Sustainable Design—A Journey Through the Nautilus Shell

BY HARRY T. GORDON, FAIA
Senior Vice President, Burt Hill Kosar Rittelmann Associates

Imagine yourself at the center of a nautilus shell, the beautiful, spiraling creation of nature that is the physical expression of the Fibonacci whole number series (1, 1, 2, 3, 5, 8, 13 . . .). This system of natural proportionality has many applications in architecture, but I would like you to imagine it from the perspective of expanding the awareness of our link as architects to the systems of nature. If you could start at the eye of the spiral and move outward, each step would open a wider viewpoint—you would be able to see and understand more, and your knowledge would expand at an ever-increasing rate as you made your journey.

For me, the journey began on the first Earth Day, in April 1970. Wisconsin Senator Gaylord Nelson had imagined a grassroots event that would increase environmental awareness in the United States. The overwhelming response to this simple idea demonstrated that many Americans were concerned about the health of the land, water, and air in this beautiful country. Remember, this was a time when few pollution controls and seemingly abundant energy resources were the rule—I recall buying gasoline for 25 cents per gallon.

So, if you were an architecture student on the first Earth Day, as I was, you might have tried to imagine how the buildings and cities you hoped to design in your career could be better stewards of the earth's natural resources. I tackled this issue as I would any design project—with research to see what others had already learned.

Among the great finds were Victor Olgyay's *Design with Climate* (1963) and Ian McHarg's *Design with Nature* (1969). Olgyay made me think about the way a building should respond to the patterns of sun, wind, and water, and McHarg showed me a way of considering the relationship between natural systems and the broader built environment of our parks and cities.

The Arab oil embargo in 1973 led to two-hour waiting lines to buy gasoline. Perhaps energy resources were not boundless. We knew then, as we are constantly reminded today, that Americans consume a disproportionate quantity of the earth's resources. What if consumption in other countries equaled ours?

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Sustainable Architecture: Getting From Here to There

AIA EXECUTIVE VICE PRESIDENT & CEO

People have always desired architecture that is functional and beautiful. But today we want more: We want our buildings to be sustainable.

What does that mean? Among other things, it means fresh air in our work spaces, natural light, clean water, splendid views, and comfortable temperatures, too. Even that does not exhaust the growing list of client and consumer expectations including recycled and recyclable materials, the sustainable production of building materials, and reduced heat as well as light pollution.

It is evident that we have come a long way from the 1970s. When the context of sustainability is considered today, it also becomes evident that our nation and our profession have entered a complex era when new opportunities and challenges are expanding at an ever-accelerating pace.

Staying abreast is no mean feat. As Harry Gordon points out in his opening article in this issue of *AIA/J*, the more we come to learn, the more we are finding there is yet to learn. That compelling fact is both the rationale for and the mission of the AIA's Committee on the Environment (COTE), the committee leading the Institute's exploration of and commitment to what has come to be called "green design."

As the AIA works with related organizations—including the U.S. Green Building Council (USGBC), National Institute of Building Sciences (NIBS), National Institute of Standards and Technology (NIST), Department of Energy (DOE), Environmental Protection Agency (EPA), and General Services Administration (GSA), as well as clients and manufacturers—the cycles of intense analysis and synthesis facing all of us are crowding ever closer together.

Is the task daunting? Of course. But architects can play a decisive role in addressing our collective need for new strategies that creatively, fairly, and efficiently meet the challenge. Who, after all, is better positioned than architects, working through the AIA, to bring the diverse constituencies together to achieve the end we all desire—more healthy, safe, and, yes, sustainable communities that work with rather than against the environment?

A case in point: certification

An insight into one of the challenges—and opportunities!—can be found in the USGBC Leadership in Energy and Environmental Design (LEED™) Green Building Rating system. Vivian Loftness, FAIA, whose tireless efforts in improving building performance have earned her leadership positions as both a USGBC Board member and the COTE vice chair this year and chair next, will tell you that LEED as currently written is a good starting point for evaluating any project. However, she suggests there are many refinements still to be made.

Loftness offers a few examples, such as giving more attention to regional variations and natural lighting or developing different sets of standards for different building types. Even as there is a growing acceptance of sustainability as a building ethic, it would be shortsighted for the marketplace to regard LEED as currently written to be the ultimate guideline. Rather, it is a work in progress that will be best served if it is informed by an objective and fair consideration of the latest research and best design practices as they evolve.

Architects should seek and be given an opportunity to play a key role not only in informing the content of LEED, but also in providing a forum in which the needs of all the parties affected by the council's actions can be aired and fairly addressed. Otherwise there is a risk that the guidelines driving the marketplace will have a negative impact that not only stifles creativity and innovation, but also alienates important political and economic constituencies essential to achieving the goal of a sustainable environment.

Toward a green legacy

Honestly acknowledging present challenges does not in any way indicate anything less than a 100-percent commitment to the ultimate goal of sustainable design. AIA members are working individually within groups such as the USGBC to bring our expertise to bear as problem solvers, integrators, and collaborators. Collectively, the AIA continues to advance the current state of knowledge through COTEs at all component levels, forthcoming publications such as the next update to *The Architect's Handbook of Professional Practice*, and research as well as development initiatives with DOE, EPA, GSA, and others.

Functional and beautiful buildings that are also sustainable cannot exist unless architects have the will and the opportunity to integrate sustainability into their designs. Creating fair and effective guidelines to promote sustainability will require listening, collaboration, and commitment not only on the part of government, industry, and the design professions, but also—and this is important—those who assess or rate sustainability as well as those whose products and materials are being assessed. The AIA stands ready to play its part, both as a forum for honest collaboration among *all* the parties and as a player prepared to contribute the profession's creativity—creativity that is inspired by our commitment to serve the best interests of our clients and society. ▫

Assessing LEED's Lead

Firm principals and their staffs must react to setbacks, changes, and advances in the market that affect how they conduct business. The emergence of the LEED Green Building Rating System™ as the front-running standards in sustainable design is just such a development. Representatives of 42 firms from around the country took a moment to answer a brief questionnaire regard LEED for this issue of *AIA/J*. While not statistically valid, their responses and comments offer a cross-section of thoughts on the subject. You can view all the comments at *www.aia.org/aiaj*.

1. How familiar are you with the specific requirements for a project to meet LEED certification?

Very: 19
Somewhat: 16
Not very: 4
Not at all: 3

2. If you are at all familiar with LEED, how effectively do you feel the LEED criteria balance the need for environmentally friendly construction with the practical and aesthetic concerns of architects and their clients?

Very effectively: 10
Somewhat effectively: 19
Not very effectively: 7
Not at all effectively: 4
No answer: 2

3. Has your firm worked on any project that received LEED certification?

Yes: 7
No: 35

4. Does your firm have a LEED-accredited architect on its staff?

Yes: 16
No: 26

5. If not, is anyone in your firm currently seeking LEED accreditation?

Yes: 16
No: 10
No answer: 16

6. Whether or not your firm is pursuing LEED recognition, does your firm have established policies regarding environmentally conscious design?

Yes: 34
No: 8

Comments:

"Good design demands that the environment be considered." *Thomas A. Hammer, AIA, principal, Rowe Architects, Tampa, Fla.*

"Often design conventions and ready materials from the marketplace defy LEED cost effectiveness....Conforming to all LEED requirements will not happen with the residential and commercial clients from whom I take my orders." *Ralph M. Alley, AIA, owner, Ralph M. Alley, AIA, Architect, Temecula, Calif.*

"The LEED system seems to have some underlying biases....Hopefully it will continue to be updated so it can evolve into a better and better tool." *Wes McClure, FAIA, principal, McClure Hopkins Architects, Raleigh*

"It should be everyone's responsibility, especially architects and designers, to make [sustainability] part of their practice policy—not part of their marketing strategy." *Don W. Carter, AIA, principal, Carter Design Associates, Houston*

"The cost of the LEED process seems more geared to generating fees than really helping the environment....I rate it as more of a 'low-carb' gimmick [than] 'lets just lose weight.' " *Michael Brady, AIA, president, Michael Brady Inc., Knoxville, Tenn.*

"We are in the process of completing our first LEED building. LEED has already had an influence upon us—for every new project, we are considering sustainable issues." *Frank Elmer, FAIA, FAICP, principal, Lincoln Street Studio, Columbus, Ohio*

"I am concerned about how complicated the LEED certification process is. I would feel more comfortable if a professional organization, such as the AIA, set and maintained the criteria standards for green design." *Lynn Pomeroy, FAIA, president, LPA Sacramento, Inc., Sacramento*

"We are practitioners of the USGBC's LEED Rating System and other methodologies, such as High Performance Schools Strategy....These methodologies are holistic approaches to designing healthy, safe, productive, cost effective, and sustainable facilities with an emphasis on the mission and functions of the building owners."

CYNTHIA DE JONG, AIA, LAP, HBA Architecture Engineering Interior Design, Virginia Beach, Va.

Sustainable Design—A Journey Through the Nautilus Shell

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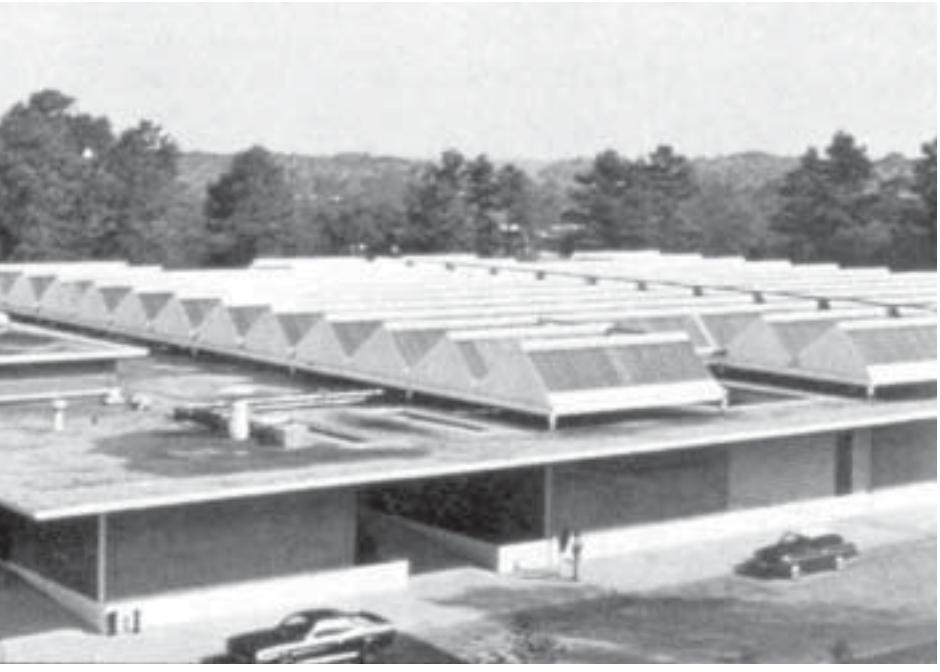
It seemed like I was on the right track. In my architecture thesis, I imagined an architecture that was based not on statics, as we had studied in our structures courses, but rather on buildings that respond dynamically to the ever-changing interface between the surrounding environment and the needs of building users.

Focus on energy

The first steps from the eye of the nautilus shell focused on energy: how we could design buildings that consumed less and obtained most of the energy they need from solar power. At Burt Hill, we had worked on some of the largest active solar heating and cooling systems that had been built. These experimental projects demonstrated that we would need a lot of glass, copper, and steel, as well as clever control systems. The systems proved to be too complicated for most applications, but the principles underlying them were sound. Many of those early solar heating systems are still functioning well today.



Designed by Burt Hill Kosar Rittelmann and constructed in Atlanta in 1975, Towns Elementary School was the largest solar-powered heating and cooling system in the world.

What if we could make those systems simpler? What if the building could become the receptor of the sun and use the heat and light directly to reduce energy requirements? Architects discovered ways to design simple, elegant houses, filled with light, that made people happy to be in them. We learned how to apply these lessons to increasingly larger buildings. Advancements in materials technology made it possible to "tune" buildings to the climate, and improvements in computer analysis increased our confidence in designing passive-solar, daylighting, and natural ventilation systems. We found that people liked being in buildings with these features much more than ordinary buildings, and they functioned better in them as well, as evidenced by higher test scores in schools and increased productivity in offices.

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As the nautilus journey continued, our perspective as architects became broader still. The AIA established the Committee on the Environment, which emphasized that although energy was important and easy to measure, site design, water, materials, indoor environmental quality, and waste reduction were also key elements in an integrated approach to resource efficiency. With the publication of the AIA's *Environmental Resource Guide* and a series of environmental design charrettes—such as the Greening of the White House—the dialogue expanded to include many other practitioners.

The U.S. Green Building Council broadened the audience still further, encompassing elements of the community of building designers, constructors, operators, and users. The development of the LEED™ Green Building Rating System created an objective, if imperfect, method of measuring the environmental responsiveness of buildings. Most architecture practitioners now

find at least some of their clients asking for a LEED-rated building.

We now have some good ideas about making buildings more responsive to the natural environment. Is this enough? Those of us who do not think so have begun to focus on sustainable community and urban master planning. This planning is based on the "triple bottom line"—a balance among people, planet, and prosperity—and embodies the belief that cities must be equally responsive to social needs, environmental responsibility, and economic vitality. Some of the most successful communities today are those that have achieved this balance. This is where people want to live.

To broader horizons

Where will our nautilus journey lead next? As we suspected might be the case 30 years ago, we now live in a global economy in which other countries emulate our resource consumption patterns. Cars are replacing bicycles in some of the most populous nations in the world, such as India and China. The demands on finite natural resources increase rapidly. What largely began as a personal awareness and concern for the environment is now driven by necessity.

Yet, we have come far in our journey. Some of the best design work now creates walkable, transit-oriented, mixed-use communities of resource-efficient, healthy buildings, with careful consideration of the social fabric that makes vibrant living places. Perhaps this will be the new world model that others will emulate. If we can be sure of only one thing, it is that the nautilus spiral will not end, and architects who practice lifelong learning will always see new and broader horizons. ▫

In addition to serving as senior vice president of Burt Hill Kosar Rittelmann Associates, Harry Gordon is a founding member and past chair of the AIA national Committee on the Environment.

IMAGES COURTESY OF BURT HILL KOSAR RITTELMANN.

ABOVE: Marx Center, an academic building at Hood College, Frederick, Md., was designed by Burt Hill to include passive heating and cooling systems while fitting in with the Georgian architecture style of the campus.

LEFT: Noisette Community Master Plan, North Charleston, S.C., is one of the largest sustainably designed planned communities in the U.S. It is based on the "triple bottom line" concept of balancing social needs, environmental responsibility, and economic vitality. The pair of images shows an existing portion of the community that is suitable only for automobiles and strip commercial uses, and Burt Hill's proposed design, which incorporates sustainable stormwater management principles, mixed-use infill development, and a pedestrian scale.

Platinum's First: Revisiting a LEED Pioneer

BY HEATHER LIVINGSTON

In July, Chesapeake Bay Foundation President and CEO William Baker and Chief of Staff Chuck Foster spoke with AIA/J *about the impact of the CBF's Phillip Merrill Environmental Center, the first building to receive the U.S. Green Building Council's Platinum LEED™ certification. Designed by the Washington, D.C., office of SmithGroup, Inc., the Merrill Center, completed in December 2000, is the recipient of numerous awards, including the AIA Committee on the Environment's Top Ten Green Buildings and the* Business Week/ Architectural Record *Awards.*

AIA/J: What was the premium on the Merrill Center's green features?

Baker: The building's cost was just shy of $250/square foot. We estimate that about $50/square foot was for the green features. At the time, a lot of the products, technology, and practices that we were incorporating were just being developed. If we were building today, we believe we could do it at no additional cost.

AIA/J: As the vanguard of sustainable corporate design, what have you learned along the way?

Baker: First, we've learned that the concept of "walking the talk" really is beneficial and pays dividends for an organization. CBF is reducing its environmental impact by virtue of the building we occupy. Second, we know it's a very worker-friendly building; people enjoy coming here. Third, it has raised our awareness with the public. We've gotten tremendous public attention and interest because of this building. As people learn about our headquarters, they also learn about CBF, and we expand our reach.

Foster: I'd like to underscore Will's point on public interest. We had no idea the world would be so interested in the building. For the first six months of occupancy, we were swamped with attention and hadn't really planned for it. It's a great problem to have.

This is the fourth building in a series for us. The others are smaller educational facilities in which we implemented a lot of the technology we have in this building. We've learned that there are no catastrophic failures of any particular system or building component, but as always, the devil is in the details. Have I learned any lessons or would we do some things differently? Absolutely. Most are small details—like sizing the circulation pumps 50 times smaller. Another thing is that we actually underestimated the savings in some areas. For example, using DOE's temperature guidelines for employee comfort, we anticipated using natural ventilation 10 percent of the year. After three years in the building, we've found that we use natural ventilation 22 percent of the time. If we're using natural ventilation, employees are willing to go outside those published temperature ranges for the benefit of natural ventilation.

I don't know if they're making a conscious decision, but I do know that our building manager has found that he can allow the temperature to be a few degrees colder or hotter if we have the windows open. If he allows that 2-degree variation when we have the windows closed, he gets complaints.

AIA/J: Has the LEED certification been a significant factor in the project's success?

Foster: I think LEED was a valuable tool in the building's design. It's hard to quantify and articulate to donors or stockholders what you're trying to achieve with a building. You tell them you're building a green building, and they ask, "Dark green, light green?" LEED allows you to quantify and stick to a plan, and then promote yourself when it's done.

Baker: The LEED process helped us enormously. It gave us self-discipline as we made the difficult decisions that come with building on a budget. When we got into value-engineering, the question from the board and our building committee was, "Will we sacrifice any LEED points if we do that?" If the answer was yes, it stayed in. If the answer was no, it likely came out.

AIA/J: Did you find any small departures from traditional construction that yielded tremendous green results?

Foster: The value-engineering made the building greener because we removed anything that didn't give us LEED points or wasn't needed—simple things like not filling in the nail holes. Well that's green because you're not using materials, but we saved $30,000 by not filling the holes. We asked, "Do we need galvanized pipe hangers in the basement?" No, because they aren't subjected to the elements. Again, small savings, but you're using fewer materials. The greenest building would have been a real small sign on this site saying, "There would have been an office building here, but we decided to do the green thing and not build it." We worked backward from that point. Our philosophy is that the greenest building is the least amount of building we truly need, built with the fewest number of materials.

AIA/J: How do the employees feel about it? Do they balk at things like composting toilets, or have they really embraced the sustainable measures?

Baker: I think it's universally the latter, but I'll tell you a true story that goes to the heart of your question. During the planning stage, I met with Mayor Mike Bloomberg of New York City—we're on a board together—and I told him about our plans. He said, "Come and look at my office building." There were no walls—everybody was out in the open together. There was great communication, a wonderful flow of energy and ideas. I came back and talked to our senior staff about doing that in our building. They looked at me as if they were thinking, "Oh no, there he goes with one of his crazy ideas again. We need our offices, our doors, our privacy."

But Chuck listened to me and kept an open mind. He thought about it for a while, and then showed the senior staff how much energy we'd save and how much less pollution would be emitted if we didn't have walls and doors because of the lighting, heating, and cooling benefits.

Without a moment's hesitation, everyone said, "Well, of course we have to do it." That's a very real example of the organization's and staff's belief in doing the right thing. As for the composting toilets, so far they've been a nonissue.

AIA/J: Do you think building green is a feasible goal for all new projects?

Baker: Every single project can have green features. One reason why LEED was so supportive of our project was because we did a great job of putting an array of technologies and practices into one building.

Foster: We actually considered making it green by putting in a fuel cell to power the whole building. We soon realized that instead of using one type of technology that isn't easily replicable, we should incorporate many smaller green features that people can choose.

Baker: And that's a great thing because people who visit this building will see something that they can incorporate into their own project. ▫

Visit the Chesapeake Bay Foundation online, www.cbf.org.

Read more about the Merrill Center online, http://www.aia.org/cote/topten_2001/04_79_ChesapeakeBayFoundationHeadquarters/Default.asp.

Daniel Williams, Architect

Building a Green Practice

BY TRACY OSTROFF

There is a difference between green design, which is a healthy approach to designing with healthy materials, and sustainable building, which is not only healthy but long-lasting and energy self-sufficient.

Daniel Williams, FAIA, has been practicing sustainable architecture for a quarter century, but the technologies he employs predate his work by millennia.

"If we're sitting in a building, which we do basically every day, you'll find some people who are too hot, and some people who are too cold, some who have too much light, and some who don't have enough, and that's the same way it was a thousand years ago before the advent of any mechanical equipment," he says.

The award-winning architect says his firm, which has varied in size from 3 to 12 people over the years, started as a standard architecture practice with ecology, energy conservation, and community planning as important criteria. Of his long-standing interest in sustainable design, Williams says, "I think others consider our experience to be unique, but I believe most architects think that sustainable design is one of the most important issues facing our practices. Even though the niche is still developing, it's not the way it was 30 years ago when there were very few people in the field. Architects understand that it is a critical challenge in their practices, and they're pursuing it as rapidly as they can."

Uphill battle

Still, practicing sustainable architecture is an uphill battle. "We haven't come up with any kind of solution that's better than people being able to control their environment to make it comfortable. The problem with most buildings today is that you cannot manipulate them—you cannot open a window or change the amount of natural light. Typically, the thing that's missing is the ability to interact with the exterior environment on 'comfort' days because the building is a hermetically sealed box that doesn't allow the participants to make their own comfort zone work better," Williams says. "Part of the challenge of sustainability and green design is, How do we bring back this connection between people and the climate by designing the ecology of a building? How do you make a building or structure more connected to the regional 'place' and specific to the needs of the users?"

Williams has pondered and lectured on these topics from home bases in Florida and, more recently, Seattle, where his experience tells him that to achieve superior sustainable design, the architecture must relate to regional resources through a method he calls "place-based design."

"In some way, the aesthetics and the place-based design are the same thing," Williams says. "An aesthetic shouldn't be applied to a building. It's a solution that springs from the building that is simultaneously responsive to the environmental, economic, and social conditions. One would hope that a building in Albuquerque would be considerably different from a building in Vancouver because the conditions are so different."

Clients come to Williams's practice for many reasons, the architect says, including his belief that sustainable design does not have to cost more than traditional design. "Our practice tries as much as possible to do things simply and with common sense. How a structure, for example, ventilates itself on days that need to be cooled is as much, or maybe more, a logical statement of how one designs a building versus designing a building and then putting a mechanical system in it to try to create comfort."

Levels of analysis

"There's a tremendous amount of data out there, and I think, in our case, we don't really need to find a whole lot more," Williams says of persuading his clients to pursue green and sustainable design. "I'm not convinced that having a lot of data makes better buildings. Clearer thinking makes better buildings."

Williams refers to data that validate the notion that people are more productive when they are happier and healthier in their space. If a building can provide a better quality of life, productivity climbs, which means that the building design is actually contributing to the company's profits. And that could be a critical element of any business's economic model.

He does note the need for data that speak to the volumetric experience of architecture. "One of the things we're trying to do with the AIA/COTE Top Ten Green Projects is to look at criteria that are more

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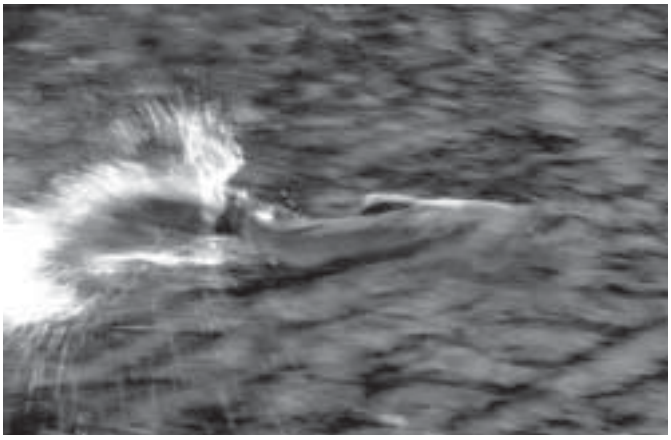
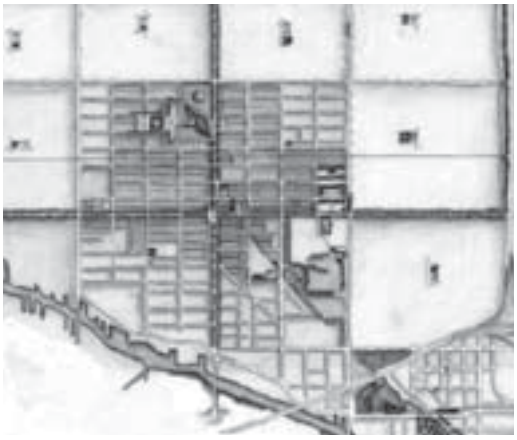




IMAGES COURTESY OF THE ARCHITECT

expressive of deep design—how does the space, its proportions, scale, and even color add to the sustainable design program?" Williams is writing a book on sustainable design, to be published next year.

On the boards, the firm is working on projects that incorporate sustainable design and respond to their regional environment, including a sustainability center in Vashon Island, Wash., a hospital for manatees in Florida, and the renovation of a 100-year-old house. His firm is also developing short- and long-range planning programs for smart growth and growth management.

The firm employs two levels of analysis on its projects. The first is an Internet-based bioclimatic/bioregional analysis: where the sun rises and sets and moves throughout the year, the direction of the prevailing breezes, and whether the area is prone to natural disasters or severe conditions that would have a significant impact over time. "We especially look at water, because it is probably the most important single element that has to do with development changes. Once we get that base, that tells us what resources are there and where the opportunities are for collaborating with the natural environment—to design a 'fit.' This means that we don't have to pay to make those things the natural system does for free," Williams explains.

The second step is to determine the particulars of the site. "You need to be able to find out from the specific site not only the community character and the context, but also what are the natural energies and resources."

There is a difference between green design, Williams says, which is a healthy approach to designing with healthy materials, and sustainable building, which is not only healthy but long-lasting and energy self-sufficient. Taken together, green design and sustainable building combine healthy materials and processes with long-lasting connections to the environment.

"It's really just in the last 50 years, with the advent of huge mechanical systems, that we've been able to design, and I think very poorly, a building for Las Vegas that can be the same as a building in Seattle or Miami. Those days are hopefully coming to a screeching halt," Williams says. "Our challenge today is to design as if we are part of the ecology—because we are!" ▫

Daniel Williams, FAIA, past chair of the AIA Committee on the Environment, serves on the advisory group for the AIA Communities by Design and is a member of the national AIA Sustainable Task Force. He received the national AIA Honor Award for Urban and Regional Design in 1999 and 2000. Williams can be reached at dwarchitect@msn.com *and* www.biourbanism.com.

We can design communities that are good for people and salmon. Biourbanism blends a sustainable water supply, transit, livable communities, and jobs while preserving agriculture and the environment.

CMU Professor Vows to Try, Try Again

The most rewarding thing was to see the look in the students' eyes when we had finished the house and people walked in.

Professor Stephen Lee, AIA, learned so many valuable lessons during the 2002 Solar Decathlon—for which he was the faculty adviser for the Carnegie Mellon University team—that he felt he had to volunteer as a faculty adviser for the 2005 competition as well. The competition is held in Washington, D.C., on the National Mall.

"It would be a terrible loss not to be able to take advantage of what we learned last time and apply it this time," Lee says. This despite the fact that he described the intercollegiate competition as "the hardest thing I ever attempted to do in my life, from many perspectives."

Professor Lee's lessons learned

First, we should have applied the KISS (keep it simple, stupid) principle. The mechanical system we designed was so incredibly complex that we didn't have a chance of getting it to work properly, particularly since the first time we turned it on was when we rebuilt the house on the Mall.

Second, we should have worked with the students to put in place a management structure that enabled them to work on the things that interested them the most and coordinated their work. A systems engineering process would have ensured that everybody wasn't concentrating on the same thing. We were never able to make a decision the first time around, because everybody had to approve or disapprove every little thing that we wanted to happen. Many really important things, like the layout of the ramps and porches, exterior spaces, and the rooftop garden, didn't receive the full attention they needed.

The 2002 house maximized floor area with a suspended loft space. Unfortunately, the house exceeded the 18-foot height limit, and we lost points. The students preparing for the 2005 competition saw how much we got penalized, so they have religiously stayed within the height limit, despite all of my encouragement to do otherwise to give the loft more room.

Interdisciplinary teamwork is key

We are partnering this time with the University of Pittsburgh School of Engineering and the Art

Solar Decathlon 2005 scoring points

Projects earn points in the following 10 categories:

- *Design and livability:* A jury of architects judges design, innovation, and aesthetics. This category is worth 200 points; the other categories are worth 100 points each.
- *Design presentation and simulation:* Teams must produce an imaginative and thorough set of documents illustrating the construction of the house and a simulation of its energy performance.
- *Graphics and communication:* This evaluates each team's Web site, newsletter, and house tours.
- *The comfort zone:* This category measures interior comfort through natural ventilation, heating, cooling, and humidity controls using a minimum of solar energy.
- *Refrigeration:* The challenge here is to maintain appropriate temperatures in a refrigerator and freezer using minimal energy.
- *Hot water:* Teams must provide a shower with a capacity of 15 gallons of water at 110°F in 10 minutes, plus run automatic clothes washers and dishwashers.
- *Energy balance:* This contest measures the amount of energy going into batteries from the solar electric system and the amount of electrical energy being drawn from the batteries to meet the house's electrical needs.
- *Lighting:* The house may use both electric lights and daylight.
- *Home business:* The house must provide enough power to satisfy the energy needs of a small business operated from the home.
- *Getting around:* Excess energy produced by the house will be used to power an electric vehicle around town.

PHOTO COURTESY CARNEGIE MELLON UNIVERSITY

Institute of Pittsburgh Department of Interior Design. Carnegie Mellon is so focused on computerization that the people who graduate from its engineering schools tend to go into exotic fields such as robotics, rather than the building-engineering disciplines. The University of Pittsburgh produces the design consultants that architects use for electrical, mechanical, and structural engineering, so that is a natural fit.

Both the engineering and architecture faculties have provided guidance. I don't believe that either side needs to be dominant in advising for this competition, though. Nothing about the project is so complicated that an architecture adviser couldn't deal with it, and nothing about the design is so exotic that an engineering adviser couldn't help the students.

Because of my involvement in the 2002 competition, I've been able to make presentations on the architecture and technology used by the other teams. One element that the 2005 team will carry over from our 2002 scheme is the way the house connects to an urban infill application through a high floor-area to footprint ratio, creating the maximum amount of livable space; thus, we still have the loft. And although I'm not sure the house design would have a lot of home-buyer curb appeal—the aesthetics are not what you would associate with New Urbanism or traditional neighborhood development—it probably would have an edgy appeal to young people looking for an alternative in the city.

The agony and the ecstasy

The last-round problems were legion, from just getting it done to finding the money, making it happen, and worrying to death about whether the students were going to hurt themselves during construction. It's like being a parent. It's a lot easier for you to do something yourself than to watch your kids do it because you're worrying the whole time.

But the rewards made it well worth my while. The most rewarding thing was to see the look in the students' eyes when we had finished the house and people walked in. They were amazed, as I was, at the reaction of the visitors. As people crossed the threshold into our house, you could hear them gasp when they saw that really wonderful two-story space with its hanging loft. Yes, there was tremendous disappointment that our solar-collector piping exploded and we didn't do well in the competitions, but that one experience of watching people see what we had created made it worthwhile for everybody who participated. I learned so much from that process. ▫

Solar Decathlon Grows Toward 2005

The Solar Decathlon is sponsored by the U.S. Department of Energy and the AIA, among others. Teams of students from schools of architecture, engineering, computer science, communications, and business collaborate to design, finance, fabricate, and publicize a house of about 800 square feet to be built on the National Mall.

The second Solar Decathlon, slated for fall 2005 in the nation's capital, will expand to 19 teams of college students, including 8 teams from schools that competed in the first decathlon. Teams from schools in Canada and Spain will also participate.

Schools and faculty advisers participating in 2005 are listed below. Asterisks indicate a school that also participated in the 2002 Solar Decathlon.

- California Polytechnic State University, Architecture Department, San Luis Obispo; Rob Peña, Assoc. AIA
- Carnegie Mellon*, University of Pittsburgh, and the Art Institute of Pittsburgh, Pittsburgh; Stephen Lee, AIA
- Concordia University and Montreal University, Montreal; Andreas K. Athienitis
- Cornell University, Ithaca; Prof. Zellman Warhaft
- Crowder College*, Neosho, Mo.; Prof. Art D. Boyt
- Florida International University, College of Engineering, Miami; Prof. Yong X. Tao, PhD
- Madrid Polytechnic University, Solar Institute; Prof. Estefanía Caamaño Martin
- New York Institute of Technology, School of Architecture and Design, Central Islip; Prof. Michele Bertomen
- Rhode Island School of Design, Department of Architecture, Providence; Jonathan R. Knowles, AIA
- University of Colorado-Denver and Boulder*; Prof. Julee Herdt, Assoc. AIA
- University of Maryland*, Civil and Environmental Engineering, College Park; Dr. Kaye L. Brubaker
- University of Massachusetts, North Dartmouth; Gerald Lemay, PhD, PE
- University of Michigan, Taubman College, Ann Arbor, Mich.; Chris Knapp
- University of Missouri-Rolla* and the Rolla Technical Institute; Jeff Birt
- University of Puerto Rico*, Electrical and Computer Engineering Department, Mayaguez; Dr. Gerson Beauchamp
- University of Southern California, School of Architecture, Los Angeles; Prof. Thomas Spiegelhalter
- University of Texas, Austin*; Michael Garrison
- Virginia Polytechnic Institute and State University*, Blacksburg; Robert P. Schubert
- Washington State University, Pullman; Matthew Taylor

Officials will select the exact dates for the 2005 competition in the fall of 2004.

Local COTE Activities Provide Role Models

BY BRIDGET TOOHEY

Las Vegas COTE members hoped the lecture series would educate Nevada citizens about the importance of sustainable design in community planning and design.

In addition to the national AIA Committee on the Environment (COTE), some 50 state and local AIA components also have their own COTEs. These state and local COTEs are the most popular of all the AIA knowledge communities. In spite of this popularity, some local components have encountered difficulty promoting the importance of sustainability.

COTE programs at three components—AIA Blue Ridge (Roanoke, Va.), AIA Iowa, and AIA Las Vegas—provide some fresh approaches that can help recharge any COTE seeking inspiration or direction.

AIA Blue Ridge makes no little plans

Most COTEs strive to influence and spotlight the issue of sustainability at the local level, and some even have success at the state level. Few can say their actions affect industry awareness of sustainablility at the national—or international—level. The AIA Blue Ridge COTE is on the verge of breaking this barrier with Cradle 2 Cradle, an innovative new design competition created by Gregg Lewis, AIA, and other members of the committee.

The component, together with partner organizations Roanoke Regional Housing Network and GreenBlue, is challenging design studios, architects, and students to design high-quality, affordable homes using the core principles of sustainability. The competition jury is composed of five architects, all of whom are prominent in the field of sustainable design: Alexander Garvin; Daniel Libeskind, AIA; William McDonough, FAIA; Randall Stout, FAIA; and Sarah Susanka, AIA. The jury will choose up to 30 of the designs to be built in the Blue Ridge area during the summer of 2005. In addition to entries from U.S. firms, applications have also been received from firms in Australia, Chile, France, Italy, and Japan.

To date, Lewis has received commitments of participation from design schools around the world, including the University of Maryland, Kent State (Ohio), Miami University (Ohio), University of Kansas, University of Minnesota, Gazi University (Turkey), University of Technology Sydney (Australia), and McGill University (Canada). Many of the universities plan to incorporate the design competition in their 2004 fall curriculum. If a university's entry is chosen as a winning design, the student team will have the opportunity to spend the summer working on the project.

Twelve contractors from the Blue Ridge area and several nonprofit organizations are involved in the project as well. Their participation will help make the winning designs real.

The goals of the competition are to create an ongoing dialogue about the importance of sustainable design and to raise awareness of sustainability issues among the design community, particularly students—the architects of tomorrow.

Iowa eyes the future

Leaders with the vision to plan for the future are vital to the success of any organization. The leaders of AIA Iowa's COTE are working on several projects that they hope will promote awareness of the importance of sustainability in their state.

One of AIA Iowa's main goals is to educate all architects in the state about sustainable design so they will be able to incorporate its principles in all of their projects. The component is working with the department

of architecture at Iowa State University to ensure that students learn about sustainability in their coursework.

The component also wants to educate the public about the importance of sustainable architecture. The "Architecture in the Schools" program, which AIA Iowa's COTE supports, is part of a continuing education program offered to K–12 teachers by the Iowa Architectural Foundation. Kevin Nordmeyer, AIA, chair of Iowa's COTE, has been a guest speaker in the program's "Math and Science of Architecture" class, addressing the topic of green architecture.

Since October 2003, Iowa's COTE has also been working to form partnerships with local utility companies in order to formalize a curriculum for K–12 students that stresses the importance and effects of sustainability to this young audience.

Further, Iowa's COTE has been working to establish a new chapter of the U.S. Green Building Council (USGBC) in Iowa, which would help the committee form coalitions with other environmental organizations, such as the Iowa Environmental Council, to develop a state environmental policy and draft legislation requiring that all new state-funded building projects be built above code to meet the guidelines of sustainability.

Learning green from Las Vegas

The Las Vegas COTE has been active only since 2002, but it has made incredible strides.

COTE at the National Component

The national AIA Committee on the Environment works to sustain and improve the environment by advancing and disseminating environmental knowledge and values, and advocating the best design practices to integrate built and natural systems to the profession, industry, and the public. As an open committee—one that invites non-AIA member participation—it supports cooperation with manufacturers, government agencies, environmental organizations, and industry groups to develop and test environmentally sound materials. COTE works with such groups as the U.S. Green Building Council, Urban Land Institute, American Solar Energy Society, Sustainable Buildings Industry Council, and the UIA World Congress of Architects.

COTE's mission is "to lead and coordinate the profession's involvement in environmental and energy-related issues and to promote the role of the architect in preserving and protecting our planet from environmental damage." Its many programs aim to educate architects, architecture students, related design professionals, clients, and the public.

Founded in 1989 as the successor to the AIA's Energy Committee, COTE now has 1,600 members. For more information about its projects and resources, see the back page or visit the COTE Web site, *www.aia.org/cote*.

Beginning in September 2003, the Las Vegas COTE implemented a lecture series titled "Sustaining Nevada." Sustainable design has become a significant issue in Las Vegas, as new communities and schools crop up every year to accommodate the steadily increasing population. Las Vegas COTE members hoped the lecture series would educate Nevada citizens about the importance of sustainable design in community planning and design.

Speakers representing firms nationwide that are committed to sustainability and green design have participated. The program was funded, in part, by grants from the Nevada Arts Council and the National Endowment for the Arts.

All of the lectures, held at the University of Nevada-Las Vegas, were well attended, drawing a group made up of UNLV students, area professionals, and local community members. After a summer break, the Las Vegas COTE plans to kick-off another lecture series in the fall.

Las Vegas COTE has also formed a partnership with the Sustainable Buildings Industry Council (SBIC). In May 2004, SBIC, in conjunction with the Business Environmental Program and the Nevada State Office of Energy, sponsored a seminar on "Green Building Design and Construction" in Las Vegas. Las Vegas COTE helped promote the seminar among local residential architects, contractors, and remodelers. Las Vegas COTE plans similar events in the future. ▫

Reference

All AIA COTEs can make a difference in their communities by promoting programs similar to those implemented by the Blue Ridge, Iowa, and Las Vegas COTEs. To learn more about the work of these components, visit the following Web sites:

AIA Blue Ridge: www.c2c-home.org

AIA Iowa: www.aiaiowa.org

AIA Las Vegas: www.aialasvegas.org

One USGBC Founder Shares His Vision

BY KAREN LINDSKOG

More than a decade has passed since the founding of the U.S. Green Building Council (USGBC), developer of the Leadership in Energy and Environmental Design (LEED™) Green Building Rating system. Randolph R. Croxton, FAIA, principal of Croxton Collaborative, New York City, and one of the founders of the USGBC, shares his thoughts on the future of the council and LEED.

PHOTO © TIMOTHY HURSLEY THE ARKANSAS OFFICE

Environmentally sensitive design, when applied with architectural skill and care, can result in a pleasing aesthetic that adds to the physical comforts of fresh air and abundant natural light, as is evident in the Chattonooga Development Resource Center, by Croxton Collaborative Architects, PC.

In an industry that has being subcontracted at every level, there are still elements that must be universal in architectural design. Certainly, the main minimum objectives are health, safety, and welfare. Tied inextricably to that as well are the natural elements of human health and well being.

Green architecture, then, is not a standalone service, Croxton emphasizes: "It should actually drop like a pebble into a pond right into the middle of the design process and then ripple out and form all decisions that are made in the beginning of the project all the way through and not just be certain selected measurable pieces and parts."

The USGBC formed as the result of people wanting a more formalized definition of green building. The greatest value of LEED is as a third-party affirmation, independent of the architecture firm, which gives an industry-consensus view of a project's achievements relating to green building.

LEED is unique for what it does, because it engages the architect and client in a process to design with the environment and not against it. It is not a code, as some may think. And it is a standard only is the sense that it establishes measurable criteria for a building to be energy and resource efficient with optimal operational performance according to our current understanding of the means toward those life-cycle goals. The LEED process is evolving toward greater flexibility and opportunities for sustainable projects.

Clients are waking up to LEED

Having a resource-efficient building—including use of recycled, nearby, and environmentally sustainable materials; energy-efficient components; and natural, renewable sources of light, heat, and electricity—is no longer the first-cost burden to clients. And, by having a LEED-certified building, clients are finding that spaces are more comfortable and more easily sold or rented. Bankers are savvy to this as well, so developers are looking to get better financing. Moreover, many of these buildings are winning design awards, proving that the aesthetic appeal of fitting into natural surroundings is giving buildings instant recognition.

In terms of building users, LEED-certified buildings promise an environment that increases occupant productivity because people feel better with fresh air, natural light, and appealing views. With natural ventilation, mechanical systems can be reduced, freeing up valuable space for uses the occupants value more—be they residential, commercial, or institutional clients. When a designer designs a building for LEED points, the building is inherently more valuable at the end of the project.

Architects are, too

Croxton has been teaching a course on sustainability at Harvard for the past eight years. The growing interest in the course over the years parallels that of LEED's acceptance within the profession, he says. The course began with eight students, mostly from government- and energy-related professional curricula, and has grown now to more than 40 students, predominately from the school of design.

Likewise, architects seeking LEED accreditation are no longer niche professionals. The large multinational firms are designing their projects in anticipation for a Platinum LEED rating. And it is clear that there is a wider appreciation that even though a designer can bring LEED criteria to bear at any phase of design, the best projects begin the process in schematics. This type of participation raises the bar for the profession of architecture as a whole, Croxton believes.

What began as a way for architects to design for a better environment—concentrating first on energy use and indoor air quality then on to low-impact systems and recycled material—has become a universal way of thinking as the ripples on the pond spread ever outward. ▫

Karen Lindskog is an architecture critic in New York City.

Portland Middle School Uses Light, Earth, and Water in High- and Low-Tech Ways

Portland, Ore., architect Heinz Rudolf, FAIA, principal of the BOORA architecture firm and a LEED™-accredited designer, worked sustainable magic for the Dalles School District, 83 miles east of Portland, when the citizens voted to replace their 1950s middle-school complex. The new $12.5 million project, which opened in September 2002, uses a variety of sustainable technologies in exciting new ways.

Water and earth

First, the school's site, prone to landslides, offered special challenges. It was the site of the town's original middle-school, which was hastily and rather poorly built to accommodate a population influx as workers moving to the area to buid the Dalles Dam. The "temporary buildings" (built to last only a few decades) and their resultant maintenance problems and high energy costs hung on until 2000, when the fire marshal condemned them.

The district voters rejected a new proposed site because of its distance from their homes, so the town searched for a way to reuse the old site. Through a mixture of extensive dewatering, adding a key trench, and moving the planned buildings to the portion of the site further from the landslides, engineers were able to make the old site feasible for a new school.

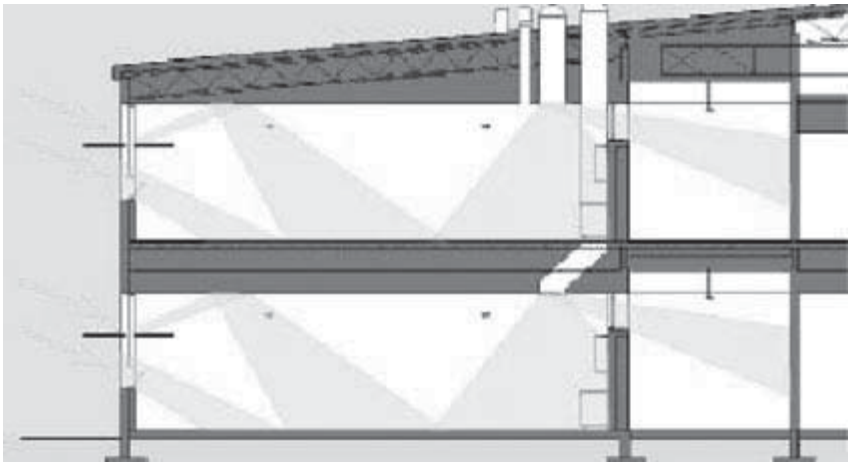
Rudolf recognized that, using geothermal principles, the 58-to-60-degree (F) groundwater pumped from the landslide area could serve as a readily available source of renewable heating and cooling energy. For warming, a heat pump extracts the energy from the water and reverses the process for cooling. In addition, the relatively cool groundwater is used to chill the air flowing through the ventilation system.

Let there be light

The architect also included a variety of means to bring daylight into the building, not only to reduce the need for electric lighting and associated air-conditioning load but also because studies show that students perform better when skylights and windows bring natural, nonglare light inside the classroom. The school uses four methods to bring daylight into each classroom.

Orientation: Classrooms face north and south to avoid direct western sun.

Fenestration: Large windows allow lots of light to the interior but use glazing that minimizes glare and heat. West-facing windows sport vertical sunscreens that provide shade in the late afternoon without blocking the view.



Light shelves: Built outside and inside the windows, about a third of the way down, 3-foot projections reflect sunlight to the white ceiling, which "bounces" the light deeper into the room. The shelves also shade the lower window and reduce solar heat gains.

Light tubes: One or two light tubes on the inside wall of the room bring in additional natural light. The light tubes are much smaller in diameter than a skylight and are made of reflective material that brings direct sunlight and ambient light through the ceiling and into the room. Adjacent to the light tubes, three high windows within the classroom allow some of the light into the interior hallway. The passive daylight strategies are backed up with energy-efficient fluorescent T-5 lighting in the classrooms. In the gym, several interior skylights are lined with spun fiberglass diffusers, so there is no direct sunlight.

The Dalles Middle School, like many other energy-saving architecture projects today, incorporates a wide range of additional sustainable strategies, such as extensive natural ventilation. Many of the schools furnishings and fixtures employ recycled materials. The school currently is under review for a gold certification from the U.S. Green Building Council's LEED program. ▫

Reference

This case study originally was presented as a U.S. Department of Energy case study. To view it and other case studies in their entirety, visit www.rebuild.org

The Oregon Office of Energy's School Program, in conjunction with Rebuild America and other U.S. Department of Energy program partners, provided technical assistance for this project.

To read "Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance" (1999), by Heschong Mahone Group for the Pacific Gas and Electric Company, visit *www.energy.state.or/us/school/daylight.pdf.*

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For an expanded version of this issue, including bonus material, *visit www.aia.org/aiaj.*

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Resources

AIA COTE

The AIA Committee on the Environment presented the AIA/COTE Top Ten Green Projects last May. Visit *www.aia.org/cote* to view the award-winning designs.

Other Links:

American Solar Energy Society
www.ases.org

Environmental Building News, BuildingGreen
www.buildinggreen.com

Environmental Protection Agency
www.epa.gov

Green Clips
www.greenclips.com

Green Seal
www.greenseal.org/about.htm

MASTERSPEC
www.masterspec.com/visitor/masterspec/ms.html

Rebuild America
www.rebuild.gov/index.asp

Smart Communities Network, U.S. Department of Energy
www.sustainable.doe.gov

Sustainable Architecture, Building, and Culture Internet Resources
www.sustainableabc.com/internet_resources.html

The Sustainable Design Resource Guide, AIA Colorado
www.aiacolorado.org/SDRG/home.htm

Sustainability Industries Council
www.sbicouncil.org

Sustainable Sources: Green Building Databases and Design Resources
www.greenbuilder.com/general/GreenDBs.html

U.S. General Services Administration, Architecture & Engineering, "Sustainable Design"
www.gsa.gov/Portal/gsa/ep/channelView.do?pageTypeId=8195&channelId=-12894

U.S. Green Building Council
http://usgbc.org

Urban Land Institute
www.uli.org

Whole Building Design Guide
www.wbdg.org

From the AIA Library

Below is a brief sampling of books and videos on sustainability available from the AIA national component Library. The AIA will mail them to members throughout the country. To access these and other titles, view the online catalog *www.aia.org/library/default.asp* or send an e-mail request to *library@aia.org*.

Architect's Energy Guide to Energy-efficient Commercial Buildings: Colorado and the Rocky Mountain Region, by Kelly A. Karmel, 1999. (TJ163.5 B84K37)

Big and Green: Toward Sustainable Architecture in the Twenty-first Century, edited by David Gissen, 2003 (NA2542.36 .B54)

Green Energy Parks Program Briefing Information, 2000 (TH808 .G73)

Photovoltatics in the Built Environment: A Workbook for Architects and Engineers, 2000 (TH7413 .P487)

Santa Barbara County (Calif.) Green Building Guidelines, 2001 (NA2542.35 .S26)

Sustainable Federal Facilities: A Guide to Integrating Value Engineering, Life-cycle Costing, and Sustainable Development, 2001 (JK1613 .S87)

Videotapes available in AIA Library and Archives Audiovisual Collection include "Healthy Building & Materials," and "Energy Efficiency, Sustainable Communities and Case Studies," (90 minutes each), and many additional titles.

AIA Store

For a list of green architecture books available from the AIA store, visit *www.aia.org/books*.