Environmental Building News™
The Leading Newsletter on Environmentally Responsible Design & Construction
SPECIAL REPRINT www.BuildingGreen.com Revised, May 2001

Establishing Priorities with Green Building

IT IS RARELY POSSIBLE TO DO everything we would like to reduce the environmental impact of building projects. It takes time to research alternative design and construction systems; new materials may not have proven track records; higher costs may be an impediment; or clients simply might not be interested. Therefore, it makes sense to figure out where our efforts will do the most good. Where should we focus most of our attention in designing and building structures that will have minimum impact on the environment?

Some designers and builders who emphasize sustainability have picked out just one aspect of green design—often it's recycled-content building materials—and hold that up as their flag. Material selection is one of the most visible green building strategies and often the easiest to point to—but it is usually not the most important. Deciding which measures are most important is no simple task. Here we take a look at some of the factors to consider and suggest a listing of priorities in green design. This sort of list can never be considered final—we look forward to an ongoing discussion of priorities from which we might all learn.

Finding a Basis for Establishing Priorities

Several related factors should be considered in making objective decisions about where our investments of time and money will do the most good in reducing environmental impact. First, we need an understanding of what the most significant environmental risks are. These may be global in nature, or more specific to your particular region or site. Prioritizing these risks is difficult because often they occur in unrelated fields, with no way to make direct comparisons. Which is worse: the release of toxic waste, destruction of an endangered species' habitat, or stratospheric ozone depletion? Interestingly, scientists often come up with very different priority rankings than the general public on these issues (see box).

The second critical factor is an understanding of how our buildings contribute to these risks, and how significantly the measures we adopt can help the situation. We may decide, for example, that ozone depletion, a global problem, is more important than the survival of a particular bird species. But if a building project we're working on could eliminate the last remaining habitat of that species—a major contribution to its demise—that's probably a higher priority than reducing our use of HCFCs, which are contributing incrementally to ozone layer damage.

The third factor has to do with the specific opportunities presented by each individual project. On some projects one can dramatically affect a building's performance in one particular area with very little investment, while addressing other impacts might prove very expensive and only minimally effective. Energy performance, for example, can sometimes be improved by simply adjusting a building's orientation, while using a recycled-content floor tile might increase cost significantly for relatively little gain.

Finally, we have to consider the available resources and agenda of the client. There are often measures that can be taken at no additional cost—some may even save money—to reduce environmental impacts. Implementing such measures should be a "no-brainer." Other measures might increase the first cost of a building but save money over time. How far we can go with such measures, in length of payback and size of initial investment, depends a great deal on the resources and willingness of the client. In some cases, a third party can be found to finance such measures and share in their savings. There are also measures that are

Environmental Risks as Ranked by Scientists

In 1990, scientists in the Ecology and Welfare Subcommittee of the U.S. Environmental Protection Agency's Science Advisory Board came up with this ranking of environmental issues, "despite gaps in the relevant data." The order of the environmental issues within each heading is not meant to imply a ranking.

Relatively High-Risk Problems	Relatively Medium-Risk Problems	Relatively Low-Risk Problems
Habitat Alteration and Destruction	Herbicides/Pesticides	Oil Spills
Species Extinction and Overall Loss of Biodiversity	Toxics, Nutrients, Biochemical Oxygen Demand, and Turbidity in Surface Waters	Groundwater Pollution
Stratospheric Ozone Depletion	Acid Deposition	Radionuclides
Global Climate Change	Airborne Toxics	Acid Runoff to Surface Waters
		Thermal Pollution

Source: "Reducing Risk: Setting Priorities and Strategies for Environmental Protection," The Report of the Science Advisory Board Relative Risk Reduction Strategies Committee to the EPA, September 1990.

important environmentally but don't offer the building owner any direct financial reward. Pursuing these strategies depends on the client's good will, environmental commitment, and interest in some of the less tangible benefits that may result, such as good public relations.

Given all these factors to consider, deciding which environmental goals to pursue on a given project might seem overwhelming. To provide a more concrete starting point, we've come up with a list—*EBN*'s priority ranking of measures to reduce the environmental impact of buildings. Clearly the order is arguable, and for specific projects and climatic regions a different order will apply. All the measures listed below are important, and one should definitely implement any that are feasible within the constraints of a particular project.

EBN's Priority List for Sustainable Building

This list—a builder's dozen—reflects our sense of where you might look to get the most bang for your buck. Each item is followed by a few sample strategies for implementation, and a discussion of the likely cost implications.

#1. Save Energy—Design and build energy-efficient buildings.

The ongoing energy use is probably the single greatest environmental impact of a building, so designing and constructing buildings for low energy use should be our number one priority. (The more severe the climate, the more steadfast the ranking of this priority.) Decisions made during the design and construction of a building will affect the environmental performance of that building for decades to come—perhaps even centuries—through energy consumption. An integrated design approach often presents energy savings that result from interactions between separate building elements, such as windows, lighting, and mechanical systems.

- In buildings with skin-dominated energy loads, incorporate high levels of insulation and high-performance windows, and make buildings as airtight as possible.
- Minimize cooling loads through careful building design, glazing selection, lighting design, and landscaping.
- Utilize renewable energy resources to meet energy demand.
- Install energy-efficient mechanical equipment, lighting, and appliances.
- Assure the quality of both materials and equipment installation.

Energy efficiency measures are likely to increase first cost, but significant savings in operating cost can often be achieved. Reduced heating and cooling loads may reduce first cost of HVAC equipment, offsetting some of the expense.

#2. Recycle Buildings—Utilize existing buildings and infrastructure instead of developing open space.

Existing buildings often contain a wealth of material and cultural resources, and contribute to a sense of place. In some cases the workmanship and quality of materials they embody is almost impossible to replicate today, making their restoration all the more valuable.

- Do not ignore priority #1, above. When restoring or renovating buildings, maximize energy efficiency.
- Handle any hazardous materials appropriately (lead paint, asbestos, etc.).

Usually—but not always—restoration is less expensive than building new. These projects can be difficult to budget.

#3. Create Community—Design communities to reduce dependence on the automobile and to foster a sense of community.

To reduce environmental impacts, we must address transportation. Even the most energy-efficient, state-of-the-art passive solar house can carry a big environmental burden if its occupants have to get in a car each morning and commute 20 miles to work. Since the 1940s, zoning and land-use planning have, in general, been impediments to, rather than supporters of, responsible transportation patterns. Effective land-use planning can also help to foster strong communities.

- Design communities that provide access to public transit, pedestrian corridors, and bicycle paths.
- Work to change zoning to allow mixed-use development so residents can walk to the store or to work.
- Incorporate home offices into houses to permit "telecommuting."
- Site buildings to enhance the public space around them and maximize pedestrian access.

Smaller and shorter roads, services lines, and storm sewers reduce infrastructure costs. Obtaining zoning variances can be time-consuming.

#4. Reduce Material Use—Optimize design to make use of smaller spaces and utilize materials efficiently.

Smaller is better relative to the environment, and no matter what the materials, using less is almost always preferable—as long as the durability or structural integrity of a building is not compromised. Reducing the surface area of a building will reduce energy consumption. Reducing waste both helps the environment and reduces cost.

- Reduce the overall building footprint and use the space more efficiently.
- Simplify the building geometry to save energy and materials.
- Design building dimensions to optimize material use and reduce cut-off waste. For example, design buildings on a 2′ or 4′ (600 mm or 1,200 mm) module. With light-frame construction, use greater on-center framing spacing (19.2″ or 24″) and headers sized to each opening.

Additional design time may be needed, but overall this strategy should save money, particularly with larger projects and multiple-building developments. Increasingly, we need to consider not only the cost of buying materials but also the cost of disposing of what's left over—by reducing waste, we save both ways. A 4x10 (1,200 mm by 3,000 mm) sheet of 5⁄8″ (15 mm) drywall, for example, which costs about $9 to buy, now costs more than $4 to landfill in some areas!

#5. Protect and Enhance the Site—Preserve or restore local ecosystems and biodiversity.

In fragile ecosystems or ecologically significant environments, such as old-growth forests or remnant stands of native prairie, this might be the highest priority.

- Protect wetlands and other ecologically important areas on a parcel of

land to be developed—on some sites you should reevaluate whether development should be carried out.

- On land that has been ecologically damaged, work to reintroduce native species.
- Protect trees and topsoil during construction.
- Avoid pesticide use—provide construction detailing that minimizes the need for pesticide treatments.
- With on-site wastewater systems, provide responsible treatment to minimize groundwater pollution—there are several innovative new wastewater treatment systems that do a better job at nutrient removal than conventional septic systems.

Some of these measures cost less than standard practice, others cost more. Maintenance costs with natural landscaping are often much less than for conventional practice.

#6. Select Low-Impact Materials—Specify low-environmental impact, resource-efficient materials.

Most—but not all—of the environmental impacts associated with building materials have already occurred by the time the materials are installed. Raw materials have been extracted from the ground or harvested from forests; pollutants have been emitted during manufacture; and energy has been invested throughout production. Some materials, such as those containing ozone-depleting HCFCs and VOCs, continue emitting pollutants during use. And some materials have significant environmental impacts associated with disposal.

- Avoid materials that generate a lot of pollution (VOCs, HCFCs, etc.) during manufacture or use.
- Specify materials with low embodied energy (the energy used in resource extraction, manufacturing, and shipping).
- Specify materials produced from waste or recycled materials.
- Specify materials salvaged from other uses.
- Avoid materials that unduly deplete limited natural resources, such as old-growth timber.
- Avoid materials made from toxic or hazardous constituents (benzene, arsenic, etc.).

Some resource-efficient products are available at no extra charge; others may cost more. Installation may differ from standard practice, raising labor cost if an installer is unfamiliar with a product.

#7. Maximize Longevity—Design for durability and adaptability.

The longer a building lasts, the longer the period of time over which the environmental impacts from building it can be amortized. Designing and building a structure that will last a long time necessitates addressing how that building can be modified to satisfy changing needs.

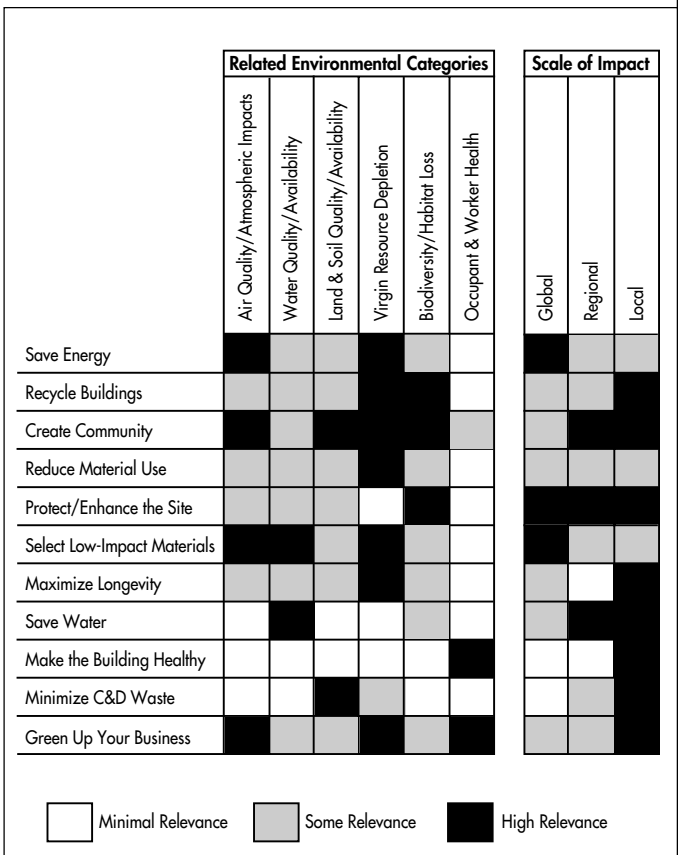
- Specify durable materials—this is usually even more important than selecting low-embodied-energy materials.
- Assure quality installation that enhances service life and, hence, resource-efficiency.
- Design for easy maintenance and replacement of less durable components.
- Design for adaptability—particularly with commercial buildings.
- Allocate an appropriate percentage of building funds for ongoing maintenance and improvements.
- Consider aesthetics during design, and whether a particular style is likely to remain popular—the idea of "timeless architecture."

Though not necessarily more expensive in all cases, building for durability usually does require a larger initial investment. Preventive maintenance also requires ongoing investment, though it is generally cheaper over the long term than repairs due to insufficient maintenance.

#8. Save Water—Design buildings and landscapes that are water-efficient.

Although this is generally a regional issue, even the Pacific North-west has experienced droughts and water issues associated with endangered salmon species. In some parts of North America, reducing water use is much higher on the priority list.

- Install water-efficient plumbing fixtures and appliances.
- Collect and use rainwater.
- Provide low-water-use landscaping (xeriscaping).
- Separate and use graywater for landscape irrigation where codes permit.
- Provide for groundwater recharge through effective stormwater infiltration designs.



In comparing relative measures, it's useful to consider the environmental issues affected by each measure and the scale of the impact.

Most of these measures will add to the cost of a project. Some savings in lower water and sewage bills and longevity of on-site septic systems can offset the additional costs. Designs that promote stormwater infiltration are usually less expensive than storm sewers.

#9. Make the Building Healthy—Provide a safe and comfortable indoor environment.

Though some people tend to separate the indoor environment from the outdoor environment, the two are integrally related, and the health of the building occupants should be ensured in any "sustainable" building. With many clients, this is the issue that first generates interest in broader concerns of environmentally sustainable building.

- Design air distribution systems for easy cleaning and maintenance.
- Avoid mechanical equipment that could introduce combustion gases into the building.
- Avoid materials with high rates of VOC offgassing such as standard particleboard, some carpets and adhesives, and certain paints.
- Control moisture to minimize mold and mildew.
- Introduce daylight to as many spaces as possible.
- Provide continuous ventilation in all occupied buildings. In cold climates, heat-recovery ventilation reduces the energy penalty of ventilation.
- Give occupants some control of their environment with features like operable windows, task lighting, and temperature controls.

Most of these measures will increase construction costs, but they often are easily justified based on the increased health, well-being, and productivity of building occupants. Failure to pursue these measures can lead to expensive "sick-building" lawsuits.

#10. Minimize C&D Waste—Return, reuse, and recycle job-site waste.

For more and more materials, sorting and recycling job-site waste is paying off economically, and it can certainly generate a good public image.

- Sort construction and demolition waste for recycling.
- Donate reusable materials to nonprofit or other community groups that would use them for building or improving local housing stock.

Additional labor to sort and recycle waste is often offset by the savings in disposal costs, though these vary by region. Sorted material can sometimes be sold for a profit. Some low-value materials can be ground and recycled on-site; for example, clean wood waste can be used as an erosion-control material, and drywall as a soil amendment.

#11. Green Up Your Business—Minimize the environmental impact of your own business practices, and spread the word.

In addition to creating buildings with low environmental impact, you should practice environmentalism in your own business, thus serving as a model for other design or construction firms.

- Purchase fuel-efficient company vehicles, and promote use of public transportation and carpooling by employees.
- Use this priority list in the operation of your own business.
- Use the design process to educate clients, colleagues, subcontractors, and the general public about the environmental impacts of buildings and how they can be mitigated.

Carpooling and public transportation can save money for employees, while reducing the number of parking spaces the business must provide. Greening your business practices will help demonstrate your convictions to your clients.

Final Thoughts

In deciding which measures to pursue on specific projects, consider the relative benefits of each measure. You might begin by customizing the list for your region. In an arid climate, for example, water conservation would go near the top, while in a city prone to smog inversions, transportation alternatives might be the most important. Then refer to your list as you consider each project, and identify the areas where you can do the most for the environment.

Pick the low-hanging fruit first, and go after the tougher issues as time and resources allow. Return to buildings you've completed to see which systems are working and which aren't, and how occupants have modified your work to fit their needs. When possible, use your buildings to strengthen the link between occupants and the global environment through education and direct interaction. Finally, if you are incorporating environmental features into your work, take advantage of that fact in your marketing efforts.

Like most lists and categories, this list serves a purpose but also carries the risk of compartmentalizing the design and construction process. Often the most significant opportunities for benefiting the environment come from a careful integration of the design, taking advantage of synergies between building elements. The most elegant design solutions—those that reduce complexity while solving multiple problems—won't be found by considering each item on this list in isolation. We hope that this ranking will serve to inspire others who regularly think about environmental impacts of building to offer their opinions. Let us know your thoughts.

– Alex Wilson, Nadav Malin, and Peter Yost

BUILDINGGREEN, INC.

Authoritative Information on Environmentally Responsible Building Design & Construction

- **Environmental Building News**
- **BuildingGreen Suite™**
- **GreenSpec® Directory**
- **EBN Archives CD-ROM**
- **Green Building Advisor**
- **The Pittsburgh Papers**

BUILDINGGREEN IS COMMITTED TO PROVIDING accurate, unbiased, and timely information to help building professionals improve the environmental performance of buildings and surrounding landscapes. We offer both print and electronic resources to help you design and construct buildings using an integrated, whole-systems approach that minimizes environmental impact and maximizes economic performance.

Environmental Building News is a monthly newsletter featuring comprehensive, practical information on a wide range of topics related to sustainable building—from energy efficiency and recycled-content materials to land-use planning and indoor air quality. *EBN* is independently published and carries no advertising or sponsorships—its objectivity has earned the respect of environmental activists and industry groups alike. *EBN* is available in print format or electronically with a subscription to our BuildingGreen Suite of online tools.

One-Year Subscription Rates

Individuals and small companies	**$99**
Organizations with 25+ employees	**$199**

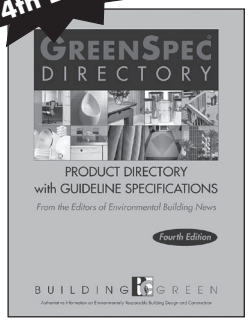
Outside North America add $30 per year for airmail.

What users say about EBN . . .

"Very thorough, well researched, evenhanded. No other source even comes close."
– ARCHITECT, MASSACHUSETTS

"EBN is an objective, credible source in an arena where wild claims abound."
– GREEN BUILDING PROGRAM DIRECTOR, TEXAS

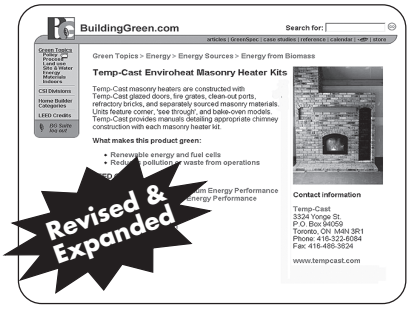
NEW! 4th Edition



GreenSpec® Directory includes more than 1,750 listings for green building products that have been carefully screened by the editors of *Environmental Building News* and organized according to the 16-division CSI MasterFormat™ system. Directory listings cover more than 250 categories—from access flooring to zero-VOC paints. Included are product descriptions, environmental characteristics and considerations, and manufacturer contact information with Internet addresses. Also included are guideline specifications that provide additional information on selecting and using environmentally preferable products.

$89 per copy 448 pages, 8⅜" x 11", paperback

Good design starts with good information. Successful projects demand smart designers and effective tools. Why do it alone? **BuildingGreen Suite™** provides fast online access to extensive information on sustainable building, integrating hundreds of articles on green building—in-depth features, product reviews, news, and opinion—with the *GreenSpec* product directory and a high-performance building case study database. Taking full advantage of the power of the Internet, each article, product listing, and case study includes links to related content in BuildingGreen Suite and other sources of further information. It's all backed by a powerful search engine that makes it a snap to pinpoint the information you need. Twice each month, subscribers are e-mailed an executive summary of products, case studies, and articles added to BuildingGreen Suite.



First User: $199/year
Each additional user: $45/user/year

Have 25 or more design professionals in your organization? Call Dan Woodbury, 800-861-0954 x103, for organization-wide rates.

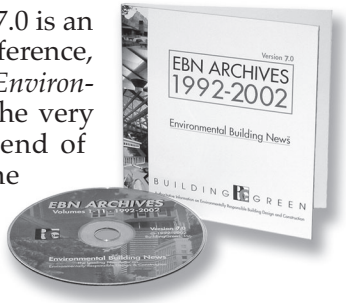
To order, use the attached order form, visit www.BuildingGreen.com, or call toll-free: 800-861-0954

Outside the U.S. & Canada:
Call 802-257-7300 or Fax 802-257-7304
E-mail: info@BuildingGreen.com

Your satisfaction is 100% guaranteed. You may return any item within 30 days of purchase, or cancel your EBN subscription at any time, and receive a full refund.

Please see other side for information on more green building resources.

EBN Archives CD-ROM v7.0 is an extensive green-building reference, featuring 88 back issues of *Environmental Building News* from the very first, in 1992, through the end of 2002. Updated annually, the *Archives* provide instant access to hundreds of articles just as they appeared in print. Find what you need using Adobe Acrobat's keyword search function, or use our cumulative index hotlinked directly to the articles. Current contact information for products reviewed or described in *EBN* that are also approved for the *GreenSpec Directory* can be found by hotlinking to our online database. A "Contents by LEED™ Credit" menu pinpoints articles according to the 41 credit criteria of the LEED green building rating system.



$199 **(update from prior version: $79)**

At BuildingGreen, we believe that:

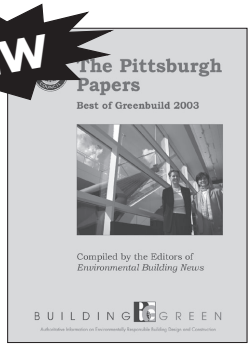
- Energy-efficient, healthy, environmentally sound commercial and residential buildings are not only possible but also practical and cost-effective.
- Every new construction and renovation project should maximize its value to the owner, occupants, neighbors, and the entire global community.
- Reliable, objective information is essential for making good decisions throughout the process of designing, constructing, and occupying buildings.
- Our customers expect and deserve comprehensive research, honest reporting, well-organized information, outstanding value, and excellent service.

The quality of our products speaks for itself. Please give them a try.

Green Building Advisor is an innovative, interactive CD-ROM-based software tool that helps users identify design strategies that can be incorporated into specific building projects. Information about the project is entered using simple pull-down menus. Based on those inputs, *GBA* generates a list of green building strategies likely to be relevant. Each strategy leads to a cascading series of screens that explain the strategy, describe materials used, profile case studies that employed the strategy, and provide resource materials.

$179 **(update from version 1.0: $49)**

NEW



The Pittsburgh Papers: Best of Greenbuild 2003—Here are the best of the papers presented for publication from the 2003 Greenbuild Conference in Pittsburgh, Pennsylvania. Compiled by the editors of *Environmental Building News* these 15 selections offer the latest from the cutting edge of green building, covering a diverse range of topics including case studies, design strategies, policies and process. Illustrations and photographs in color and black-and-white. Published under agreement with the U.S. Green Building Council.

$35 per copy 116 pages, 8¼" x 10¾", paperback

A few copies of **The Austin Papers** featuring the best of the papers submitted for the 2002 International Green Building Conference are still available for $25 per copy. Please call 800-861-0954 to order.

To order, use the form below, visit www.BuildingGreen.com, or call us toll-free: 800-861-0954

BUILDING GREEN

☑ YES, send me the green building resources indicated.
❑ Check enclosed. ❑ Please bill me.
❑ Charge my: ❑ MC ❑ VISA ❑ AmEx

Card #: _____ Exp: _____

Name on Card: _____

Signature: _____

Outside U.S., make payment by credit card or money order in U.S. dollars only.

Name: _____

Company: _____

Address: _____

City: _____ State: ____ ZIP: _____

Phone: _____ E-mail: _____

ENVIRONMENTAL BUILDING NEWS		
Individual/small co.: $99/1 yr, $169/2 yrs, $229/3 yrs	$	
Orgs. w/25+ empl.: $199/1 yr, $359/2 yrs, $499/3 yrs		
Postage outside No. America: $30 per year		
BUILDINGGREEN SUITE		
First User: $199 per year	$	
Additional Users: $45 per user per year		
Add-on for printed *Environmental Building News*: $30/yr		
* Add-on for printed *GreenSpec Directory*: $30		+Ship
* Add-on for *EBN Archives CD-ROM*: $30		+Ship
BOOKS & CD-ROMs		
* GREENSPEC DIRECTORY, 4th Edition: $89	$	+Ship
* THE PITTSBURGH PAPERS, Best of Greenbuild 2003: $35	$	+Ship
* EBN ARCHIVES v.7: $199 (Update: $79)	$	+Ship
* GREEN BUILDING ADVISOR v1.1.2: $179 (Update: $49)	$	+Ship
***VERMONT Residents only: 6% Sales Tax on CDs/Books**		
SHIPPING for orders with CD/Book: $5 US/Can., $12 others		
BGF0302 *All prices subject to change.* **TOTAL DUE**		

recycled paper, process chlorine free