior editor Susan Bady writes, "Last year, in a McGraw-Hill Construction survey, NAHB builder members predicted that 40 to 50 percent of new homes built in 2010 would be green. That might be a stretch, but it shows how much green building has affected the housing industry."<sup>2</sup> Clearly, the concerns of consumers "going green" are no longer just global warming or landfills that are too full. Seeing the long term cost savings and other benefits of an energy efficient home are key reasons for choosing to "go green" as well.

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The problem is that no one really knows what "green" is. The National Association of Home Builders admits as much in their own *NAHB Model GREEN Home Building Guidelines*: "It should be noted that although many green building programs have been in existence for 10 years or more, the concept and practice of green building is not clearly defined and straightforward."<sup>3</sup> Similarly, a recent article in *Professional Remodeler* notes, "without a standard definition, it's hard to know exactly what constitutes green."<sup>4</sup> As we will see, various organizations are attempting to fill the void with different "green building" certification programs, but as of yet there is no consensus as to which "green" is *the* green, and we will not attempt to make that distinction in this paper. What we will do is examine the various criteria used to determine what makes something "green" in order to apply that label to one specific component of "green building" — insulation.

**Section Two:****Identifying "Green Insulation" Through the "Green Building" Certification Process**

At present there are an estimated eighty-five local "green building" certification programs across the nation, including EarthCraft House in Atlanta, EcoBUILD in Memphis, Earth Advantage in Portland, North Carolina HealthyBuilt Homes, and a myriad under the title Green Home, Green Building or some variation thereof. On a nationwide scale, the big three are ENERGY STAR (the Department of Energy's program, in partnership with the Environmental Protection Agency), the NAHB Model GREEN Guidelines, and the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program. In the recent "green builder" survey done by *Professional Builder*, ENERGY STAR (the most widely known of all the programs) was the one most builders used: "According to the *PB* survey, 62 percent had used ENERGY

**Section Two: continued**

STAR, 32 percent had used the NAHB program and 19 percent had used LEED. <sup>5</sup> To differentiate between the three, here is a brief synopsis of each:

**ENERGY STAR** – To be certified an ENERGY STAR home, the residence must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. These homes are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20-30% more efficient than standard homes. ENERGY STAR qualified homes typically include a variety of 'tried-and-true' energy-efficient features that contribute to improved home quality and homeowner comfort, and to lower energy demand and reduced air pollution:

1. Effective Insulation
2. High-Performance Windows
3. Tight Construction and Ducts
4. Efficient Heating and Cooling Equipment
5. Efficient Products

Third-party verification is required to receive ENERGY STAR certification.

**NAHB Model GREEN Home Building Guidelines** – NAHB certification is divided into three tiers: bronze, silver and gold. At all tiers, builders accrue points by following the NAHB guidelines, which are divided into eight 'guiding principles' or sections:

1. Lot design, Preparation and development
2. Resource efficiency
3. Energy efficiency
4. Water efficiency
5. Indoor environmental quality
6. Operation, maintenance and homeowner education
7. Global impact
8. Site planning and land development

No third-party verification is required for NAHB certification.

**USGBC LEED Rating System** – The LEED rating system for residential homes has four levels: Certified, Silver, Gold and Platinum. Points are awarded in each of eight categories:

1. Innovation and design process
2. Location and linkage
3. Sustainable sites
4. Water efficiency
5. Energy and atmosphere
6. Materials and resources
7. Indoor environmental quality
8. Awareness and education.

Different products have different point values based on these categories, allowing builders or consumers to choose products based on LEED value. LEED certification requires third-party verification.

Clearly, one way to define "green" insulation is to identify it as a product that helps a home qualify for ENERGY STAR, NAHB or LEED certification. With the ENERGY STAR and NAHB guidelines, the manufacturer can focus on the amount of insulation required to achieve the

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**Section Two: continued**

R-Value required for certification, i.e. InsulStar® closed-cell spray foam insulation points out that "closed-cell foam has the thermal insulation value (R-value) to bring your home up to ENERGY STAR® standards with only one-half the thickness required for fiber insulations."<sup>6</sup> The LEED rating system, because it uses a point system, is able to provide a more apples-to-apples comparison. (Interestingly, some LEED point values are based on ENERGY STAR compliance.)

Overall, it is vital for any insulation that wants to be identified as "green" to be affiliated with one or more of these "green building" certification systems.

**Section Three:****How Third Parties Define "Green"**

Many have attempted to define "green insulation" from different points of view: the environmentalist, the consumer, the building industry professional. As result we have a number of different criteria but no overall consensus as to what makes insulation "green." Below we examine three aspects of insulation that could make it "green."

**1. The Functional/Environmental Aspect**

Any product defined as "green" is assumed to function in a way that has less of an environmental impact than a non-"green" product. As a rule, the first and foremost element in any discussion of "green" products involves energy efficiency. Energy efficiency is a key component in meeting ENERGY STAR, NAHB and LEED standards. As the *NAHB Model GREEN Home Building Guidelines* explain, "Energy consumption has far-reaching environmental impacts: from the mining of fossil-fuel energy sources to the environmental emissions from burning non-renewable energy sources. And each home consumes energy year after year, meaning that the environmental impacts associated with that use accrue over time. Therefore, energy efficiency is weighted heavily in a green building program."<sup>7</sup> A product that reduces energy use and, therefore, reduces the pollution required to produce that energy, is generally considered "green."

Another functional aspect involves improving the indoor air quality of the home itself. A 2007 article in *The Seattle Times*, "What it means to live in a green home," includes this under the heading, "What makes a house green?": "Indoor air quality is improved by limiting mold through moisture control and proper ventilation, and by reducing exposure to materials that emit toxins."<sup>8</sup> The NAHB Guidelines reiterate this point: "After energy efficiency, the quality of a home's indoor air is often cited as the most important feature of green homes."<sup>9</sup>

Among consumers, energy efficiency and indoor air quality are far and away the most important criteria. According to the 2007 *Professional Builder* survey, "Builders said energy efficiency was somewhat or extremely important to 97 percent of their buyers; indoor air quality was selected by 83 percent...Energy efficiency's high ranking may reflect the fact that buyers can more easily understand and appreciate the benefits of building green when it allows them to heat and cool their homes more cost effectively."<sup>10</sup>

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**Section Three: continued****2. The Content Aspect**

A second aspect of defining "green" involves the content of the material used. One of the criteria used by the Partnership for Advancing Technology in Housing (PATH) in determining if a product is "green" is that it is "made from reused, recycled, rapidly renewable, preferably local" materials.<sup>11</sup> The NAHB also focuses on this aspect, under their Guiding Principal of Resource Efficiency: "Creating resource-efficient designs and using resource efficient materials can maximize function while optimizing the use of natural resources."<sup>12</sup>

Though less of a consideration to the average consumer, the content of a "green" product is of primary concern to a certain segment of the audience. Some, in fact, see this as the primary attribute of "green." According to a 2004 article in *Builder News*, "There are two schools of thinking: you can be eco-friendly because your product provides improved air quality, as insulation does, or you can be eco-friendly because your product is manufactured using recycled or natural materials."<sup>13</sup>

**3. The Comprehensive Aspect**

A third aspect of the "green" issue involves looking at the total impact a product has on the environment, from manufacturing through disposal. This is termed "Life Cycle Analysis" (LCA). According to the NAHB guidelines, "An LCA of a building product covers its environmental impacts 'cradle to grave' through six basic steps: 1) Raw material acquisition, 2) Product manufacturing process, 3) Home building process, 4) Home maintenance and operation, 5) Home demolition, and 6) Product reuse, recycling, or disposal."<sup>14</sup>

At this point, the average consumer (and even most who identify themselves as "environmentalists") choose not to focus on a product's LCA, simply because it is so difficult to actually determine. As the NAHB explains, "There are numerous reasons why building products are not commonly selected via LCAs. One of the issues is the availability of data—there is a lack of data to feed into tools that allow for an LCA on a product or system."<sup>15</sup> The National Renewable Energy Laboratory, located in Golden, Colorado, is currently engaged in a project to gather data that can be used to solve what they call "the problem of data inconsistency and incompatibility that currently plagues the LCA field in general,"<sup>16</sup> but as of this writing there are no insulation LCAs listed in their online database ([www.nrel.gov/lci/](http://www.nrel.gov/lci/)).

**Section Four:****Defining "Green Insulations"**

Because no clear definition of "green" exists, no clear definition of "green insulation" exists. For some, the point is not what makes insulation "green," but that all insulation is, by its very nature, "green." Writing in *Walls & Ceilings*, Robin Bectel makes the argument that "the core purpose of insulation is to provide thermal efficiency, and to that end, all insulation is 'green.'"<sup>17</sup> The certification programs would seem to agree. ENERGY STAR, for instance, simply says that the typical ENERGY STAR home will have "effective levels of wall, floor, and attic

**Section Four: continued**

insulation properly installed.”<sup>18</sup> No certification program specifies any one insulation as being “greener” than another, but all include insulation among the products necessary for a “green” home. Thus the best that we can do at this point is try to define which types of insulation are generally considered “greener,” and why.

**1. Cellulose Insulation**

Made of finely shredded newsprint and chemically treated to resist mold, fire and pests, cellulose is considered “greener” largely because of its high recycled content. One typical product, manufactured by US GreenFiber, is “85% recycled content with a minimum of 80% post-consumer paper fiber. The remaining 15% is fire-retardant chemicals and other additives.” The manufacturing process also helps make it “greener” – it’s made in electrically-driven mills at about 750 BTUs per pound, whereas manufacturing fiberglass insulation consumes from 6,000 to 15,000 BTUs per pound.<sup>19</sup>

**2. Cotton or Wool Fiber Insulation**

An organic insulation made from shredded blue jeans, Bonded Logic’s UltraTouch cotton fiber insulation is also considered “greener” largely because it uses natural fibers and has 85% recycled content.<sup>20</sup> Sheep wool insulation is a “greener” insulation used in the United Kingdom, but so far not as popular in the United States. Thermafleecce, for instance, is “a patented sheep’s wool insulation material” that is produced in England.<sup>21</sup>

**3. Eco-Friendly Fiberglass Insulation**

While standard fiberglass insulation would merely be “green” because it insulates, some manufacturers are now offering fiberglass insulation that does not use a formaldehyde binder and uses recycled materials, both making it “greener.”<sup>22</sup> Johns Manville Formaldehyde-free™ insulation is one example. It “uses an innovative new acrylic binder that eliminates binder-related formaldehyde emissions during manufacturing, and after installation will not off-gas formaldehyde inside your home. And [it] contains 20% post-consumer recycled glass.”<sup>23</sup>

**4. Spray Polyurethane Foam (SPF) Insulation**

Sprayed into walls as a liquid that expands and cures to create an insulating “shell,” spray polyurethane foam insulation offers many “greener” qualities. As noted earlier, it requires less thickness than fiberglass to achieve the same R-value, making it more energy efficient. It also meets many other “greener” criteria. It will not shrink and adheres to the surrounding structure, so there is no settling and no air gaps. It has no volatile organic compounds (VOCs) and no formaldehyde. Recognized for ENERGY STAR certification and LEED credits, it is becoming very popular as a clean, green, long lasting insulation. One writer notes “it is an insulation and an air barrier that promises a tighter home with less dust and mildew, ensuring better indoor air quality.”<sup>24</sup> SPF insulation is available in two forms – open-cell and closed-cell. Open-cell SPF insulation, such as NCFI’s Sealite™, is less costly and has slightly higher R-values than fiberglass or cellulose, while closed cell products like NCFI’s InsulStar High Performance Insulation offer the highest R-values available as well as improved structural wall strength while acting as an air barrier.

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## Section Five:

## Conclusion

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As more and more consumers seek to buy "green" homes, a clearer definition of "green" will need to be established. Any "green" home, however, will need to be well insulated, and certain insulations are clearly "greener" than others, including cellulose, cotton or wool fiber, eco-friendly fiberglass and spray polyurethane foam. To determine which of these is the "greenest" insulation may be impossible, given the difficulty of doing a "life-cycle analysis" on any one product. If one chooses to define green by such things as recycled content or use of natural materials, cellulose or cotton/wool fiber could be considered the greenest. Content is a one-time criteria, however, and it would seem to make more sense to use a more results-based analysis. Ultimately, whatever its content, the insulation will be in the home for decades, and its long term impact will be in the energy it saves and the health benefits it provides. Comparing the various "green insulations" in more quantifiable terms, such as R-value at similar thicknesses, overall energy savings, and effect on indoor air quality may be the most accurate way to assess their "greenness," and by those criteria spray foam insulation would appear to be the greenest of the "green."

## Footnotes:

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