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FEBRUARY 2008

EC&M

THE MAGAZINE OF ELECTRICAL DESIGN, CONSTRUCTION & MAINTENANCE

Seeing GREEN

Debunking the myths surrounding the costs of sustainable building

A PENTON MEDIA PUBLICATION

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Seeing GREEN

Debunking the myths surrounding the costs of sustainable building

Although concern for the environment and awareness of green technologies are at an all-time high, results from an online survey of 1,000 respondents conducted by EcoAlign, a marketing agency based in Washington, D.C., focused on energy and the environment, reveal a disconnect between a willingness to adopt or purchase green products, services, and technologies and consumer value perceptions around these offerings. According to the survey, "Customer Perceptions of Green Technologies," the general public perpetuates the idea of green technologies as cost prohibitive.

Contrary to this perception, real-world examples illustrate that green building projects can be completed for an average of only 2% more (or from $3 to $5 per square foot) in up-front costs. This has been proven on projects in Pennsylvania, Portland, and Seattle. For example, Portland's three reported and completed LEED Silver buildings were finished in 1995, 1997, and 2000 and incurred cost premiums of 2%, 1%, and 0%, respectively, according to the report "Green Building Costs and Financial Benefits," by Gregory H. Kats, founding principal of Washington, D.C.-based Capital E, a provider of strategic consulting, technology assessment and deployment, and advisory services to firms and investors in the clean energy industry.

"To date, there has been a widespread perception that green buildings — though more attractive from an

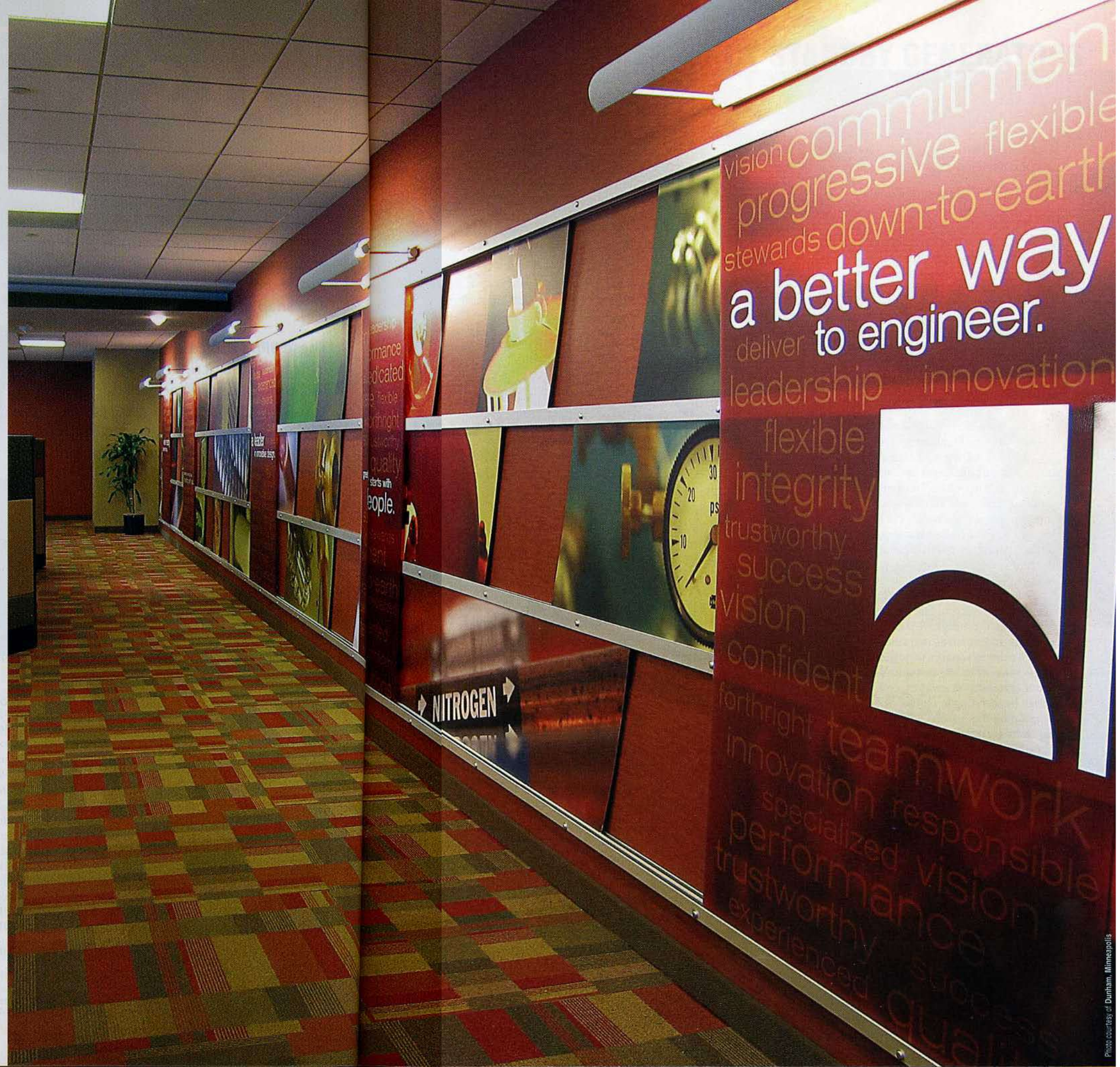

Photo courtesy of Dunham, Minneapolis

environmental and health perspective — are substantially more costly than conventional design and may not be justified from a cost benefits perspective," Kats says. "This perception has been the single largest obstacle to the more widespread adoption of green design."

In reality, the decision to build green should be determined by the true costs and benefits of designing and installing green technology and systems — including some rather important intangibles. "Clearly, when you start looking at major goals like LEED platinum, there's no question you're facing very significant mechanical/electrical cost up-charges to put in those kinds of systems," says Randy Olson, a mechanical engineer and project manager with Minneapolis-based mechanical and electrical engineering firm Dunham.

The bulk of the additional cost originates with increased architectural and engineering (A&E) design time, modeling costs, and time necessary to integrate sustainable building practices into projects. "There clearly is an up-tick beyond a certain point, especially in the time it takes to complete your due diligence," he says.

Therefore, the challenge for the engineering and construction community is to change these negative perceptions. EcoAlign recommends that companies work harder to connect their products and services with the customer's ideas about convenience, comfort, cost, and design by investing in market research, articulating the reasons why consumers should care about green technology offerings and aligning design with functionality.

Teaching green. In November 2006, Dunham moved its 100 employees into its new green office space, which was recently awarded LEED-Commercial Interiors-Silver by the U.S. Green Building Council (USGBC) — the first in Minnesota and the first project to achieve LEED Certification of any type in the City of Minneapolis. "When we started this project, the landlord in our building had never been exposed to LEED certification before, and the architect that designed our space hadn't done a LEED project before," says Jay Rohkohl, electrical engineer, Dunham. "There was a lot of education from us to them, helping them understand what it was we wanted to achieve, walking them down this path, and making sure that they were doing what they needed to do in order for us to achieve this. And that's true of a lot of projects."

Actual cost considerations in building green requires patience. A client may be interested in lowering its operating and maintenance costs, prolonging the lifespan of its building, increasing the productivity of the building's occupants, or stimulating a faster payback on its investment. Therefore, the message you should be delivering to these clients is that any extra up-front costs associated with a sustainable project may be recovered through faster lease-up rates, rental premiums, and increased market valuation — not to mention the core energy savings realized throughout the life cycle of the building.

"With every project we get involved with, we look at a number of strategies to save energy," Rohkohl says. "We do payback analysis to determine whether or not to go forward with each strategy, and each client will have an opinion as to what's a reasonable payback period."

A quick return on investment (ROI) for one system may also lead to a further retrofit of another. Dallas-based Nordco Energy Systems looks for quick paybacks for its clients' lighting projects. "I like educating my clients on how they can put waste back into the operation of their business — you can do that if you properly design a lighting project," says George E. Nordgren, president, whose company takes pride in delivering paybacks of less than two years. "I got into lighting because it helped me draw down the payback of a chiller application or building management system," he says. "The payback is so quick, the clients can see these results of an application right away."

Show me the green. The Whole Building Design Guide, a Washington-D.C.-based Web portal made available by the National Institute of Building Sciences, provides guidelines for performing a cost-benefits analysis for green building. It offers three tenets associated with ensuring cost-effective construction that reflect the need to accurately define costs, benefits, and basic economic assumptions.

First, use cost-management and value engineering throughout the planning, design, and development process. Because most projects are funded with a straight budget, it is critical that the project requirements are set under consideration of life-cycle costs. Once a budget has been set, it is important to continually check the viability of its assumptions by performing cost management throughout the design and development process.

A vital part of cost management is value engineering (VE), a cost control practice. VE is a systematic evaluation procedure directed at analyzing the function of materials, systems, processes, and building equipment for the purpose

The Buzz About Green Building Products

When choosing products for a green project, a high energy-efficiency rating isn't the only criteria to focus on. The Building for Environmental and Economic Sustainability (BEES) software — developed in the United States by the National Institute of Standards and Technology (NIST) Building and Fire Research Laboratory with support from the U.S. EPA Environmentally Preferable Purchasing (EPP) program and the White House-sponsored Partnership for Advancing Technology in Housing (PATH) — offers builders a way to evaluate the environmental and economic performance of building products.

The tool is based on consensus standards and designed to support purchasing decisions by providing key science-based information sometimes lacking in green product selection. The intended result is a cost-effective reduction in building-related contributions to environmental problems.

BEES measures the environmental performance of building products using the life-cycle assessment approach. All stages in the life of a product are analyzed: raw material acquisition, manufacture, transportation, installation, use, and recycling and waste management. Up to 10 environmental impacts are measured across these life-cycle stages: global warming, acid rain, resource depletion, indoor air quality, solid waste, eutrophication (the unwanted addition of mineral nutrients to the soil and water), ecological toxicity, human toxicity, ozone depletion, and smog. The approach takes into consideration the trade-offs that must be made to reduce overall environmental impacts.

BEES measures economic performance using similar life-cycle thinking. Economic performance is measured using the ASTM standard life-cycle cost method, which covers the costs of initial investment, replacement, operation, maintenance and repair, and disposal. The life-cycle cost method sums these costs over a fixed period of time, known as the study period. Alternative products for the same function can then be compared on the basis of their life-cycle costs to determine which is the least-cost means over the study period.

Version 4.0 of the BEES software is now available for download at no charge at www.bfrl.nist.gov/oae/bees.html. If you prefer a free BEES 4.0 compact disc and printed manual, place your order through the EPA Pollution Prevention Information Clearinghouse by calling (202) 566-0799 or e-mailing ppic@epa.gov.

Speaking Green

To 41% of the general U.S. population, the term "demand response" holds no meaning, according to a survey by EcoAlign, a marketing agency based in Washington, D.C., focused on energy and the environment. The survey report, "The Green Gap: Communications and Language," finds the same can be said for the nuances of "energy efficiency," "energy conservation," "smart energy," and "clean energy."

Although consumers are unable to articulate the difference between the phrases, there is a level of awareness regarding consumer's energy and environment footprint. This is what the report calls the "green gap," which it describes as a "growing misalignment between customers' stated intentions (e.g., their desire to be more green or frugal with energy consumption and their actual behavior)." This can lead to consumer paralysis.

To span this gap and stimulate consumer action, those in the industry are encouraged to educate and guide consumers through the environment and energy space. "By educating consumers about the energy they use, their impact on the environment, and what actions they can take, consumers will feel more confident in making changes," the report says. But before you can practice what you preach, make sure you understand the meanings of the terms. Can you match the industry phrases with the definitions below?

1. Clean energy
2. Demand response
3. Energy conservation
4. Energy efficient
5. Green energy technologies
6. Smart energy

A. Within the electric industry, the mechanisms to manage the demand from customers in response to supply conditions. For example, having electricity customers reduce their consumption at critical times or in response to market prices.

B. The use of computers, electronics, and advanced materials to make energy use more efficient.

C. Performing the same services but using less power.

D. A term describing what is thought to be environmentally friendly sources of power and energy. Typically, this refers to renewable and non-polluting energy sources.

E. The practice of decreasing the quantity of energy used while achieving a similar outcome. This practice may result in an increase of financial capital, environmental value, national security, personal security, and human comfort.

F. Technologies that use natural or renewable resources, conserve energy, or are more sustainable from an environmental perspective by reducing pollution and overall energy consumption.

Source: *EcoAlign, "The Green Gap: Communications and Language"*

Answer key: 1D, 2A, 3E, 4C, 5F, 6B

of achieving required functions at the lowest total cost of ownership.

Second, use economic analysis to evaluate design alternatives. In addition to up-front costs, facility investment decisions typically include projected cost impacts of energy/utility use, operation and maintenance, and future system replacements. At the beginning of each project, establish which economic tools and models will be used to evaluate these building investment parameters.

The methodologies of life-cycle cost analysis (LCCA) will typically offer comparisons of total life-cycle costs based upon net present values. Other methods typically used as supplementary measures of cost-effectiveness to the LCCA include net savings, savings-to-investment ratios, internal rate of return, and payback.

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Third, consider non-monetary benefits, such as aesthetics, historic preservation, security, and safety. Most economic models require analysts to place a dollar value on all aspects of a design to generate final results. Nevertheless, it is difficult to accurately value certain non-monetary building attributes, such as formality (for example, of a federal courthouse) or energy security.

The objective of an LCCA is to determine costs and benefits of design alternatives to facilitate informed decision-making. Costs can be more readily quantified than benefits because they normally have dollar amounts attached. Benefits are difficult because they often tend to have more intangibles. In some cases, these non-monetary issues are used as tiebreakers to quantitative analyses. In other instances, non-monetary issues can override quantitatively available cost comparisons, such as renewable energy application. These cost-effectiveness principles serve as driving objectives for cost management practices in the planning, design, construction, and operation of facilities that balance cost, scope, and quality.

Getting the green. Conventional buildings use more than 75% of the electricity generated by the nation's power plants and account for almost half of all annual greenhouse gas emissions, according to the U.S. Energy Information Administration, Washington, D.C. "Sustainable" or "green" buildings use resources — energy, water, materials, and land — more efficiently than buildings simply built to code. The natural light, better air quality, and other benefits associated with green buildings have been credited with improved employee and student health, comfort, and productivity.

Traditionally, the technology and resource consumption patterns for the building sector have been seen as relatively stable and unchanging, says Kats. However, the private sector and industry have responded to increased awareness and interest in green building by creating more products and systems that have multiple benefits. However, the impetus for building green still lies with the designers of the projects. "Simply using less electricity through reduction helps," Olson says. "Conserving through reduction still resides in the mechanical/electrical design realm. It comes down to how we design systems to make them more efficient."

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Therefore, rising material and energy costs certainly make a case for the added benefits of green building. "Over the last several years, we've seen construction costs go up significantly, and we continue to see energy costs rise too," Rohkohl says. "It's these rising material and energy costs that make a strong case for green building."

As the number of green buildings rises, the costs should decline. Also on the rise will be the benefits of green building, which can be measured monetarily — energy and water savings, reduced maintenance costs, and reduced employee health costs — as well as in an improvement in quality of life through improved indoor environmental quality and greater employee comfort/productivity. EC&M