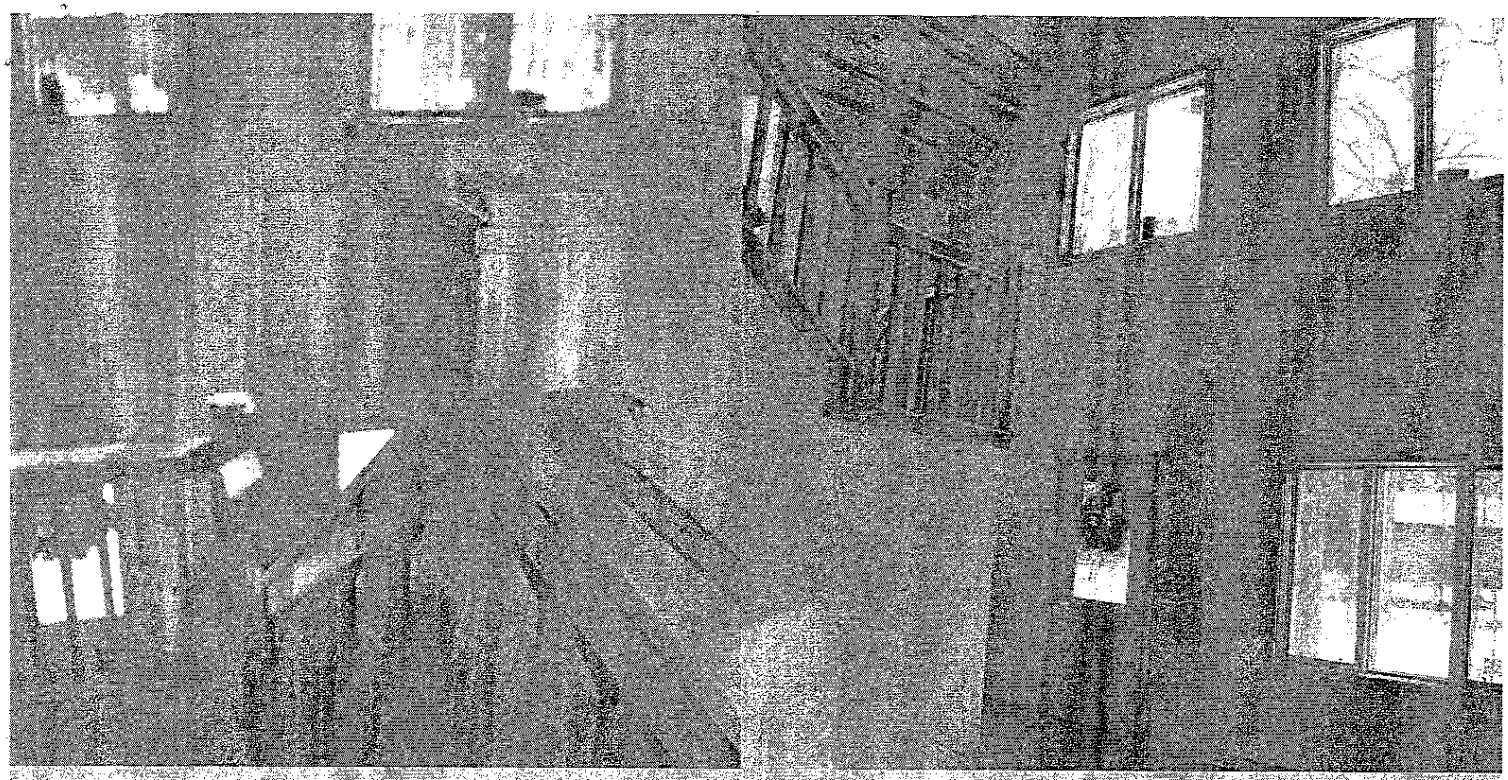
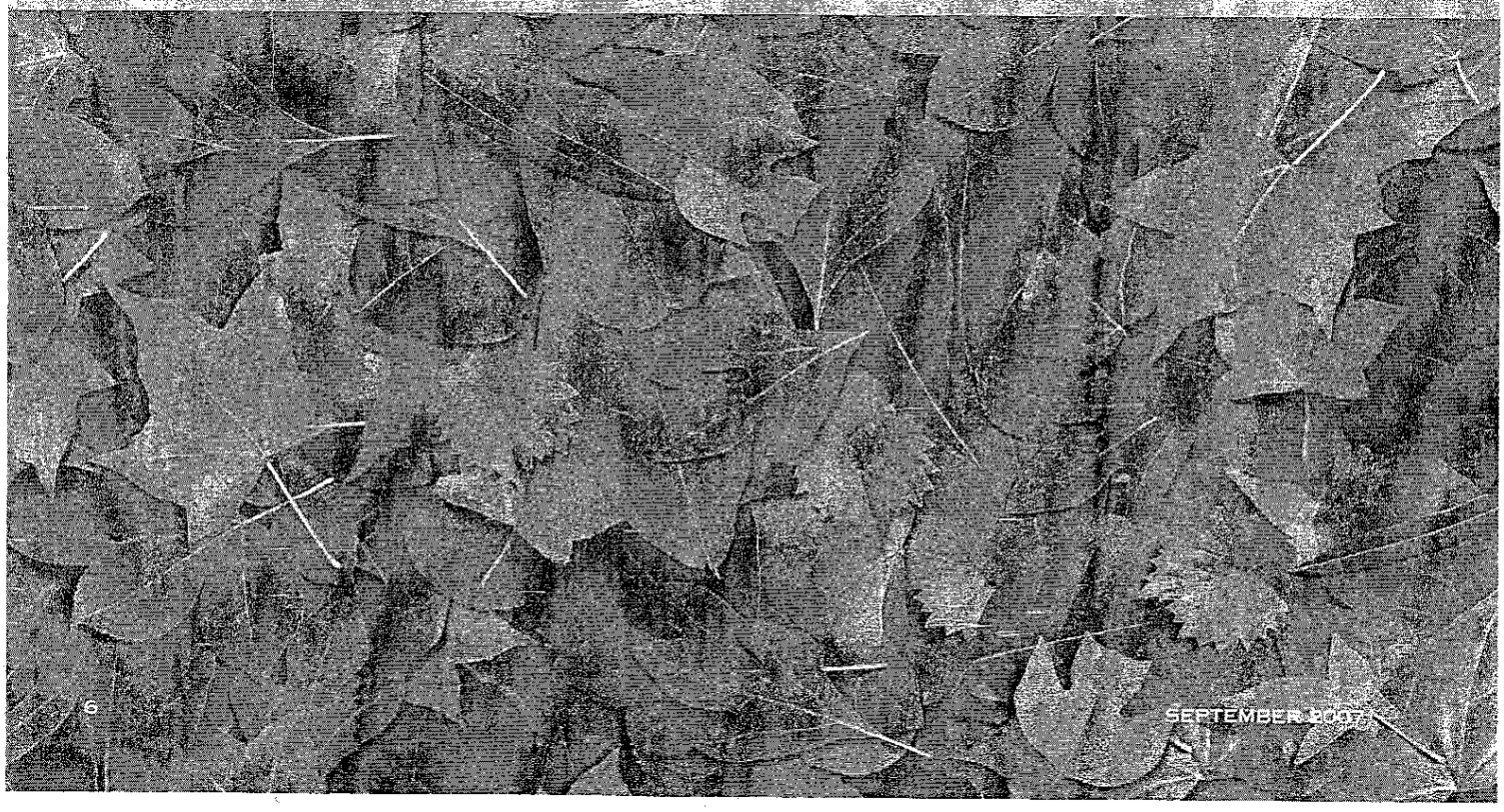


GREEN BUILDING PROGRAMS



— By Jim L. Bowyer —

Are They Really GREEN?

Green creeps into building construction

Ten years ago, any reference to green in the construction industry would have translated to either profits or to the color of the countertops. Today, however, "green" is widely understood to refer to environmentally responsible construction.

One manifestation of the shift toward environmentally responsible behavior is the development of a myriad of green building programs. Mostly a phenomenon of North America and Western Europe, green building initiatives are being pursued today at national, state, county, and municipal levels. Thus far the impact on the construction industry has been modest, but trends in program growth and in attendance of builders, architects, and other construction professionals at green building seminars and workshops suggest significant impact in the relatively near term.

Planning and constructing buildings and the neighborhoods of which they are a part look different from standard practice when environmental concerns are front and center. Energy efficiency, water management, waste reduction, indoor air quality, and environmental attributes of construction materials all receive more attention than traditionally.

This article examines some of the most notable green building programs of North America and focuses on how environmentally preferable construction materials are defined and identified within them. Programs examined in this article include LEED, Green Globes, the Seattle (King County) Built Green Program, the Austin (Texas) Green Building Program, the California Green Builder Program, the Built Green Colorado Program, and the Wisconsin Green-built Program. It is important to recognize that these are but a few of the green building programs in existence within the United States and Canada, as well as in a number of other countries.

Comparing green building programs

National and international

LEED

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System is a program of the U.S.-based Green Building Council (USGBC) (USGBC, 2007). The USGBC was founded in 1993 and is a national, not-for-profit, membership organization. By April 2007, the USGBC had more than 7,500 member companies and organizations, operating through 75 regional chapters. The LEED program was initiated in 1998 as a voluntary national standard for developing high-performance, sustainable buildings. The program originally focused on new construction (LEED–NC), but has since expanded to include commercial interiors (LEED–CI), core and shell (LEED–CS), and existing buildings (LEED–EB). LEED for homes (LEED–H) and LEED for neighborhood development (LEED–ND) are in the pilot stage. Other programs, focusing on schools, retail establishments, health care, laboratories, and university campuses, are in various stages of development.

Under LEED, projects can be certified to various performance standards (in ascending order of achievement: certified, silver, gold, and platinum); a project becomes certified when third-party verification confirms that all mandatory requirements have been met, and that a specified number of credits related to optional elements have been earned.

To illustrate how LEED works, standards for two building categories—new construction (LEED–NC), and homes (LEED–H)—are briefly examined in the following paragraphs. It should be noted that it was announced on June 29, 2007 that revisions to the LEED system that harmonize core elements across the various programs are underway. Thus,

House photos (including cover) and drawings on page 9 courtesy of Dovetail Partners, Inc.

specifics of various programs, as discussed below, can be expected to change within the near future (USGBC 2007b).

The LEED program uses a credit system in rating buildings, with credits awarded in a number of environmentally related categories, including site factors, water efficiency, materials, and resources, and indoor air quality. Credit levels for attainment of various performance standards within LEED–NC and LEED–H are shown in Table 1. Within LEED–NC, 69 credits are distributed across six categories, whereas in LEED–H, some 108 credits are distributed across eight categories. Credits available within the materials and resources category comprise about 19 percent and 22 percent of all credits in LEED–NC and LEED–H, respectively. The number of credits earned is used to determine attainment of certification levels.

Credits related to characteristics of construction materials are summarized in Table 2. Note the emphasis on waste reduction, recycling, local production of building materials, and certification of wood products by the Forest Stewardship Council (FSC). Renewability is also stressed, but only when renewal occurs within 10 years or less; given the short time frame specified, most wood products do not qualify for the renewability credit.

Under credit 5.2, program participants select "environmentally preferable" materials from a list (Table 3); in this listing, credits are heavily concentrated in three areas: low emission products, products with recycled content, and FSC certification (for wood products only). Preference is given to biobased products, especially if "rapidly renewable" (meaning renewable within 10 years or less); bamboo is especially favored using such criteria. A maximum of four credits (or less than 4 percent of the total credits available in LEED–H) are dedicated to environmentally preferable materials.

Up to this point the identification of environmentally preferable materials within LEED has been rather haphazard and based on a few criteria that reflect little other than personal bias, intuition, internal politics, and single attributes. Moreover, there is no provision for certification of any construction material other than wood.

In the latest version of LEED H (version 1.11a, 2007), life-cycle assessment (LCA) is mentioned as a tool that

Table 1. — Credit distribution under the LEED–NC and LEED–H programs.

	LEED–NC, Version 2.2	LEED–H, Version 1.72
Sustainable sites	14 points, 1 prerequisite	14 points, 3 prerequisites
Water efficiency	5 points	12 points, 1 prerequisite
Energy and atmosphere	17 points, 3 prerequisites	14 points, 3 prerequisites
Materials and resources	13 points, 1 prerequisite	24 points, 4 prerequisites
Indoor air quality	15 points, 2 prerequisites	29 points, 6 prerequisites
Innovation and design process	5 points	4 points
Location and linkages		10 points
Homeowner awareness		1 point
TOTAL	69 points, 7 prerequisites	108 points, 17 prerequisites

Table 2. — Credits related to materials and resources under the LEED–NC and LEED–H programs.

Materials and Resources	
LEED–NC	**LEED–H**
Credit 2.1 and 2.2 – Reduction of construction waste	Credit 2.2 – Advanced framing techniques
Credit 3.1 and 3.2 – Use of salvaged, refurbished, or reused materials	Credit 3 – Materials extracted/manufactured within 500 miles
Credit 4.1 and 4.2 – Use of materials with recycled content	**Credit 5 Environmentally preferable products**
Credit 5.1 – Local/regional materials (manufacturing)	Credit 5.1 – Tropical hardwoods, if used, must be FSC [prerequisite]
Credit 5.2 – Local/regional materials (harvesting)	Credit 5.2 – Select environmentally preferable products from list.
Credit 6 – Rapidly renewable materials (10-year or less harvesting cycle)	
Credit 7 – FSC certified wood	
Indoor Environmental Quality	
Credit 4.4 – Low-emitting materials; composite wood & agrifiber	

may be helpful in selecting environmental preferable materials and assemblies, but there is no requirement for its use. However, in the previously mentioned late June announcement (USGBC 2007b) it was indicated that LEED will incorporate life-cycle assessment throughout its programs. Should this come to pass it would be a major step forward for the program.

Potential changes to LEED that are now under consideration include:

To change the Rapidly Renewable Credit (Credit 6 under LEED–NC in Table 2) to a Biobased Credit.

The change is proposed based on recognition that the rapid renewability restriction cannot be justified from an LCA standpoint (the first use of LCA by LEED) since some rapidly renewable materials carry fairly heavy environmental and health burdens and because there is little scientific justification for continuing to preferentially reward rapidly renewable biobased products over forest-derived biobased products.

With regard to wood, proposals for change are based on the statement that "The intent of MRc6 [Materials and Resources Credit 6 (see Table 2)] would be to approve all wood products that have undergone some level of certification that ensures that they are not derived from illegal logging. Likely certification systems would be the Sustainable Forestry Initiative (SFI) certification with third-party verification, the Canadian Standards Association (CSA) wood certification, and the American Tree Farm System (ATFS)." Then outlined is the concept of "Tier 2" wood certification systems that "are more rigorous than Tier 1 systems." Only FSC-certified wood would qualify as a Tier 1 certification program under the change proposal.

To modify MRc7 (See LEED–NC, Table 2) to establish a basis for adoption of certification systems but maintain the FSC Certification requirement for wood products at this time.

Here the idea is to leave room for development of certification systems other than FSC that are comparable or even more rigorous. A part of the proposed change involves development on the part of USGBC of a set of minimum criteria that any certification system would need to meet before being approved as an MRc7 referenced standard.

An additional facet of this recommendation is that waste agricultural materials, such as a particleboard made from wheat straw, be approved by definition for MRc7. It is noted that "such materials currently satisfy both the recycled-content credit (MRc4) and the rapidly renewable credit (MRc6); if also approved by definition for MRc7, they could satisfy three different credits – thus providing a strong incentive for their use in LEED projects. It is also proposed that bamboo satisfy Tier 1 certification criteria without the requirement for certification based on the argument that it meets "certain prescriptive criteria." A vague reference is made to the possibility of certifying materials

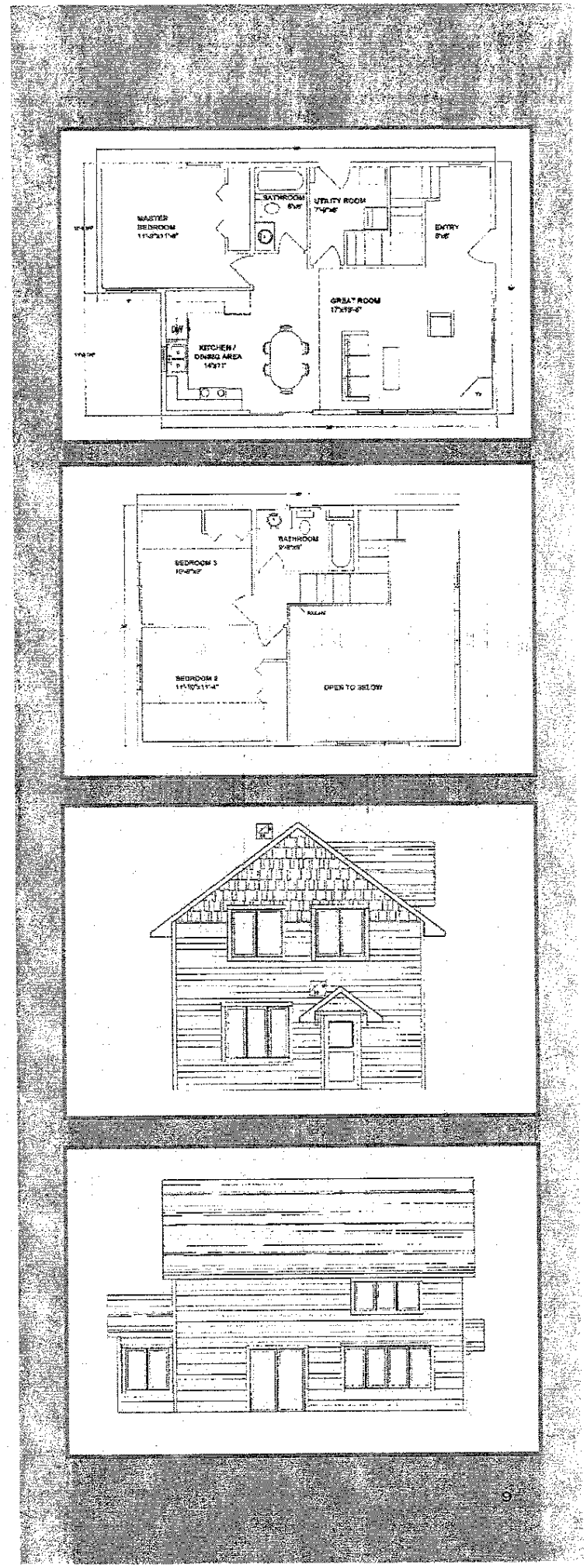


Table 3. — Specifications for environmentally preferable products in LEED–H (blue highlighting denotes specifications that pertain to wood or related products).

Specifications Related to Indoor Air Quality

Assembly	Component	Qualifying EPPs	Specifications
Other	Cabinets & trim	Low-VOC	Wood and agrifiber products contain no added urea-formaldehyde resins
Other	Counters	Low-VOC	Wood and agrifiber products contain no added urea-formaldehyde resins
Floor	Flooring	Low-VOC carpet & pad	Must comply with Carpet and Rug Institute's Green Label Plus Program
Floor	Flooring	No carpet in house	
Roof + floor + wall	Insulation	Low-VOC	Must comply with State of California, DHS, Practice for Testing of VOCs from Building Materials Using Small Chambers
Walls, ceiling, trim	Paint	Low-VOC	Must comply with Green Seal Standard GS–11, Paints, First edition, 1993.

Other Environmentally Preferable Products

Assembly	Component	Qualifying EPPs	Specifications
Foundation	Cement	Cement replacements	Minimum 30% fly-ash as replacement, not addition to, cement content
Roof	Framing	FSC-certified	
Floor	Framing	FSC-certified	
Floor	Flooring	Recycled content carpet & pad • linoleum • bamboo FSC certified wood recycled content tile sealed concrete	For 50% of house (sf), carpet and pad minimum recycled content 25%
Floor	Flooring	Recycled content carpet & pad • linoleum • bamboo FSC certified wood recycled content tile sealed concrete	Additional 0.5 point for 100% of house (sf), carpet and pad minimum recycled content 25%
Exterior wall	Framing	FSC-certified	
Interior wall	Framing	FSC-certified	
Walls + ceilings	Gypsum board	Recycled content	For 100% of gypsum board in house, minimum recycled content 25%
Roof + floor + wall	Insulation	Recycled content	For 100% of insulation in house, minimum recycled content 25%
Roof + floor + wall	Insulation	Recycled content	For 100% of insulation in house, additional 0.5 point for recycled content of 70%+
Roof	Roofing	Recycled content Vegetated	minimum recycled content 25% minimum 200sf if vegetated
Roof + floor + wall	Sheathing	Recycled content FSC-certified	minimum recycled content 25%
Exterior wall	Siding	Recycled content FSC-certified	minimum recycled content 25%
Landscape	Decking	Recycled content	minimum recycled content 25%
Other	Doors & windows	Recycled content FSC-certified	minimum recycled content 25%
Other	Cabinets and trim	Recycled content FSC-certified	100% recycled/ recovered, 25% min post-consumer
Other	Counters	Recycled content	minimum recycled content 25%

Unless otherwise noted, 90 percent of the selected component must meet the specifications shown – 0.5 point for each; total points – 4 maximum.

other than wood and biobased materials in the future. In effect, it is proposed that all of these materials will be exempted from rigorous evaluation.

Summarizing credits related to materials and resources in the LEED program:

- ➢ There is no provision for systematic analysis of any construction material except wood—and then only by FSC.
- ➢ Designation of environmentally preferable materials is based largely on personal bias, intuition, internal politics, and single attributes.
- ➢ There is no requirement that building materials assessments be informed by life-cycle analysis or life-cycle inventory (LCA/LCI), although it appears that a change to incorporate LCA throughout LEED is currently underway.

Green Globes

The Green Globes program applies to buildings of all kinds. It is a credit-based program, with a total of 1,000 possible points identified. Green Globes concentrates on energy efficiency, the indoor environment, site impacts, water management, and characteristics of construction materials (Table 4). As with other green building programs, various levels of achievement are identified and third-party assessment is used to verify attainment.

Ten percent of the possible points available in Green Globes relate to environmental attributes of construction materials. This program is unique among all green programs in that environmental preferability of construction materials is largely based on rigorous evaluation using life-cycle assessment of many factors including embodied energy and emissions to air, water, and ground. In addition, determination of environmental preferability under Green Globes favors the use of materials that minimize resource depletion, that are highly durable, and that contribute to minimization of waste in the construction process (Table 5). In this program, lumber and wood products must be certified, but by any one of four such programs operating in North America.

Summarizing the construction materials provisions of the Green Globes Program:

- ➢ 7 to 8 percent of credits are directly related to characteristics of construction materials.
- ➢ A central focus of building materials assessment is LCA/LCI using international protocols.
- ➢ The program seeks to minimize use of non-renewable materials.
- ➢ Guidelines throughout the standards are based on established standards (ANSI, ASHRAE).

Table 4. — Point distribution within Green Globes.

Category	Points
Project management	50 points
Site	115 points
Energy	380 points
Water	85 points
Resources	100 points
Emissions, effluents, other	70 points
Indoor environment	200 points
TOTAL	**1000 points**

Table 5. — Credits related to characteristics of construction materials (resources) under the Green Globes program.

Characteristic	Points
Have the following assemblies been selected based on a life cycle assessment considering embodied energy and green house gas emissions? – Foundations and floor assemblies, structural systems, roof assemblies, other mat's (cladding, windows, etc.)	40
Minimize consumption and depletion of material resources	30
– What proportion of bldg matls and components are reused?	10
– What proportion of bldg materials contain recycled post-consumer content?	10
– What proportion of materials are biobased mat'ls?	5
– What proportion of lumber and panel products are third-partycertified (SFI, CSA SFM Program, FSC, ATFS)?	5
Re-use of existing structures	10
Building durability, adaptability and disassembly	10
Reduction, re-use and recycling of waste	10

➢ There is no requirement for certification of any material other than wood, but a number of certification programs are allowed.

STATE AND REGIONAL

Austin Green Builder Program

The municipal program of Austin, Texas, is advertised as the first such program in the United States, dating back to 1990. Assistance is provided to construction professionals and consumers in making choices when evaluating green building materials and systems. Builders can ask that a project be rated through this program. Ratings are done under commercial, multifamily, or single-family rating tools, with available certification levels ranging from one (lowest) to five (highest) stars.

The Austin GBP Single Family Rating Tool encompasses 337 points, 117 of which are voluntary. All points in the "materials" category (53) are under the voluntary listing. Point totals needed to achieve various rating levels are summarized in Table 6.

Table 6. — Austin Green Building Program single-family rating tool certification levels.

Rating	Points Required
One Star	40-59
Two Star	60-89
Three Star	90-129
Four Star	130-179
Five Star	≥180

Table 7. — Available points in the "materials" category in the Austin Green Building Program.

Area	Points Available
Design and structure	27
Finishes	17
Efficient use and recycling	9
Total	**53**

Table 8. — Credit distribution in the King County (Seattle) Built Green Program.

Category	Credits
Build to green codes/regulations	Required
Site and water	155 points
Energy efficiency	186 points
Health and indoor air quality	152 points
Materials efficiency	205 points
Promote environmentally friendly homeowner O&M	129 points
TOTAL	**827 points***

** Other points for innovation and certain required elements*

Under the "materials" category, points are available in three areas: design and structure, finishes, and efficient use and recycling (Table 7).

Austin GBP and LEED are similar in that both require the use of third-party certified wood products and recognize only FSC certification. In the materials category, the Austin program emphasizes the use of use of third-party certified wood products and FSC certification, rapid renewability (10 years or less), high post-consumer recycled content, recyclability, durability, low-maintenance, regional sourcing and manufacturing, and low-emission materials.

King County (Seattle) Built Green Program

The King County Built Green™ Program is another long-standing program that predates both LEED and Green Globes. Developed in partnership with the Master Builder's Association of King and Snohomish counties of the Seattle area, the Built Green program emphasizes energy and materials efficiency, occupant health and indoor air quality, and water management (Table 8).

As in other programs, mandatory elements are supplemented by criteria in each of the emphasis areas for which credits can be awarded; the number of possible credits is not fixed, as innovation is encouraged in every emphasis area through verifiable and generous credit allocation.

Materials efficiency is a central focus of the King County program, with almost one-quarter of the defined credits dedicated to this area. Almost one-half of the materials efficiency credits are related to recycling, reuse, and waste minimization (Table 9). Local production of materials, high durability, and emission-free materials, and materials other than solid wood are emphasized; lumber, when used, is awarded credits only if FSC-certified.

In summary, in the King County (Seattle) Green Building Program:

➢ Building materials assessments not informed by LCA/LCI.

Table 9. — Credits related to materials efficiency under the King County (Seattle) GBP.

Characteristic	Points
Recycle construction wastes/minimize wastes	48
Reuse materials	30
Use recycled materials	17
Wood FSC certified or equivalent	27
Limit project size	25
Use locally produced materials	10
High durability products used	8
Use wood composites rather than lumber	8
Use linoleum, cork, or bamboo flooring	3
Formaldehyde, CFC, HCFC free products used*	3

** Additional points under the Health and Indoor Air Quality Section*

Table 10. — Point distribution within Built Green Colorado Program.

Category	Req. Features	Points*
Site protection	0	35
Energy efficiency	3	380+
Health and safety/ Indoor air quality	2	150+
Material resource efficiency	2	230+
Water resource conservation	1	76+
TOTAL		**871+**

Table 11. — Credits related to material resource efficiency in the Built Green Colorado program.

Characteristic	Points
Building materials with recycled/ reused content	54
Use materials other than wood	30
Use engineered wood to reduce use of lumber.	24
Wood materials are third party certified.	23
House size <1,500 ft2	15
Use of structural insulated panels instead of standard framing.	14
Reduced wood use (advanced framing)	13
CFC, HCFC, Formaldehyde free*	12
Use of long-life materials.	8
Use of locally sourced materials	8
Minimum job site waste.	6

* *Additional points under the Health and Indoor Air Quality Section*

- ➢ Recycling reuse a central theme.
- ➢ Emphasis on not using sawn lumber.
- ➢ No requirement for certification of any material other than wood, and then by FSC or equivalent.
- ➢ FSC or equivalent means FSC.

Built Green Colorado Program

The Built Green® Colorado program was established in 1995 as a result of a cooperative effort of the Governor's Office of Energy Management and Conservation, the Home Builder's Association of Metro Denver, E-Star Colorado, and Xcel Energy. Emphasizing energy and materials efficiency and health/safety/indoor air quality, the voluntary program is interesting in that it is the only green building program to forthrightly award credits for use of building materials other than wood (Table 10). Reduced use of lumber is also specifically encouraged. Lumber that is used can receive credits if third-party certified; the certification system to be used is not specified (Table 11).

In summary, the Built Green Colorado Program features:

- ➢ Major emphasis on recycling/reuse.
- ➢ Major emphasis on reduction of wood use (and particularly lumber use) and substitution of non-wood materials for wood.
- ➢ Third–party certified wood specified, but can be SFI, ATFS, CSA, or FSC.
- ➢ Certification not required for any material other than wood.
- ➢ No provision for systematic assessment of materials using LCA/LCI.

Wisconsin Green Built Program

The Green Built Home™ program was begun as a non-profit program of the Wisconsin Environmental Initiative in partnership with the Madison Area Builders Association. It started as a pilot project with the Madison Area Builders Association's Parade of Homes in 1999.

The program promotes green building practices by certifying remodeling projects and new homes that meet required sustainable building and energy standards. Green Built Home strives to reduce the ecological footprint of new home construction by promoting the development of sustainable communities.

The Green Built Home program uses a series of checklists to assess the environmental attributes of housing projects (Tables 12 and 13). Using checklists, architects and builders can work together on issues such as erosion control, storm water management, materials selection, water and energy conservation, indoor air quality, and waste reduction to reduce environmental impacts.

Table 12. — Point distribution in Wisconsin Green Built Home program.

Category	Points
Meet basic requirements in energy efficiency, air tightness, ventilation, erosion control, recycling, use of tropical hardwoods.	Required
Siting and land use	18 points
Landscape conservation and storm water management	47 points
Energy efficiency	153 points
Materials selection	185 points
Indoor air quality	56 points
Plumbing and water conservation	23 points
Waste reduction, recycling and disposal	30 points
Builder operations	33 points
Efficient use of space	33 points
TOTAL	**578 points**

Table 13. — Environmentally preferable materials selection criteria — Wisconsin GBP.

Category	Points
Reused or recycled construction materials	28
FSC certified or equivalent	20
Use of non-wood materials	16
Reduce materials consumption	7
Use of engineered wood products	5
Use of highly durable materials	4
Use of regionally produced materials	4
No vinyl	4
Use of domestically produced materials	2

Criteria under each issue area are assigned credit values, with a minimum number of credits needed to achieve certification. The minimum number of credits varies by program.

There are five programs within Wisconsin Green Built Home:

- new homes
- new home and product directory
- remodeling
- waterfront property
- multifamily (in development)

In addition to meeting a number of required criteria, all new homes must meet a minimum of 60 points, and remodeling projects must meet 10 to 60 points. The Green Built Home program offers a do-it-yourself method of remodeling certification as well as resources for contractors and developers to get involved in the building green process.

Summarizing the environmentally preferable materials criteria in the Wisconsin Green-Built Program:

- Major emphasis on building material characteristics.
- Major emphasis on recycling/reuse.
- Certification by FSC or equivalent specified.
- Certification not required for any material other than wood.
- No provision for systematic assessment of materials using LCA/LCI.

Significant problems in the quest for Camelot

Green building programs have grown out of a general concern for the impact of building construction and operation on the local, regional, and global environment. Thus, such programs address a broad array of topic areas including energy efficiency; water management; building materials production, transport, use, and maintenance; indoor environmental quality; and recycling, reuse, and waste minimization. While the impacts of green building programs are currently modest, the rate of growth in program participation and development is large, suggesting substantial impact on the construction sector in the relatively near future.

In general, the influence of green building programs is positive, as the programs are causing builders, architects, home buyers, and others to think systematically about how to improve the environmental performance of buildings. A negative aspect is that directors of the best-known programs have fallen victim to adoption of prescriptive standards for environmentally preferable materials that are based on intuitive judgment and/or single attributes (Table 13). There is also a focus in all current programs on a single material – wood – that requires that wood, and wood alone, demonstrate responsible practice in product manufacture. The result is that a number of materials currently listed as environmentally preferable by green building organizations have demonstrably greater environmental impacts than non-favored alternatives.

Table 14. — Summary comparison of green building programs.

Green Bldg Program	LEED	Green Globes	Seattle (King County)	Austin Green Building	California Green Builder	Built Green Colorado	Wisconsin Greenbuilt
FSC Only	X		X	X			X
SFI, ATFS, CSA, FSC		X		--	X	X	
3rd party verification of certification	X	X	X	X		X	X
Certif. req. for mat'ls other than wood							
Vinyl use discouraged							X
Use of bamboo flooring rewarded	X		X	X	X	X	X
Prescriptive system RE env. preferable mat'ls	X		X	X	X	X	X
Bldg mat'ls assessment based on LCA/LCI	•	X					

• The use of LCA is mentioned, but not required, in the standard.

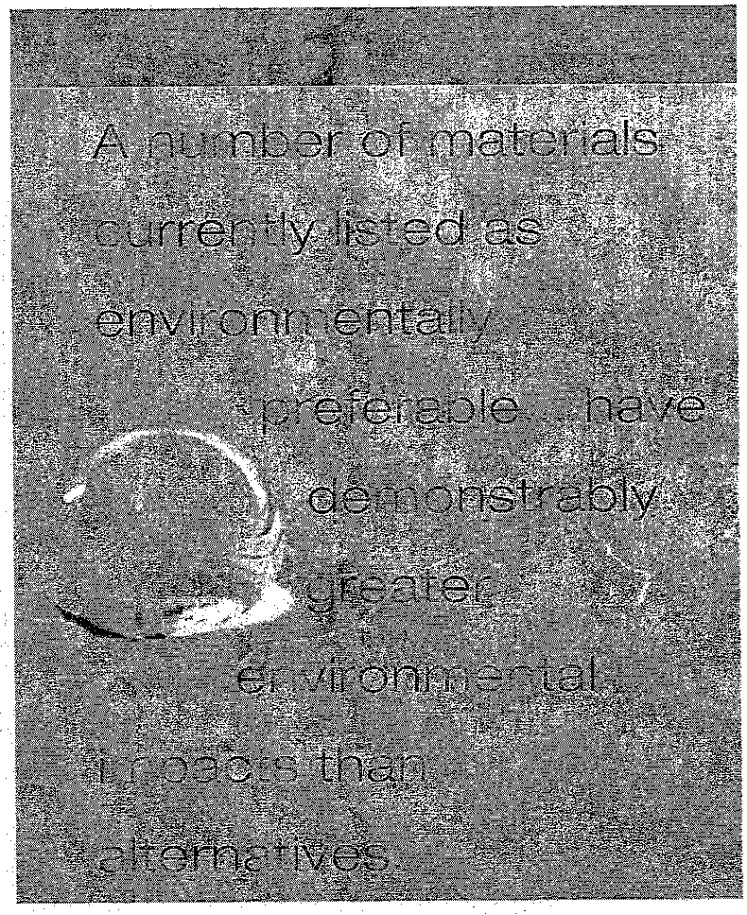
For instance, judging whether products are environmentally good or bad based on a single product attribute simply isn't supported by science. The focus on a single product characteristic keeps things simple and easy to comprehend—simple for the consumer and simple for organizations making judgments about various products: a product contains recycled content (good) or it doesn't (bad); it is "natural" (good) or it isn't (bad); it was produced from rapidly renewable resources (good) or it wasn't (bad). Unfortunately, focusing narrowly on product attributes is often useful in identifying environmentally preferable products only in the most straightforward of situations. For example, if faced with purchasing one of two brands of aluminum garage doors, one of which is made of 100 percent recycled aluminum and the other of 100 percent virgin aluminum, the consumer is presented a clear choice. While a recycled label wouldn't say so, the product made entirely of virgin content requires 20 times more energy to produce than the recycled alternative. Also, production of the recycled aluminum results in far less in the way of impacts to air, water, and land, and is clearly environmentally superior. Suppose, however, that a consumer is faced with the choice of selecting steel framing that has 35 percent recycled content or wood framing members that contain no recycled content. In this case, a choice to use steel framing based on recycled content would result in more than twice the energy consumption and more than four times the fossil fuel consumption to produce the framing members, and increased emissions to air and water in roughly the same magnitude as the differences in fuel consumption. Insulating the framed-in wall to a given R-value would result in even greater differences in energy consumption. Is a product containing recycled content always an environmentally better choice? Clearly not!

With regard to certification, required for wood to receive credit as an environmentally preferable material in most green building programs, it is important to recognize that there is no requirement that any material other than wood be certified.

This singular focus on wood is worth consideration. FSC certification, as specified in a number of green building programs, requires assessment of a number of factors in the certification process within the following categories:

- Compliance with laws
- Tenure and use rights and responsibilities
- Indigenous peoples' rights
- Community relations & worker's rights
- Benefits from the forest
- Environmental impact
- Management plan
- Monitoring and assessment
- Maintenance of high conservation value forests
- Plantations

Attention to land tenure issues, observance of indigenous people's and worker's rights, and focusing on community relations in addition to a wide range of environmental impacts linked to raw materials extraction and processing is certainly an enlightened approach to materials selection. But if these factors constitute essential elements in selection of an environmentally preferable building material, it is reasonable to ask why green building programs do not require compliance with similar standards for any material other than wood. As an example, growing and harvesting of bamboo is known to have all of the problems often attributed to wood and also often bears the environmental burdens associated with monoculture plantations and intensive agriculture (Bowyer et al. 2005). It is curious, then, that bamboo is accepted without question by LEED and other green building programs as an "environmentally preferable" material. There appears to be no logical or scientific reason for this.

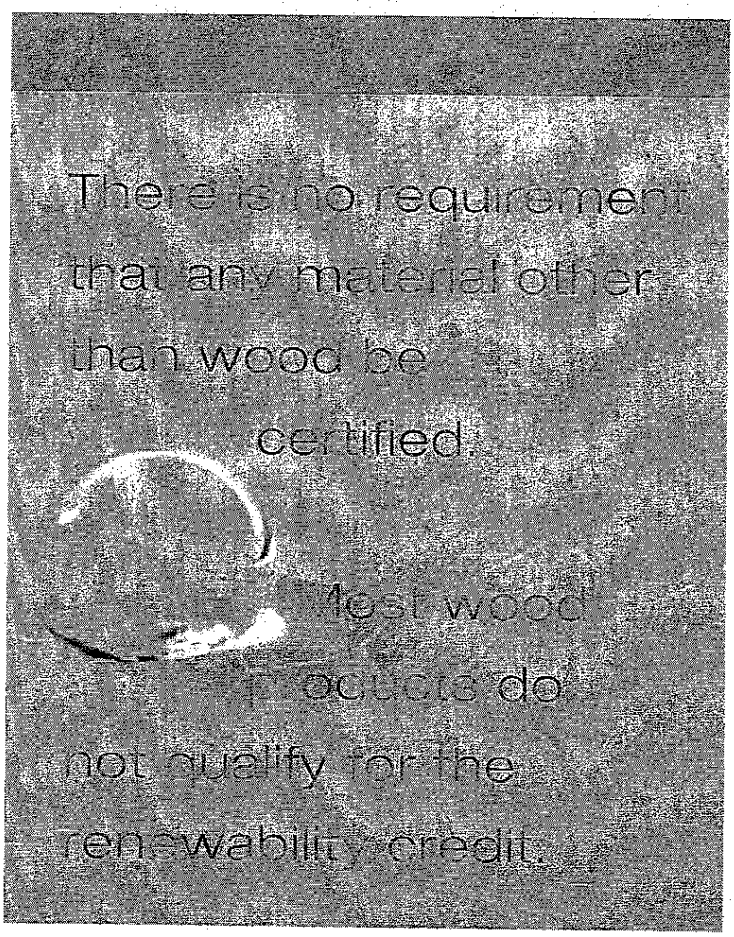


As things now stand, non-wood materials are in effect being given a free pass, the implication being that typical practices employed in their production are inherently environmentally better than those associated with production of wood products. However, most of the same concerns that led to development of certification programs for forests and forest management also apply to extraction and processing of other basic raw materials. With respect to non-biobased materials and products such as metals, there is extensive evidence pointing to mining development as a major disruptive force to communities, indigenous people's rights, worker's rights, and long-held land tenure. It is also often highly disruptive of forested and non-forested ecosystems alike. In view of these realities, the World Wildlife Fund (WWF) in January 2003 took the first steps to create a Mining Stewardship Council, noting pervasive environmental, social, and economic problems linked to mining activity worldwide. Given these problems, it would appear that

development of a certification program for metals and minerals should be a high priority. In any event, there is no apparent justification for singling out only one construction material for a host of special requirements.

Perhaps the worst characteristic of most green building programs today is defined by what is **not** considered in identification of environmentally preferable materials. At the moment, only one program requires consideration of embodied energy of products and product assemblies, even though embodied energy is often equivalent to many years of energy consumption associated with a structure, and even though high embodied energy products result in far higher emissions to air and water. Only one program systematically and comprehensively considers environmental impacts linked to all inputs and outputs associated with building materials production and use. This one program is Green Globes —in many ways a prototype for what green building programs of the future need to become. As noted previously, this program requires that selection of building assemblies be based on life cycle assessment considering embodied energy and green house gas emissions.

Designation of environmentally preferable materials in a 21st century green building program should never be based on unsubstantiated prescriptive standards, especially in view of the fact that tools are now available that allow comprehensive assessment using standard methodologies. In addition, criteria used in assessing landscape impacts of raw materials production in such a program should not focus on only one material to the exclusion of others. Unfortunately, these characteristics describe the vast majority of leading green building programs in the United States and Canada.



Summary

What must be done in order to correct deficiencies in the way that environmental preferability of construction products is determined today within leading green building programs? There is no one answer, no miracle solution, but three things are obvious:

- A "green" building program that cannot accurately distinguish low environmental impact products from high impact products, but that nonetheless encourages the use of some products over others, is green in name only.

- Environmental labeling programs, if they are to facilitate meaningful comparisons, must quickly evolve to include all products used for similar applications.

- All assessments of environmental performance of products must include evaluation based on examination of a broad range of environmental indicators representing the full life cycle of products using internationally accepted protocols for evaluation. Another way of saying this is that environmental life-cycle assessment must play a major role in product evaluation and labeling.

Fundamental change in the way that green building programs assess environmental attributes of construction materials is needed. Ironically, current practices are encouraging unsound environmental decisions at a time when precisely the opposite is needed.

The author, Jim L. Bowyer, is Professor Emeritus, Department of Bioproducts and Biosystems Engineering, University of Minnesota, St. Paul, Minnesota; President, Bowyer & Associates, Inc. — a wood science and biocnergy consulting firm; and Director, Responsible Materials Program, Dovetail Partners, Inc., Minneapolis, Minnesota. Bowyer served as President of the Forest Products Society (1993-94) and of the Society of Wood Science and Technology (1987-88), and as Vice President of the Consortium for Research on Renewable Industrial Materials (1992-2003). Jim headed the University of Minnesota's Department of Wood & Paper Science from 1984 to 1994, and was Founder and Director of the Forest Products Management Development Institute at the university from 1994-2003. Bowyer has published more than 230 articles dealing with wood scien

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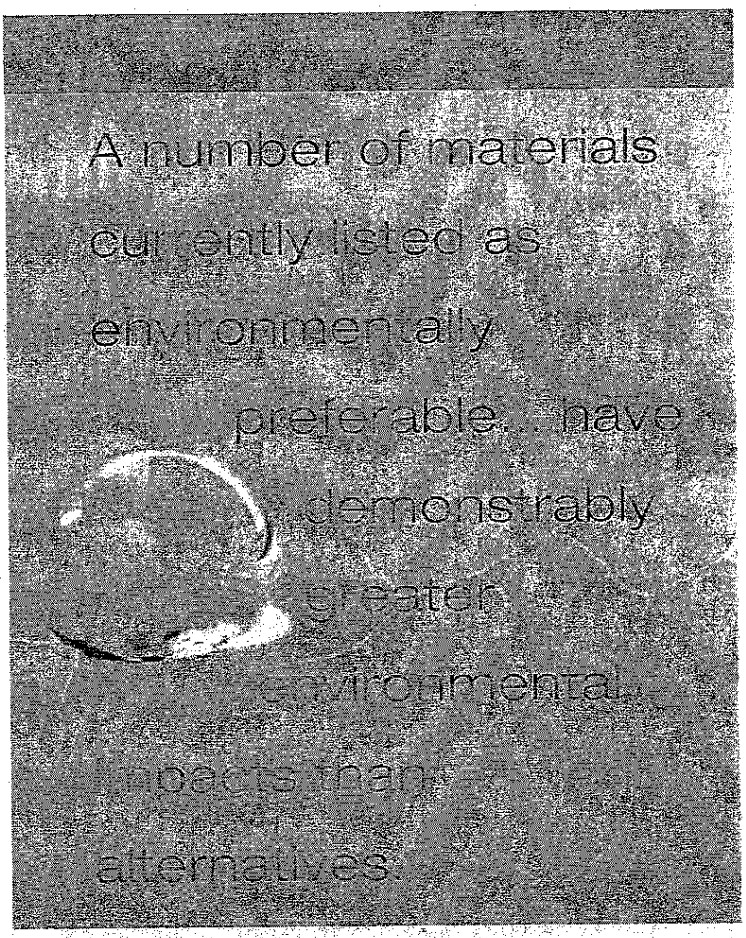

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