Greening Your Practice
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Buildings designed with the environment in mind are steadily gaining acceptance in both the public and private sectors. Federal, state, and local governments have begun to require green building services, and many major corporations are challenging their architects to design green buildings.

The focus on environmentally sustainable buildings began in the late 1980s as an extension of the response to the 1970s energy crisis and the perceived need for more energy-efficient buildings. Sustainable design advances a holistic agenda that addresses a wide range of environmental issues in addition to concerns about energy use and efficiency. This agenda includes integration of building technology with natural systems to reduce negative effects on resource use and ecosystems, as well as development of strategies to improve the health and well-being of building users and people in the wider community.

The American Institute of Architects has played a leading role in this field. The AIA established the Committee on the Environment (COTE) in 1990, and in 1992 AIA president Susan Maxman championed sustainable design as the Institute’s convention theme. An early COTE project involved developing a methodology to determine the environmental impact of building materials. Information resulting from this effort was published in the Environmental Resource Guide (ERG), which quickly became a definitive resource on the environmental performance of materials and products. The ERG also provided detailed case study information and other technical reports that helped define the components of green building design.

The landmark “Greening of the White House” project in 1995 and subsequent greening projects brought together thousands of design professionals to brainstorm and document green design strategies for significant public projects. Since 1998 the AIA Committee on the Environment has recognized the ten best green buildings by U.S. architects each year through its Top Ten Green Projects award program. This program has benefited the industry by identifying new models of design excellence.

The U.S. Green Building Council (USGBC) has also played an important role in promoting and advancing green buildings. The development of the LEED™ (Leadership in Energy and Environmental Design) Green Building Rating System™ has been an important stimulant of growth in demand for green building services. The LEED performance standards have given clients a sense of confidence that their desires for a green facility design are attainable. The LEED rating system makes it possible for designers and owners to evaluate their buildings against an objective national standard. Through a...
A few Definitions

<table>
<thead>
<tr>
<th><strong>Sustainability:</strong></th>
<th>The World Building Congress defines “sustainability” as “meeting our needs today without compromising the ability of future generations to meet their own needs.”</th>
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<tr>
<td><strong>Sustainable design:</strong></td>
<td>Sustainable design recognizes the interdependence of the built and natural environments. It is a broad, holistic, and inclusive approach to building planning, design, construction, and operation that is efficient and restorative, promoting the health and productivity of building occupants and the larger community. Sustainable design eliminates extractive and disposable systems that are energy-intensive, resource-inefficient, and toxic, and it creates cyclical, closed-loop systems that are restorative, dynamic, and flexible.</td>
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<td><strong>Green building:</strong></td>
<td>Green building is an informed process that represents a conscious effort to move toward sustainable design of the built environment. While sustainable design represents the ultimate design goal, green building is a term commonly used to describe the results being achieved by leading practitioners today.</td>
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<td><strong>Integrated design:</strong></td>
<td>Design integration is a task that moves a step beyond simple “coordination” of design disciplines to engage the design team in a collaborative process. Whereas coordination involves management of discrete systems that occupy the same physical space, integration involves designing interdependent and coordinated systems that work effectively together. Integrated design demands an inclusive and collaborative design process.</td>
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Web-based list of LEED buildings and LEED-accredited professionals, the USGBC helps owners find architects and engineers with experience in green building design. More and more successful green building projects are being completed by leading firms, and the benefits of those projects are being broadly promoted by architects, building owners, and green building advocacy groups. As a result, clients are beginning to see the benefits of green buildings and to request green building services from their architects. With this rapid growth in client interest, many more architects have become motivated to learn about sustainable design, and many firms are expanding their scope of services and expertise to include this capability. Design firms are also marketing their “green” design abilities to differentiate themselves in the marketplace and gain competitive advantages. What effect is this having on practice? How have successful firms adapted their practices in response to this challenge/opportunity? And how have they done it?

This report presents a step-by-step process for greening your practice. The process has profound effects on fundamental issues such as teaming and collaboration, professional development, contracts and compensation, and firm positioning and marketing. The strategies discussed are based on the experience of Hellmuth, Obata + Kassabaum, Inc. (HOK), as well as insights gleaned from discussions with other firms, both large and small.

**OPPORTUNITIES AND CHALLENGES**

A strong consensus is forming among practitioners experienced in green building design that sustainable design provides added value to clients by both enhancing quality and reducing the overall cost of owning and operating buildings over the long term. Reduced energy and water requirements and low-maintenance landscaping are some of the ways this is accomplished. In addition, improved indoor environments with better daylighting and views and better access to nature have been shown to improve the health and well-being, and therefore the productivity and creativity, of building occupants. Green buildings have also been shown to contribute to recruitment and retention of employees because of improved workplace quality and the evidence of shared values. Finally, green buildings contribute to positive public and community rela-
tions, which can often translate into an easier and faster project approval and permit-
tting process.
Architects engaged in green design point to the benefits and increased opportuni-
ties their firms have experienced. As a rule, they have found that offering green design
has attracted not only more clients, but better clients. They say their clients see them as
creative problem solvers who focus on issues that really matter. Many these firms have
also found that offering green design enables them to command better fees for their ser-
vices because of the added value they bring to the design process. As well, success in
greening their practice has brought these firms valuable benefits in terms of their
internal operations. They unanimously agree that they are attracting high-quality, highly
motivated employees, who are drawn to them because of a sense of shared values.
As the firms interviewed in the “Green Advantage” study have shown, the case for
greening a firm is strong. However, the challenges of doing so are not insignificant. Those
interested in attempting this transformation will have many questions, among them the
following: How do we manage the risk that is associated with innovation? How do we
minimize the cost of staff education and training? How do we manage an integrated
design process? How do we shift our design culture to one that is more collaborative?
Successful firms have found creative ways to overcome these and other challenges.
This report offers insights gleaned from the experiences of firms that have faced these
issues and developed successful strategies to overcome the challenges while reaping the
benefits of a greener practice.

GETTING STARTED
A decision to green a firm can be like opening Pandora’s box. Conventional design prac-
tice has not prepared most architects to answer green practice questions, and one ques-
tion often leads to another. While many firms may feel they have an intuitive sense of
green building principles, most architects do not employ a design process grounded in a
truly holistic understanding of the built and natural environment, nor do they under-
stand the complex impacts the built environment has on the natural world. Working
through these issues requires persistence and a conscious search for effective solutions.
Firms seeking to incorporate sustainable design into their practice will need to
address leadership issues, team formation, training, development tools and resources,
design procedures, and client expectations. By doing so, firms can climb the learning
curve more quickly and more efficiently. Start by following the five steps that follow,
which provide a comprehensive process for greening your practice.

STEP 1: MAKE THE COMMITMENT
The leaders of an architecture firm may choose to green their practice because they
believe sustainable design is a core value that is central to the firm’s design philosophy.
Or, they may see it simply as an extension of their commitment to client service and
desire to be able to address sustainability issues at the request of a client. In either case,
the first step is to make the firm’s commitment to sustainable design explicit. Once such
a commitment has been made, the firm will benefit if firm leaders communicate this clearly to both staff and potential clients.

Show Leadership Support
Many successful firms have incubated their green design capabilities within a core group of staff for years before gaining widespread support from leadership. This can be a good strategy for building support internally. Nonetheless, visible leadership support is an essential step if the full benefits of greening a firm are to be realized. To be credible, firm leaders need to support their commitment with actions and lead by example.

Develop Sustainable Design Goals
Sustainable design goals that are specific and quantifiable can be extremely helpful for measuring success. For example, a firm may decide that at least half the professional staff should be LEED-accredited within two years. Another goal may be to have every project undergo LEED evaluation, whether or not this is required by the client. A firm may also wish to set goals such as documenting all finished projects in case study format with consistent criteria to help the firm measure performance. Or, a firm could follow up with every client to determine how projects measure up in relation to the sustainable goals set during design.

Set a Policy for Staff Training
Staff members find it helpful when a firm makes it clear how they can contribute to fulfilling the sustainable design goals set for the firm. Sustainable design policy should address issues such as how much staff time is appropriate for education and training and who pays for the LEED-accredited professional exam and attendance at green building conferences. Linking the firm’s sustainable design program to staff performance evaluations and promotions can reinforce its importance.

STEP 2: BUILD THE TEAM
This step involves assembling a team of people committed to improving the firm’s sustainable design capability and increasing the commitment of firm leaders and employees. This team will be an important resource to project teams in the office. The goal is to provide a structure that will enable firm members to cultivate their knowledge and experience outside the project team structure, so that knowledge and experience can be effectively carried over from project to project.

Identify an Internal “Champion”
It is helpful to have someone in the organization who will coordinate the contributions of all team members and serve as a contact person for people seeking information. This role also involves educating, empowering, and encouraging the efforts of others. Ideally, the sustainable design champion will be recruited from within; however, a green building consultant might be brought in to play this role on an interim basis if necessary.

Establish a Green Team
A green team is composed of individuals who have a personal and professional commitment to developing both their own and the firm’s sustainable design knowledge base. The idea behind a green team is that it is efficient to distribute the task of research and resource development across a group of people with diverse skills. The team structure also supports collaboration and a sense of shared purpose. The green team works best when it draws upon a diversity of disciplines and responsibilities within a firm. Team members should include designers, managers, project architects, and specifiers to the greatest extent possible. In a multidisciplinary design firm, the green team should...
include people from each of the major disciplines, such as architects, interior designers, landscape architects, and engineers.

Support Education and Training
While a firm is developing its sustainable design expertise, the need for professional education and training is heightened. LEED training is currently available through the national USGBC and its local chapters. Attendance at green building conferences is valuable both for information gathering and networking. Nonetheless, one of the best and most cost-effective ways to build knowledge within a firm is in-house training sessions presented by vendors, specialty consultants, and staff. Having members of a firm’s green team present educational seminars reinforces their own knowledge while providing valuable knowledge to others in the firm. Training sessions should cover a broad range of topics, including new technologies and strategies, project examples and case studies, design process innovations, and assessment methods and criteria.

Identify the Right Consultants
Good consultants are an essential part of successful projects. This is especially true for sustainable design because of the need for integrated, “whole-building” solutions. Identify consultants who will supplement the expertise of your practice, and if necessary, consider specialty consultants. For example, an energy modeling specialist may be brought in to supplement the capabilities of the engineering design firm. An expert in native plantings may supplement the knowledge of landscape planners. When selecting consultants, it is important to carefully evaluate their ability to support the project’s sustainable design goals.

Investigate Opportunities for Partnering and Collaboration
Partnering with others outside the traditional design team can provide many benefits. Partners can include universities, national laboratories, utilities, manufacturers, and others, depending on the specifics of a project. For example, a number of universities have centers dedicated to green building research that will provide design assistance and technical resources. Many utilities have incentive programs encouraging new technologies and energy conservation initiatives. National laboratories will provide design assistance, including energy analysis and renewable energy consultation, for federal building projects as well as some private sector projects.

STEP 3: EVALUATE YOUR DESIGN PROCESS
Sustainable design requires architects to weave numerous factors into a coordinated whole that considers the life-cycle effects of the materials and systems used. Specialists may be contracted to provide expertise; however, as leader of the design team, the architect is responsible for engaging the multidisciplinary team in a collaborative design effort. Some owners hire “integration facilitators” as consultants to ensure this critical task is accomplished. Thus, firms seeking to maintain their leadership role in sustainable design must be proactive in developing a workable integrated design methodology. Multidisciplinary collaboration is the mantra of green design practitioners.

Begin with Visioning and Goal-Setting
At the outset of a project, engage a broad range of project stakeholders (owner, building users, maintenance personnel, etc.) in a visioning and goal-setting session to establish consensus on what is important. Collaborating to determine project vision and goals allows everyone involved in the process to feel vested in the principles guiding the project.

During goal-setting sessions allow time to focus explicitly on sustainable design goals for the project. The LEED Green Building Rating System can be a useful tool, as it provides a concise yet comprehensive list of issues for consideration. When working
with LEED, which was developed as a national standard, it is important to highlight priorities that may differ regionally because of local climate, ecology, and resource availability issues. The output of the goal-setting session should be a mission statement that defines issues most critical to the success of the project, as well as sustainable design goals that target anticipated levels of achievement. These goals build a sense of common purpose and serve as motivators for the design team. Getting a fix on them early is critical to success, as the greatest opportunities to improve performance and reduce environmental impact often exist during planning, site selection, and programming—before design even begins.

Use an “Integrated” Design Process

Sustainable design is a process for seeking solutions that are responsive to the complex interrelationships between the built environment and the natural world and the long-term effects of design decisions. This approach is fundamentally different from one in which building performance is driven simply by the need to meet required codes and standards. Sustainable design involves careful evaluation of a broad range of solutions so that the most appropriate options can be discerned from other, less promising ones. Effective solutions often demonstrate synergy between design disciplines (e.g., a single strategy providing multiple benefits). If this is to be achieved, the use of an integrated design process that considers architectural issues in parallel with engineering and site design issues is essential. Because many refinements that lead to more optimized design solutions cannot be determined intuitively, simulation tools and life-cycle cost analysis may be needed.

Identify Benchmarks and Measure Performance

Benchmarks provide a means to measure building and site design performance. Use of consistent measurement standards allows teams to predict performance relative to code requirements or industry standards. The LEED Green Building Rating System is a broad-based industry standard for evaluating the success sustainable strategies for building and site design. As such, it can be used to introduce, promote, and guide green building design. Another resource for green design is the set of criteria developed by the AIA Committee on the Environment to evaluate projects competing for the group’s Top 10 Green Projects designation. These criteria support use of the LEED system, while providing a concise format for capturing detailed information on building performance.

Use Life Cycle Cost Analysis

Life cycle cost analysis is a process for evaluating the cost and value of design strategies over time. As such, it is an essential part of the design optimization process. The parameters for life-cycle cost analysis should be determined early on, including the minimum payback period for investments, the time horizon for analysis, the discount rate, and energy cost escalations. The payback period for investments may be quite short, perhaps five to ten years for institutional projects and three to five years for corporate projects. The time horizon for analysis, on the other hand, should be more closely related to the building life cycle. When design options are evaluated over a longer time horizon, the ultimate value of the design options is more apparent.

Create Feedback Systems

Feedback systems make it easier for a building owner and a design firm to gather information about building and site design performance over the life of a facility. Feedback systems can involve meters, sensors, and controls embedded in the facility design, or they can be procedures, such as an agreement to perform a postoccupancy evaluation. Ideally, systems involve a combination of technology and procedures that are tailored to the specifics of a facility. Consider strategies to monitor energy and water consumption, renewable energy generation, electricity use for lighting, indoor air quality, and special
The design of the National Wildlife Federation Headquarters in Reston, Virginia, required careful consideration of cost and value and a life-cycle cost analysis. This sustainable project was built within a budget more typical of conventional speculative office development.

Photo credit: Alan Karchmer/FPG
### Consultant Qualifications

**A Checklist of Questions to Ask Potential Design Team Members**

<table>
<thead>
<tr>
<th>CONSULTANT</th>
<th>QUESTIONS TO ASK</th>
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| Mechanical engineer           | - What is your energy analysis methodology?  
- Do you have the ability in-house to perform hourly, whole-building energy analysis?  
- How will you use life cycle costing to inform design decisions?  
- Describe your approach to integrating passive solar design strategies.  
- Do you have experience with mixed-mode conditioning systems (e.g., systems that accommodate both natural and mechanical ventilation)?  
- Do you have experience with on-site energy generation technologies? Which ones?  
- Describe how you balance energy efficiency goals with the environmental impacts of fuels and refrigerants.  
- How will you address comfort and indoor air quality?  
- Do you have experience developing a LEED-compliant measurement and verification plan?  
- Are you familiar with the documentation requirements for LEED? |
| Commissioning agent           | - Describe your commissioning experience and the extent of commissioning services you provided for each project you have been involved with.  
- Describe your approach to creating comprehensive operations and maintenance manuals.  
- Describe your experience with monitoring energy use.  
- Are you familiar with documentation requirements for LEED? |
| Energy analysis consultant    | - Describe your energy analysis methodology.  
- Which energy simulation tools do you use? What will you use for this project?  
- How will you use life cycle costing to inform design decisions?  
- Are you able to model passive and mixed-mode conditioning systems?  
- Are you able to model on-site energy generation?  
- Are you familiar with documentation requirements for LEED? |
| Electrical engineer           | - Describe your approach to daylighting integration and development of energy-efficient electric lighting.  
- Describe your approach to optimizing the efficiency of electric power distribution.  
- Do you have experience with the design of photovoltaic systems?  
- Do you employ design strategies to reduce building occupants’ exposure to EMF (electromagnetic fields)?  
- Are you familiar with documentation requirements for LEED? |
| Lighting designer and/or daylighting specialist | - Describe your approach to daylighting integration and development of energy-efficient electric lighting.  
- Will you make use of daylight modeling software? If so, which program(s) will you use?  
- Will you make use of physical models to evaluate daylighting?  
- Describe your approach to minimizing light pollution from the building and site lighting.  
- Are you familiar with documentation requirements for LEED? |
| Plumbing engineer             | - Describe your approach to optimizing water efficiency.  
- Do you have experience creating a water budget for interior and exterior use?  
- Do you have experience with ultra-low-flow and waterless plumbing fixtures?  
- Do you have experience with rainwater harvesting and reuse systems? gray-water systems?  
- Do you have experience with solar hot-water systems?  
- Are you familiar with documentation requirements for LEED? |
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<thead>
<tr>
<th>Role</th>
<th>Questions</th>
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<tr>
<td>Structural engineer</td>
<td>- Describe your approach to resource-efficient structural design using sustainable materials.</td>
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<td>- Do you have experience with the use of recycled content materials?</td>
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<td>- Do you have experience with deconstruction and reuse projects?</td>
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<td>- Are you familiar with documentation requirements for LEED?</td>
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<tr>
<td>Civil engineer</td>
<td>- Describe your approach to low-impact site design and natural storm-water management systems.</td>
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<td>- Does your team have experience with the design of alternative wastewater treatment systems?</td>
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<td></td>
<td>- Or, have you collaborated with a specialty consultant to develop these?</td>
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<td></td>
<td>- Do you have experience with bio-retention systems?</td>
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<td></td>
<td>- Do you have experience with pervious paving systems?</td>
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<td></td>
<td>- Are you familiar with documentation requirements for LEED?</td>
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<tr>
<td>Landscape designer</td>
<td>- Describe your methodology for evaluating the microclimate, geology, hydrology, and ecology of the site, as well as regional impacts on the watershed, wildlife habitats, and transportation.</td>
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<td>- Do you have experience developing self-sustaining landscapes based on plants tolerant of local soils, climate, and water availability?</td>
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<td>- Do you have experience with native plant selection?</td>
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<td>- Do you have experience developing landscape maintenance plans utilizing organic fertilizers, integrated pest management, and water-conserving irrigation measures?</td>
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<td>- Do you have experience with “plant rescues,” in which trees and other vegetation are transplanted prior to construction?</td>
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<td>- Are you familiar with documentation requirements for LEED?</td>
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<td>Interior designer</td>
<td>- Describe your approach to developing interior environments that promote occupant comfort and wellness.</td>
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<td>- Describe your approach to evaluating and selecting building materials and systems that reduce life-cycle environmental impacts.</td>
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<td>- Do you have experience using locally available materials and products and salvaged materials?</td>
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<td>- Are you familiar with the EPA Comprehensive Procurement Guidelines (CPG) for the use of materials with recovered content (<a href="http://www.epa.gov/cpg">www.epa.gov/cpg</a>)?</td>
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<td>- Are you familiar with documentation requirements for LEED?</td>
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<tr>
<td>Specification writer</td>
<td>- Describe your approach to the development of “green” specifications.</td>
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<td>- Have you developed indoor air quality specifications?</td>
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<td></td>
<td>- Have you developed waste-recycling specifications for construction and demolition?</td>
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<td>- Have you developed salvage and reuse plans for demolition?</td>
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<td>- Have you developed specifications for appropriate handling of hazardous waste materials, such as oil, paint, and fluorescent light bulbs?</td>
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<td>- Are you familiar with documentation requirements for LEED?</td>
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<tr>
<td>Cost consultant</td>
<td>- Describe your approach to life cycle costing.</td>
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<tr>
<td>Environmental consultant</td>
<td>- Do you have experience with brownfield remediation?</td>
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<td>- Do you have experience with indoor air quality testing?</td>
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<td>- Do you have experience developing an indoor air quality management plan?</td>
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<td>- Are you familiar with documentation requirements for LEED?</td>
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<tr>
<td>Sustainable design consultant</td>
<td>- Describe your experience with the LEED Green Building Rating System.</td>
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<td></td>
<td>- Are you a LEED-accredited professional?</td>
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<td></td>
<td>- Have you filed for LEED certification on any projects? How many of those projects have been certified?</td>
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systems such as constructed wetlands, gray-water recycling, or a green roof. Plan to gather baseline information just prior to occupancy, as this information will serve as an important point of reference for future monitoring.

STEP 4: ORGANIZE DESIGN RESOURCES
Sustainable design requires project teams to consider numerous issues and potential design strategies in the decision-making process. It is advantageous to create a system for developing and organizing sustainable design resources for use firmwide, rather than on a project-by-project basis. The development of shared resources will create efficiencies for project teams and will help the firm to build a more significant resource base over time.

Organize In-House Design Resources
In-house sustainable design resources may include books and periodicals, Web site links, product information, project specifications, and construction details. Creation of a green products library helps staff stay current with new products entering the market, and provides easy access to environmental impact information. Developing an intranet site to organize electronic resources, Web links, and relevant project files can make this information available to all project participants.

Identify Outside Resources
Local or regional government offices and nonprofit organizations can be valuable, time-saving resources. For example, a growing number of states and local communities have green building offices that provide detailed information on subjects such as locally available green building materials, recyclers, energy-efficiency programs, and residential weatherization programs. Assistance for identifying tax credits and other financial incentives may also be available. If you cannot find a green building office, seek out a local recycling and waste management office or energy office. Look for local nonprofit organizations that focus on specific issues such as native plants or salvaged materials.

Document Lessons Learned
Case studies and project profiles can be effective for transferring knowledge and lessons learned from one project team to others in the firm. Consider developing a standard format for organizing project environmental information. This could include images, building performance data, design process innovations, and project cost data. Develop a method for capturing postoccupancy information, including occupant satisfaction, operating cost savings, and performance of materials and systems. Unexpected results and problems that must be solved during construction and/or occupancy also provide invaluable information for future projects. Project information can be tracked on an office intranet or simply posted on a bulletin board in a highly visible office location.

Consider Employing a Green Building Consultant
For firms just getting into green design, the support of a green building consultant can be invaluable. A consultant can help organize design resources, provide education and training, and support project design teams. A firm may want to hire such a specialist to institute the firm’s sustainable design program and train those who will carry the program forward. The consultant may also be enlisted as an ongoing member of the team.

STEP 5: ADJUST YOUR BUSINESS STRATEGY
A focus on business strategy for sustainable design goes beyond how-to issues. It also must address “why” issues. A firm that adopts a sustainable design business strategy must communicate why this approach is of value to the client, why the firm is qualified to do this work, and why the scope of services and related compensation may be dif-
There is considerable debate among practitioners as to whether costs for designing a green building are greater or simply distributed differently. However, most practitioners agree there is a steep learning curve for firms just beginning to practice sustainable design, and the process becomes more efficient after the firm has gained experience.

**Develop a Value Proposition**

Sustainable design is fundamentally about “values” in the largest sense, including some that are economically measurable and some that are not. As a design professional, you have an opportunity to articulate your “value proposition” to current and future clients. Begin by analyzing past projects and interviewing past clients so you can demonstrate how your firm’s sustainable design services have proved valuable to your clients. Include information on project costs, operating costs, and occupant satisfaction. Put together information that supports the value of your sustainable design services. If possible, include information about enhanced productivity of building users, clients’ employee recruitment and retention statistics, and positive public reactions to the project design.

**Develop Green Marketing Materials**

The architect’s services for the World Resources Institute Headquarters in Washington, D.C., involved an expanded scope that included visioning and goal-setting, programming, and site selection. Involvement with the client early in the process was essential to the success of this project, which has been widely recognized for its sustainable interior design.

The architect’s services for the World Resources Institute Headquarters in Washington, D.C., involved an expanded scope that included visioning and goal-setting, programming, and site selection. Involvement with the client early in the process was essential to the success of this project, which has been widely recognized for its sustainable interior design.

Photo credit: Alan Karchmer/HOK
### Sustainable design visioning and goal setting
Visioning is an activity used to build consensus across a broad range of facility stakeholders on the sustainability issues most critical to a particular project. The architect, owner, building users, builder, and maintenance personnel, among others, gather to determine goals for the design effort and to develop strategies and technologies for achieving them. The LEED Green Building Rating System can be a useful tool for this process, as it provides a concise yet quite comprehensive list of issues for consideration.

### Sustainable design charrette
Green charrettes offer the design team an opportunity to engage in multidisciplinary collaboration and brainstorming. In some cases, it is worthwhile to bring in outside expertise to contribute during the charrette. Sessions are most productive when preliminary work such as site evaluation, programming and massing studies, energy and daylighting analysis, and development of a preliminary cost model is undertaken first.

### Feasibility studies
Feasibility studies evaluate the potential benefit, economic and qualitative, associated with use of a particular technology or strategy. It can be beneficial to conduct a preliminary feasibility study of the potential costs and benefits associated with nontraditional strategies before the full design team begins developing them. Feasibility studies can be particularly valuable for sustainable strategies such as on-site renewable energy systems, water harvesting and reuse, and alternative wastewater treatment systems.

### Audits
Audits are generally used to study existing buildings. Energy audits evaluate the energy use in an existing building and the potential for improvement. Water audits do the same for on-site water use.

### Site evaluation
Site evaluation provides important information about topics such as transportation networks; solar orientation and access; wind; wetlands; and the geology, hydrology, and ecology of the site. A more comprehensive approach to site evaluation also includes issues related to the health of the regional watershed and wildlife habitats (including greenways and flyways).

### Energy/daylighting analysis
Energy and daylighting analysis provide necessary information for making design decisions that promote energy conservation and indoor environmental quality. Energy analysis can be provided either by the mechanical engineer responsible for design and documentation of systems or by an energy analysis consultant. It is the responsibility of the architect to ensure that the findings from the energy analysis are integrated into the design and inform decisions about site planning, building envelope design, lighting, and interior space planning.

### Life cycle cost analysis
Life cycle cost analysis is a design tool for assessing construction costs and operating costs over the life of a building element or system. The analysis typically includes investment cost (first cost), utility costs (energy, water use, wastewater disposal), operation and maintenance costs, and periodic replacement costs. Life cycle cost analysis is recommended to guide decisions about high performance building envelopes, energy-efficient lighting, mechanical system selection, materials selection, gray-water recycling systems, and alternative wastewater treatment systems.

### Commissioning
Commissioning is a systematic process for ensuring that all building systems perform interactively, as a system, according to the contract documents, the design intent, and the owner's needs. Commissioning is increasingly a common part of the startup of a new building. To be truly effective, the commissioning process begins early in design and continues through construction, owner acceptance, and the warranty period.

### Measurement and verification
Measuring and verifying whether energy and water cost savings are being achieved can be carried out using the International Performance Measurement and Verification Protocol (IPMVP; see www.ipmvp.org). This task is typically performed after a building has been occupied for about a year, but measurement and verification (M&V) should be planned for in parallel with the design effort. Building control systems may also be used to facilitate data collection.

### Postoccupancy evaluation
Postoccupancy evaluation (POE) is a process for determining how well a completed project measures up to a set of established goals such as cost, performance, durability, flexibility, etc. When possible, plan for postoccupancy evaluation during design.

### Benchmarking
Benchmarking is a process that allows comparison of performance relative to a set of established criteria. Sometimes termed "metrics," these criteria can be established by the team or adopted from an existing standard, such as the LEED Green Building Rating System or the EPA/DOE Energy Star program. The AIA Committee on the Environment has developed green building criteria as part of its Top 10 Green Projects award program (see www.aia.org/cote).

### LEED certification
The USGBC’s Leadership in Energy and Environmental Design (LEED) Green Building Rating System is flexible to accommodate a wide variety of project types, locations, and budgets. The design team can assess whether their project qualifies for certification at any point during its development; however, formal certification requires submittal of information to the USGBC for review and approval. The individual responsible for submitting certification information to the USGBC typically coordinates with design team members as well as construction team members responsible for documenting LEED criteria during the construction phase.
materials should include a statement of design philosophy and approach, qualifications of the proposed team members, descriptions of past projects, and information about awards. Informed clients seek information that is specific and highlights the results of the sustainable design effort. What were the specific benefits of the sustainable design approach? How did sustainable design affect costs? Many owners are becoming attuned to the importance of more integrated design processes and may ask how the design team will address energy and daylighting analysis or how the team will make use of the LEED Green Building Rating System.

**Evaluate your Scope of Services**

Currently, there is no clear guidance on how firms should incorporate sustainable design into their scope of services, and it may be prudent to address this issue on a case-by-case basis. Firms experienced in sustainable design have found that they tend to get involved in projects earlier, with services such as feasibility studies and site selection, and that they tend to stay later, with tasks such as commissioning and postoccupancy evaluations.

For experienced firms, the consensus is that the integrated design process itself is no more time-consuming than a more traditional design approach. However, the effort expended tends to fall in different phases in projects that incorporate sustainable design. Project management can be greater when more specialty consultants are involved, requiring more effort in the concept and schematic design phases, but this time is offset with efficiency gains during design development and contract documentation.

To reflect differences in how services are provided, some firms offering sustainable design adjust their basic scope of services to be all-inclusive, including feasibility studies, design analysis, specialists, commissioning, and other related services. Other firms modify their basic scope of services to reflect an integrated design process but selectively identify high-cost elements of the scope (such as energy analysis and commissioning) as discrete services.

**Manage Risk Proactively**

Risk management is an unavoidable component of managing costs in a design practice. Concern over possible increased risk may make architects reluctant to embrace innovation. However, firms engaged in green design can address risk associated with new building materials, systems, or technologies through careful research and using information gleaned from pilot projects. Use of sustainable design strategies can manage the owners’ risk as well by demonstrating a good-faith effort to promote the health and well-being of building occupants. For example, a focus on sustainable design can reduce the owner’s potential liability for future problems caused by poor indoor air quality, chemical emissions from building materials, and sick building syndrome.

**THE VALUE OF GREEN DESIGN**

The effort to green a firm may seem daunting, but the goal is worthy. Sustainable design underscores the value of design in the largest sense—value to the client, value to the community, and value to future generations. Many firms that offer sustainable design have found the increased value they provide for their clients has translated into significant business opportunity. Sustainable design also has the potential to enrich the lives of architects and their clients on a personal level, as it anchors the design effort to a larger purpose. Many architects have stated that the greatest reward they have experienced in greening their firms is an increased sense of personal commitment and professional fulfillment.

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**Some Useful Resources**


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The Certified Forest Products Council provides information about forest product certification. An interactive tool enables users to find FSC-certified wood products anywhere in the world. Visit their Web page at www.certiﬁedwood.org/.

Environmental Building News is a monthly newsletter providing authoritative information on environmentally responsible building design and construction. Subscribers can search the full news archive by topic, but some content is available online free of charge for nonsubscribers. Go to http://www.buildinggreen.com/meru/news.cfm.

Green Roofs at www.greenroofs.com/ is a resource portal for design professionals interested in green roof information. Included are resource links, case studies, and products.

Green Seal is an independent, nonprofit organization that provides a rigorous product certification process for manufacturers of green products. The Green Seal Web site includes recommended products, manuals on best practices, and environmental specifications and standards for products. Visit Green Seal at www.greenseal.org/.

The High-Performance Buildings Database at www.eere.energy.gov/buildings/high-performance/case_studies/index.cfm includes detailed case study information on dozens of residential and commercial high-performance green buildings. All entries have been reviewed by the U.S. Department of Energy for consistency.

The Urban Land Institute defines smart growth as development that is environmentally sensitive, economically viable, community-oriented, and sustainable. The Smart Growth Network Web site at http://smartgrowth.net/Home/sg_Home_fst.html includes an introduction to smart growth, news, case studies, and information on state and local initiatives.

The U.S. Department of Energy Smart Communities Network Web site at www.sustainable.doe.gov/buildings/gbiintro.shtml provides a concise overview of green building concepts with a focus on both commercial and residential sectors. Included are an overview of programs, rating systems, codes and ordinances, case studies, and other resources.

The Natural Step site at www.naturalstep.org/ includes guidelines, resources, and case studies for sustainable design, including a downloadable publication entitled “Blueprint for a Sustainable World.”

Information about U.S. Green Building Council (USGBC) programs, resources, and activities can be found at www.usgbc.org. Also available at this site is a variety of information on the LEED Green Building Rating System, consensus-based voluntary national performance standards for high-performance, sustainable buildings.

The Whole Building Design Guide is the federal government’s information gateway for information related to “integrated whole building design.” Go to www.wbdg.org/. Multiple links between sections of the WBDG and the Internet allow easy access to online information related to a broad range of sustainable design topics, including design tools, federal mandates, and government and nongovernment standards. Also available are in-depth technical summaries, called Resource Pages, written by industry experts.

The HOK Guidebook to Sustainable Design by Sandra F. Mendler and William Odell (2000) provides a comprehensive sustainable design guide for architects, engineers, planners, interior designers, and landscape architects. The book includes a process road map, principles, checklists, and 24 case studies highlighting a variety of international HOK projects that embody sustainable design.

The Environmental Resource Guide (1996) developed by the AIA contains detailed and comprehensive data on the use and performance of building materials in three report formats: project, application, and material reports. The original material and two supplements (1997 and 1998) are integrated on a CD-ROM that is available from the publisher.