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Making the Case for Green Building

TO THOSE OF US ENTRENCHED IN the green building world the benefits seem obvious. Why would anyone choose to build in a way that isn't comfortable, healthy, and energy efficient? In the process of designing and building green, however, we keep running into others who are not yet as convinced. For those situations, it's useful to be able to spell out the benefits.

The building owner ultimately calls the shots, so getting that person or group on board early is essential. But not every owner will find the same arguments compelling: a hospital board may opt for green because certain green features promote healing, a commercial office property holding company may incorporate green features to speed the lease-out and thus lower carrying costs, a federal agency may desire green features to improve employee morale and increase job retention.

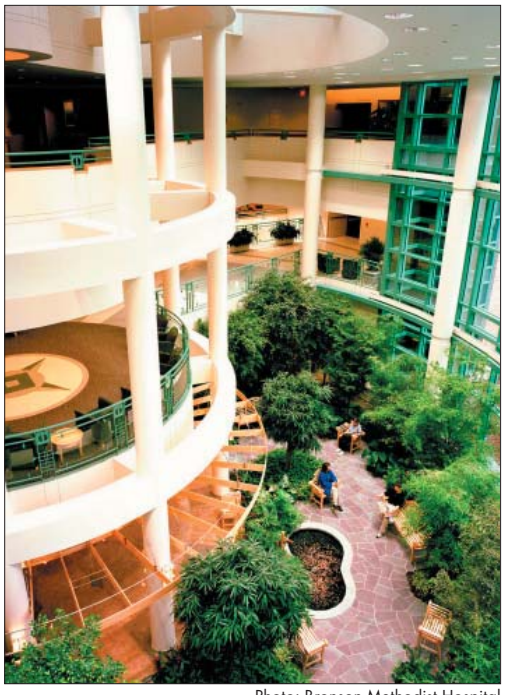

Photo: Bronson Methodist Hospital

An abundance of daylight, plants, natural colors, textures, and artwork are intended to promote healing and comfort for patients and visitors at the Bronson Methodist Hospital in Kalamazoo, Michigan.

Even within a single project, different team members often have different reasons for promoting a green agenda. The architect may promote environmental measures because she feels it's the right thing to do. The facilities manager who will take care of a building may recognize inherent durability and maintenance advantages. And the owner may look strictly at bottom-line financial benefits of green.

Note that while a green building might theoretically be able to achieve all of these benefits, most green buildings do not. For any specific project, it is important that any claims about the benefits are associated with green strategies that are actually being implemented—or at least considered—for that project. Further, there are green buildings in which benefits that are not achieved—such as durability—may render other benefits irrelevant. If poor moisture control results in premature building failure and the growth of mold, those problems could undo key benefits of the building, such as providing a healthy indoor environment. Green building is not only about adding together different green features—and green benefits—it is about how these systems fit together to create a building that works.

There are lots of reasons for building green, none necessarily better than others. This article examines the spectrum of reasons, providing short explanations for 46 benefits. Even if many of these items are already familiar, this list may provide some new insights and help you convince your next clients to pursue an even deeper shade of green.

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In This Issue

Quote of the month:

"We have 67 cooling towers—if I had the budget, I'd convert them all right now."

John Hahn of the University of California at Davis on Dolphin non-chemical water treatment for cooling towers.

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Recycling Saves Energy

Having recently read your cover story "Recycled Content: What is it and What is it Worth?" [*EBN* Vol. 14, No. 2], I would like to commend author Nadav Malin for a very comprehensive review of the subject matter.

I am also compelled to comment on the following quote, attributed to Wayne Trusty, president of the ATHENA™ Sustainable Materials Institute: "Sometimes it may take more energy and resources to collect, transport, process, and recycle something into a usable product than you save. So there may be cases where we're better off if we incinerate and capture the energy than if we recycle the product."

Certainly, the energy-saving benefits of recycling are well documented. Studies confirm that each year recycling in California alone saves enough energy to power 1.4 million homes. No question, the energy balance of recycling some materials is lower than others; however, in the long run strengthening markets for the increased use of post-consumer recycled material is our first strategy for conserving energy and resources.

Safe and healthy recycled-content products do exist in the marketplace, and their use in the building industry continues to grow. In California, the Integrated Waste Management Board has provided more than $70 million in low-interest loans to businesses that manufacture these products. Sustaining that investment with an annual $10 million in available loans is a key part of our strategy to minimize what we bring to landfills.

Thank you for your continued support of recycled-content building materials.

Rosario Marin, Chair
California Integrated Waste Management Board
Sacramento, California

What's Happening

USGBC Awards First Platinum Pre-Certification in LEED-CS Pilot

The U.S. Green Building Council (USGBC) has begun awarding pre-certification through the pilot program of the LEED® Rating System for Core and Shell Development, which began accepting applications in late 2003. In recognition that LEED for New Construction and Major Renovations (LEED-NC) does not apply to most speculative office, retail, or mixed-use development, where different entities control a building's core and shell development and its interior fit-out, USGBC developed two new rating systems—LEED for Core and Shell (LEED-CS) and LEED for Commercial Interiors (LEED-CI). The two systems are designed to function independently but also complement one another, roughly approximating LEED-NC when considered together.

LEED-CS applies to only new commercial and high-rise residential buildings, and it is not applicable in cases where the owner controls both

The Xihu Tiandi Development Project (Phase Two), which includes 440,000 ft² (41,000 m²) of gross floor area on a 215,000 ft² (20,000 m²) site in Hangzhou, earned the first Platinum certification through the LEED-CS Rating System. A ground-source heating and cooling system and a natural gas-fired absorption chiller will contribute to an estimated 35% energy savings over a conventional shopping mall design; and reusing rainwater and graywater for irrigation and flushing toilets will minimize potable water use. Construction is set to begin by the end of 2005, and occupancy is planned for late 2007. Rendering: Wood + Zapata Architecture

the core and shell *and* the interior elements of a building. Reflecting the responsibilities of the typical speculative developer, LEED-CS addresses primarily site selection, the building's structure and envelope, and its building-level systems. It also considers provisions for the tenant fit-out to reduce operational energy use, to optimize the use of daylight and views, and to prevent contamination from indoor pollutants.

The green achievements of a core and shell development cannot be verified until much of the construction process is complete, but withholding LEED-CS certification until that point would dramatically reduce its marketing value to the developer; speculative buildings are generally leased before construction begins. Out of this conundrum was born pre-certification, unique to LEED-CS, which enables developers to market the conditional LEED-CS status of a building before it is built. "This is essentially a statement from the developer saying, 'I intend to complete the building with these features and at this level of performance,' and a parallel statement from the USGBC saying, 'If you build the building that you have proposed and document the measures taken, you will be granted a LEED-CS certification at this level,'" according to USGBC. Once a pre-certified building is complete, it is eligible for official certification.

The first pre-certification came through in June 2004, according to USGBC's Brendan Owens. The Certified level rating was awarded to the 1.6 million ft² (150,000 m²) Century Prosper Center in the central business district of Beijing, China, developed by the Fountainwood Real Estate Company, Ltd. This speculative twin office tower is currently under construction and set for occupancy in late 2005 or early 2006. "The developer is using the pursuit of LEED very aggressively in its marketing of the building," said Jason Hainline, director of green building services at EMSI, the sustainable design and LEED consultant for the Century Prosper Center.

Beijing's Century Prosper Center was the first project to achieve pre-certification through the LEED-CS Rating System. A high-performance chiller, heat-recovery ventilation, and low-emissivity glazing will reduce energy use, and graywater reuse, dual-flush toilets, and waterfree urinals will reduce potable water use. Rendering: RTKL Associates, Inc.

March 2005 saw the first Platinum pre-certification under LEED-CS. The Xihu Tiandi Development Project (Phase Two) is "a multi-use leisure and lifestyle destination," alongside China's famed West Lake in the historic district of Hangzhou, in Zhejiang Province, according to Cole Roberts, P.E., LEED consultant for the project at the engineering firm Arup. Developed by Shui On Properties, a subsidiary of Shui On Construction and Materials, Ltd., "Xihu Tiandi retains the serene beauty of ancient Hangzhou while helping to usher the city into a sustainable future," Roberts told *EBN*. – *JB*

For more information:

The LEED-CS pilot rating system can be downloaded from www.usgbc.org/leed/.

Architecture Schools Now Required to Teach Sustainable Design

The National Architectural Accrediting Board, Inc., (NAAB) is responsible for ensuring that architectural degrees granted in the United States are provided by programs that meet accepted standards. In this mission, it represents the interests of the general public and four organizations that serve the architectural profession:

- The Association of Collegiate Schools of Architecture (ACSA);
- The American Institute of Architects (AIA);
- The National Council of Architectural Registration Boards (NCARB); and
- The American Institute of Architecture Students (AIAS).

Photo: James Wasley

Students in a graduate-level design studio taught by Jim Wasley at the University of Wisconsin Milwaukee conferring with interior design students taught by Mark Nelson at UW Madison on a design for the Gaylord Nelson Environmental Programs Building, a project being designed for the Madison campus. Green technologies and design solutions are a focus of the project.

NAAB periodically reviews and updates the requirements for architectural degree programs. The most recent revision to the "NAAB Conditions for Accreditation," released in the second half of 2004, includes, for the first time, a specific mention of sustainable design. "Sustainable design was tangentially included in conditions in the prior version," notes Robert Odermatt, president of the board of NAAB. "There was enough feeling that this was such a focus today in the profession that it ought to have its own stand-alone provision. It's an extremely important part of the profession today," he told *EBN*.

The 2004 version of the NAAB Conditions for Accreditation includes a list of 34 "student performance criteria" (down from 37 in the previous version). Graduates of accredited programs are expected to have "understanding" or "ability" in all of these areas. Among a handful of changes in these criteria from the 1998 version is the inclusion of a new item as number 15:

Sustainable Design: *Understanding of the principles of sustainability in making architecture and urban design decisions that conserve natural and built resources, including culturally important buildings and sites, and in the creation of healthful buildings and communities.*

This new language reflects the way environmental issues are currently addressed in the profession, but some may take issue with the loss of a related criterion. In adding this new performance criterion, the NAAB removed an item from the previous version called Environmental Conservation. That criterion called for: "Understanding of the basic principles of ecology and architects' responsibilities with respect to environmental and resource conservation in architecture and urban design."

New language regarding "appropriate applications and performance" was incorporated into several other criteria, namely: Environmental Systems, Building Envelope Systems, Building Service Systems, and Building Materials and Assemblies. "The intent in adding this language is that, when talking about these topics, we need to talk about judgment in using these systems," explains Sharon Matthews, executive director of NAAB, adding: "With the new language we are strengthening those four for better attention to sustainable design." The language relating to Collaborative Skills was also enhanced in a way that puts greater value on integrated design with multidisciplinary project teams.

Another significant change in the new NAAB Conditions, unrelated to sustainable design per se, is the inclusion, for the first time, of requirements for a Doctor of Architecture (D.Arch.) degree. Schools are expected to begin documenting their efforts to comply with the new conditions in the fall of 2005. – *NM*

For more information:

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Washington Passes First State Law Requiring LEED

At press time, Washington Governor Christine Gregoire was expected within days to sign into law a bill passed on March 30, 2005, by the Washington State legislature requiring Silver-level certification through the U.S. Green Building Council's LEED® Rating System for all major construction projects built with public funds. Executive orders and municipal ordinances requiring LEED are in place in several states and cities, including Seattle. And numerous other municipalities endorse LEED-certified or "LEED-certifiable" buildings. But this new Washington law is poised to be the first state-level legislation with a LEED requirement.

According to the pending legislation, all construction projects by public agencies costing over five million dollars or exceeding 25,000 ft^2 (2,300 m^2) in size "must be designed, constructed, and certified to at least the LEED Silver standard." The same requirement applies to major construction projects undertaken by other organizations using state funds. Exceptions are provided for certain building types, including hospitals and laboratories, and for affordable housing—but the bill requires the development of a separate sustainable building program for affordable housing. Schools are allowed to use Washington's sustainable school design protocol in lieu of LEED.

The political clout to pass this bill came in large part because it was identified as one of four legislative priorities by a broad-based consortium of Washington environmental groups, according to Kollin Min, vice president for programs and director of the Seattle office of the Cascadia Region Green Building Council (a chapter of the U.S. Green Building Council). "Previously, legislation had been introduced, but never made it out of committee," says Min. "What made a big difference this year is that a lot of legislative legwork went into

getting together coalitions to work on this," Min adds.

Timber industry opposition to this law was addressed by the addition of a clause that gives credit for the use of "wood products with a credible third-party sustainable forest certification or from forests regulated under . . . the Washington forest practices act." It is not clear how this clause will affect implementation of the law's LEED requirement, however, since LEED only credits the use of wood certified to the standards of the Forest Stewardship Council (FSC). *– NM*

For more information:

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Washington State legislation information:
www.leg.wa.gov
Senate bill #5509, House bill #1272

Newsbriefs

Scottsdale Calls for LEED Gold— With the March 2005 approval of Resolution 6644, Scottsdale, Arizona, became the first city in the nation to require that all new city-owned buildings achieve a LEED® Gold certification from the U.S. Green Building Council (USGBC). The resolution applies to buildings of any size, as long as the green features have an anticipated payback period of five years or less. USGBC President Rick Fedrizzi congratulated the City of Scottsdale and Mayor Mary Manross, saying, "You will be an inspiration for cities across the country, paving the way towards a healthier future for us all." The City of Scottsdale's website is www.scottsdaleaz.gov.

Mercury Exposure Reduces Earning Potential—Decreased intelligence caused by fetal exposure to mercury costs the U.S. economy $8.7 billion each year in lost productivity, according to a study published in *Environmental Health Perspectives*. About 15% of that cost burden can be attributed to the emissions of coal-fired power plants, according to the study, which was performed by pediatricians at the Mount Sinai School of Medicine and the Albert Einstein College of Medicine. A 1.6-point drop in an individual's IQ leads to $31,800 in lost revenue over the course of that person's life, according to the report. The U.S. Environmental Protection Agency estimates that 8% of American women of childbearing age have enough mercury in their blood to threaten the health of a fetus.

ASHRAE to Study Noise—The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has approved a $70,000, 15-month study of the effects of noise on productivity. "Indoor background noise can dramatically impact occupants by causing annoyance, affecting productivity, hindering speech communication, impacting sleep, and degrading overall occupant comfort and satisfaction," according to principal investigator Lily Wang, Ph.D., a professor at the University of Nebraska, Lincoln. Heating and ventilation systems are often to blame for excessive indoor noise, notes ASHRAE. For more on noise management, see *EBN* Vol. 10, No. 1 and Vol. 14, No. 3).

Sherwin-Williams Ends Legal Challenges—The Sherwin-Williams Company, the nation's largest paint manufacturer, has dropped its challenges of Pennsylvania's new air-quality regulations. The state's new coating standards set limits for emissions of volatile organic compounds (VOCs) in 48 distinct categories, including paints, primers, and stains. The regulations are anticipated to reduce VOC emissions, which contribute to ground-level ozone pollution and smog, by 10,200 tons (9,300 tonnes) per year. Sherwin-Williams' recent actions mean that the new rule, which took effect in early 2005, will stand.

Kresge Revises Grant Guidelines—One year after the Kresge Foundation announced its Green Building Initiative (see *EBN* Vol. 13, No. 1), the foundation has released new guidelines for the grant program. These new guidelines reflect the foundation's two goals for the Initiative: to help nonprofit organizations without an explicitly green agenda meet their facility needs with green buildings, and to help nonprofits with green building experience build projects with "significant innovation in sustainable design." Kresge has already awarded 38 planning grants, representing a total of $2,619,000. Details on the Green Building Initiative, including the new guidelines, are available online at www.kresge.org.

BMRA Announces Call for Presentations—The Building Materials Reuse Association (formerly the Used Building Materials Association, see *EBN* Vol. 13, No. 3) is seeking presentation proposals for its upcoming conference, Building Materials Reuse and Recycling: Decon '05. The conference will be held November 7 and 8, 2005, in Atlanta, just before the U.S. Green Building Council's Greenbuild conference gets underway, also in Atlanta. Proposals are due May 1. For details, e-mail Brad Guy at guy_brad@yahoo.com.

Yost Announces New Company—Peter Yost, *EBN* senior editor during 2000 and 2001, has banded with Nathan Yost and Steven Baczek to form 3-D Building Solutions, LLC, a building-science consulting firm specializing in building investigation, architectural design review, and training for both the residential and commercial building industries. The three worked together at Building Science Corporation for three

years before creating their own firm. Although the company is based in Columbus, Ohio, Baczek and Peter Yost will operate out of their offices in Reading, Massachusetts, and Brattleboro, Vermont, respectively. More information is online at www.3-d-buildingsolutions.com.

Marco Island, Florida, Bans Artificial Turf—The Marco Island City Council voted four to two in March 2005 to ban artificial turf, in response to a dispute between homeowner Ed Ehlen and his neighbors (see *EBN* Vol. 14, No. 2). While Ehlen argued that his synthetic lawn's water savings made it environmentally friendly, the city council countered that the lawn's rubber pellets could float into the city's sewer system and canals, harming wildlife. City officials have yet to establish whether preexisting fake lawns may be grandfathered in. For more on artificial turf, see *EBN* Vol. 13, No. 4.

Awards & Competitions

NAHB Announces 2005 Green Building Awards

The National Association of Home Builders (NAHB) announced the winners of its 2005 National Green Building Awards in March during its Green Building Conference in Atlanta. "Green building is a way of life for these award winners," said Ray Tonjes, homebuilder and chairman of NAHB's Green Building Subcommittee.

- **Cannon Beach Cottage**, a 2,268 ft² (210 m²) home in northern Oregon, won *Green Custom Project of the Year*. Rich Elstrom Construction, Inc., based in Gearhart, Oregon, built the home, which is expected to produce more energy than it uses.

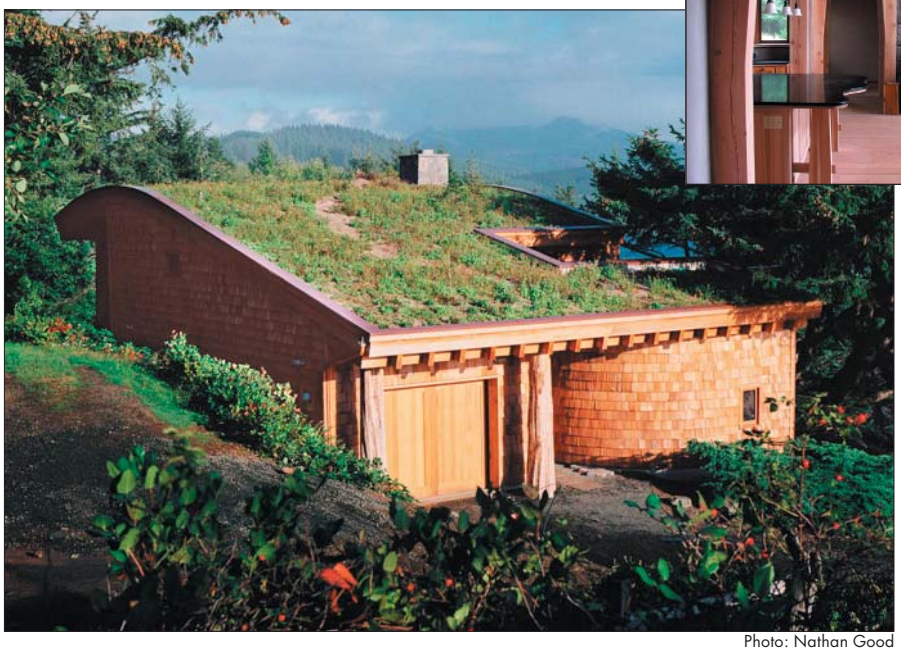

Photo: Nathan Good

Cannon Beach Cottage, designed by Nathan Good, AIA, IIDA, of Salem, Oregon, was planned for a 100-year life with minimal maintenance. It achieved a Home Energy Rating System (HERS) score of 94.0 and a Platinum rating in Portland General Electric's Earth Advantage® program, earning more points than any project in the program's five-year history.

- Madison-based **Veridian Homes**, Wisconsin's largest homebuilding company, won *Green Production Project of the Year*. All of the 558 homes the company built in 2004 earned ENERGY STAR® ratings and Wisconsin's Green Built Home™ certification.
- **Perkins Eastman** won *Green Affordable Multifamily Project of the Year* for its work on the renovation of the Felician Sisters Convent in Coraopolis, Pennsylvania.
- **The Eco Housing Corporation™ and Poretsky Building Group, Inc.**, both of Bethesda, Maryland, were awarded *Green Luxury Multifamily Project of the Year* for the Eastern Village Cohousing community in Silver Spring, Maryland, which was converted from a four-story office building.
- Dallas-based **RS Lawrence Construction, LLC**, won *Green Remodeling Project of the Year* for its work renovating a 1915 historic home originally designed by Texas architect Hal Thomson.
- **WCI Communities, Inc.**, won *Outstanding Green Marketing Award* for its work promoting the Venetian Golf and River Club in Bonita Springs, Florida, currently undergoing certification through the Florida Green Building Coalition's Green Home Standards.
- **California Green Builder**, a subgroup of the California Building Industry Association, won *Green Program of the Year.*
- The U.S. Department of Energy's **Building America** program, whose approach has been used in the design of more than 26,000 homes, was awarded *Green Advocate of the Year: Group or Organization.*
- **Pam Sessions**, co-owner and president of Hedgewood Properties in Atlanta, was named *Green Advocate of the Year: Builder.* All Hedgewood

homes are built to the standards of the Southface Energy Institute's EarthCraft House™ program.

- **Mark Kelley**, founder of Building Science Engineering in Harvard, Massachusetts, was named *Green Advocate of the Year: Individual*. Kelley, a past member of the *EBN* editorial advisory board, has been a leading proponent of renewable energy and sustainable building technologies for more than 25 years.
- **Carl Seville**, vice president of SawHorse, Inc., in Atlanta, who pushed for the expansion of EarthCraft House training to include renovations and chaired the committee that made it happen, was named *Green Advocate of the Year: Remodeling.*

Product News & Reviews

Non-Chemical Water Treatment for Cooling Towers

Cooling towers dissipate heat through evaporation, using large thermal transfer areas wetted by recirculating water. They often provide the most cost-effective option for removing heat generated in manufacturing, power generation, and large, refrigerant-based air-conditioning systems; but the combination of heat, expansive moist areas, and recirculating water creates an almost ideal petri dish for bacteria and mold. In addition to creating occupant health risks (think Legionnaire's disease), this biofouling decreases the system's heat-extracting efficiency by accumulating as a biofilm on surfaces—causing microbe-induced corrosion and providing a substrate for the other bugaboo of the process: scale.

Scale forms when dissolved minerals (generally calcium carbonate) and other solids in the water crystallize on surfaces. This further reduces the system's efficiency by clogging water paths and insulating heat-transfer areas: a 1/32" (0.8 mm) layer of scale can increase energy use by close to 10%. Evaporation exacerbates scale formation, and adding make-up water introduces more minerals to the process. This is partially controlled by "blow-down," a process of replacing some of the solids-laden recirculating water with make-up water.

Treating cooling-tower water to prevent biological fouling, scale, and corrosion is a complex, highly monitored process. Most of the dirty work in the half-million cooling towers in the U.S. is accomplished with biocidal, conditioning, dispersant, and scale-inhibiting chemicals, including chlorine, various brominated compounds, phosphates, molybdenates, acids (including sulfuric acid), and zinc compounds (which are now banned for cooling-tower use in about half of U.S. states). While chemicals do get the job done, there are considerations beyond the tower. Regulations are increasingly stringent for chemical storage, handling, and disposal; in many jurisdictions, chemically treated cooling-tower blow-down water itself is regulated. There are also consequences to worker, public, and environmental health due to accidental spills, chronic chemical exposure (even at low levels), and bioaccumulation of persistent chemicals in the food chain. Reducing or eliminating chemical usage in the treatment of cooling-tower water is an appealing thought.

Various alternatives are being used, including ozonation, ionization, and UV light treatment, all of which kill bacteria. Another option is the Dolphin Series, manufactured by Clearwater Systems, LLC, of Essex, Connecticut. It exposes recirculating cooling-tower water to electromagnetic fields, strength-varied and pulsed 60 times per second. Magnets?

"The non-chemical water treatment industry has a checkered past," Jerry Ackerman, marketing director for Clearwater, acknowledged to *EBN*. "There have been a number of non-chemical water treatment system manufacturers with dubious products and practices." To help clear the water, NACE International (originally the National Association of Corrosion Engineers) released the standard "Control Factors in Performance Testing of Nonchemical Water Treatment Devices" in 1997 as a criterion. Still, Clearwater keeps a careful distance from any association with fixed magnet technology.

The Dolphin system has no moving parts—it consists of a transformer panel with a PVC pipe assembly installed in the water's recirculating path. While some claims about how the system works verge on the

Photo: Clearwater Systems Corporation

A Dolphin System Series 2000 unit was installed at the Dare County Courthouse in Manteo, North Carolina, in October 2003 to replace chemical treatment in the air-chilling system.

mystical, there does appear to be a sound basis in the underlying physical chemistry—a basis that is backed by sources outside the industry.

The Dolphin's "pulsed-power" pipe assembly is wound with coils that "impart pulsed, high-frequency, electromagnetic energy" into the water, according to Clearwater's literature. The pulsing electric field induces the coagulation of colloids—very small, electrically charged particles—which creates nucleation sites that encourage calcium carbonate to precipitate as a powder in the bulk solution rather than a scale on surfaces. The powder can settle in the tank or be filtered out of the system. This coagulation-precipitation activity also reduces bacteria counts by trapping bacteria within the crystal formation, an effect noted in water-treatment plants, which typically use lime or alum to induce coagulation.

The primary source of microorganism control is also the pulsed-power electric field. The Dolphin is a less powerful version of a cold pasteurization process developed in the mid-1980s by Maxwell Laboratories in California. Electromagnetic radiation pulses cause electroporation of bacteria cell walls—the same technology often used to insert drugs or DNA into cells for medical research, but applied in such a way that the pores fail to close so the cells can no longer function normally. The Dolphin's use of electroporation is more effective at destroying bacteria in recirculating water systems than in single-pass systems.

Claims made about the Dolphin are impressive, to say the least: exceedingly low bacteria counts, virtually no biofilm, almost no corrosion or scale, significantly reduced maintenance, extended tower life . . . and no chemical use. "People have used our blow-down water to irrigate lawns or to flush urinals. We're working with a couple people who are going to use the blow-down on green roofs," Ackerman said. To some, these claims sound too good to be true, and a few leading green engineers whom *EBN* spoke with remain skeptical.

Nevertheless, the system has earned LEED® points for half-a-dozen projects, according to Ackerman, including DPR Construction's offices in Sacramento, California. Peggy Fischer, project manager for DPR, told *EBN*, "It's been about two years now, and we're still impressed with the Dolphin system." (LEED doesn't directly address chemical or water use in cooling towers, so these points are earned for "Innovation in Design." If blow-down water can be used for flushing urinals, there may also be points in "Water Efficiency.")

Photo: Clearwater Systems Corporation

The Shawnee Mission Medical Center (SMMC) in Kansas City, Kansas, installed a Dolphin system on a cooling tower next to their child-care center.

The University of California at Davis has converted six cooling towers from chemical treatment to the Dolphin. John Hahn, assistant superintendent and refrigeration shop supervisor, told *EBN*, "We've eliminated the chemicals, the cost of the chemicals, and the labor involved with the chemicals; we've kept chemicals from going into the water treatment facility on the campus; and the treated water has actually cleaned the bundles and the inner housings. We have 67 cooling towers—if I had the budget, I'd convert them all right now."

The cost of the system depends as much on cooling tonnage as on supply-water quality. "It's an engineered system—you can't just throw it up. It needs to be spec'd correctly," Bob Lersch, president of American Chem-Free, Inc., in West Virginia, which sells the Dolphin system, told *EBN*. Chemicals cost more in some parts of the country, and water quality varies; but in most cases, according to Lersch, the system "costs between two and three years of chemicals." He cites paybacks ranging from as little as six months to one expected to take seven years.

The number of installations of the Dolphin system in the U.S. and Canada since 1998 is approaching 2,000, and Clearwater Systems has an impressive client list that includes numerous Fortune 100 companies (even one that manufactures cooling-tower chemicals—Dow Chemical), the U.S. Department of Energy, and a score of hospitals, schools, and universities (including Yale). Even if how it works is confusing and perhaps not entirely proven, the Dolphin Series does seem to offer a great alternative treatment system for recirculating water systems, including cooling towers, boilers, and even display fountains. – *MP*

For more information:

Clearwater Systems, LLC
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www.clearwater-dolphin.com

Underwater Timber Salvage

In the 1800s heyday of commercial forestry in the U.S., huge numbers of logs were floated on rivers to downstream sawmills. Some of that old-growth timber became saturated and sank—and many of these "sinker logs," protected by cold water and a lack of exposure to oxygen and light, are still in excellent condition after a century or more on river-bottoms. (See *EBN* Vol. 8, No. 10 for details on river-bottom salvage in Florida.)

Underwater Timber Salvage Corp. (UTS) in St. Helens, Oregon, retrieves such logs from the Columbia Basin waterways for its custom mill, designed to accommodate the large, dense timber. The salvaged logs are often larger than 3 feet (1 m) in diameter, with growth rings sometimes exceeding 60 per inch (2.4/mm).

UTS offers clear, finished wood in standard dimensions, as well as rough-cut widths 24 inches (305 mm) and more, in lengths up to 20 feet (6.1 m). Trim packages cut entirely from single logs are available to ensure consistent quality and appearance. Species include fir, hemlock, cedar, ash, maple, alder, oak, pine, and others. Some of these woods are available in coloration and quality unavailable from today's second- and third-growth forests. Stock is dependent on what's come out of the water lately.

"We have a crew of old log hands that know wood and understand the importance and value of this rediscovered commodity," Ross Bennett of UTS told *EBN*. "Some of the logs we retrieve bear the brands of companies long gone and forgotten, and our hands spin tales about who they belonged to and how far they've traveled." The company documents these historical clues, so that the rich history of the materials can be shared at the point of use.

UTS has applied for FSC certification through the "FSC Recycled" label (see *EBN* Vol. 14, No. 2), using the third-party certification organization SCS.

Photo: Underwater Timber Salvage Corp.

Waterlogged and sunken for one hundred years or more in some cases, the river-salvaged timbers produce top-quality, tight-grain lumber. Some timbers are so large that they have to be ripped in the yard before they can be cut in the sawmill.

Photo: Underwater Timber Salvage Corp.

Operating from a barge, workers at Underwater Timber Salvage lift old-growth timbers from a Columbia River tributary.

In addition to providing old-growth wood without cutting forests, UTS improves the Columbia Basin by removing artificial objects detected by their sonar—whether they have recycling value or not. Barrels are *not* included in this effort, due to liability concerns, but their locations are pinpointed with GPS and reported to the U.S. Environmental Protection Agency for recovery. The logs themselves can also be a danger to water traffic: strong spring runoff and stormwater surges can shift sunken logs, bringing them to the surface. Removing these navigational hazards improves waterway safety.

Another local benefit came up in hindsight. "We couldn't hire any more of the unemployed locals," Bennett told *EBN*, "so we gave them our ever-growing edging [scrap] pile to cut up and sell for firewood." This initiative has supplied inexpensive firewood to low-income and elderly residents in the area while providing a source of livelihood for some other residents. – *MP*

For more information:

Underwater Timber Salvage Corp.
St. Helens, OR
888-366-5353, 506-366-5353
www.underwatertimber.com

Product Briefs

Owens Corning Increases Recycled Content and Joins Sustainability Consortium—The third-party certifier Scientific Certification Systems (SCS) confirmed in March 2005 that Owens Corning has increased the average recycled content of its fiberglass insulation from 30% to 35%. The insulation now includes 9% post-consumer and 26% post-industrial recycled content. (For more information about insulation, see *EBN* Vol. 14, No. 1.) The company has also accepted an invitation to join the Alliance for Sustainable Built Environments, a consortium of building-material companies promoting sustainability. For more about the Alliance, see *EBN* Vol. 13, No. 4 or visit www.sustainablebuiltenvironments.org. Owens Corning is online at www.owenscorning.org.

National Gypsum and USG to Purchase Recycled Drywall—Both the National Gypsum Company, based in Charlotte, North Carolina, and the USG Corporation, based in Chicago, have agreed to purchase reclaimed, reprocessed gypsum from the Danish company Gypsum Recycling International A/S (GRI) for use in new drywall. GRI, which was launched in 2001 and is currently operating in Scandinavia and Holland, will begin collecting and crushing scrap drywall from construction sites in New England during the fall of 2005; it hopes to expand to other parts of the U.S. in the future. This program applies only to new, unpainted drywall, not drywall reclaimed during demolition. GRI is online at www.gypsumrecycling.biz.

Making the Case for Green Building *(from page 1)*

Benefits of Building Green

FIRST-COST SAVINGS

Streamlined permitting and approvals

For some, but not all, green projects, regulatory delays and difficulties may be reduced as a result of green measures. A project that is designed to minimize loss of open space or that will result in less stormwater runoff, for example, can greatly reduce concerns by local citizen groups and planning commissions. (On the other hand, innovative development schemes may be unfamiliar to regulatory and citizen groups and result in additional review—but this outcome is less common.)

Reduced infrastructure costs

Substantial first-cost savings can often be achieved with green building through differences in how infrastructure is handled. For example, innovative stormwater infiltration systems can reduce or eliminate the need for storm sewers and stormwater detention ponds; narrower streets to slow traffic can reduce paved area; and clustering buildings on a site can reduce the amount of paved area and the length of sewers and utility lines. For some projects, the infrastructure savings are so significant that they can pay for other green features with higher construction costs.

Reduced material use

Designing smaller, more compact houses and other buildings can save a substantial amount of materials. Because construction waste volume is generally proportional to building size, smaller buildings also generate less construction waste—another savings (see next item). Keep in mind, though, that other strategies, such as daylighting, may conflict with the goal of keeping the building geometry simple.

Photo: Pizzagalli Construction

To make room for a Student Life complex at Champlain College in Burlington, Vermont, Pizzagalli Construction dismantled an old one-story cafeteria. Much of the equipment and the structure was salvaged or recycled, reducing landfill costs.

Savings in construction waste disposal

Disposal of construction waste was once an almost insignificant component of construction costs, but it has become significant in many regions. Reducing construction waste through optimizing building dimensions (designing on a two-foot module, for example) and separating and recycling waste can dramatically reduce these costs. Architect John Boecker, AIA, saw savings of $20,000 and $30,000 through these strategies on two recent projects: a $2.5 million office building and a $7.5 million school, respectively.

Savings from downsizing mechanical equipment

By improving the energy performance of a building envelope, it is often possible to downsize mechanical equipment as well as perimeter heating systems. With air-conditioning equipment, the cost is fairly proportional to the cooling capacity, so a reduction in cooling load translates into savings quite directly. (The correlation between heating capacity and cost is less direct.) Once loads have been reduced significantly, whole new approaches to heating and cooling sometimes become available—for example, using radiant systems rather than air distribution for heating and cooling, and separating ventilation air from comfort air. In some cases, by going even further with improved envelope energy performance, it's possible to totally eliminate heating or cooling equipment—and in the process pay for much or all of the envelope improvements.

Tax credits and other incentives

A few states and municipalities offer tax credits and other financial incentives to developers of green buildings or buyers of green products, such as efficient clothes washers and water heaters, that might go into such buildings. New York, New Jersey, Maryland, and Oregon are among states that offer significant green building tax credits. Also, a growing number of local municipalities offer incentives for green building.

REDUCED OPERATING COSTS

Lower energy costs

Reduced energy use is often the single most obvious economic benefit of green buildings. Minimizing energy consumption is a priority in nearly all green buildings—from single-family houses to skyscrapers. Green buildings commonly use less than half as much energy as their conventional counterparts, and some green buildings consume less than a quarter as much energy. Much of this benefit often comes from an improved building envelope and more energy-efficient equipment, but, with residential projects, simply creating smaller houses can save tremendous amounts of energy—even without improving the envelope. In addition to reducing energy usage, many green design strategies lower peak energy demand, which has a huge impact on the energy costs of nonresidential buildings. If energy costs continue rising, as they have during 2004 and 2005, energy savings will become an even greater driver of green building.

Lower water costs

Many resource experts are more worried about freshwater supply than energy supply over the coming decades. Through a combination of indoor and outdoor water conservation strategies, many green buildings are using less than a quarter as much water as conventional buildings. In addition to conserving water, some green buildings collect water off their rooftops or separate graywater from the waste stream for use in landscape irrigation. A few green buildings, such as the Solaire high-rise apartment building in New York City and the Pennsylvania DEP office building in Norristown, Pennsylvania, include self-contained water collection and treatment systems to provide nonpotable water for toilet flushing and irrigation from wastewater. Very high water costs or high hook-up fees can be a motivation for strategies such as this.

Greater durability and fewer repairs

A very important, yet often overlooked, feature of green buildings is durability. Well-designed and properly built green buildings will not experience moisture problems because sound building-science principles were incorporated into the design and construction. Durable buildings cost less to operate because repairs and replacement of failed building components are less common. Although durable building materials and equipment may cost more up front, their life-cycle costs are often lower than conventional products because they last longer and require fewer repairs. Green (vegetated) roofs, for example, can significantly increase the durability of the roof membrane by protecting it from exposure to UV light and thermal shock.

Reduced cleaning and maintenance

Some green building strategies, materials, and products require less maintenance or reduce the need for cleaning. A rain-screen siding detail, for example, reduces the need for repainting wood siding. Track-off entryway grates and carpeting keep a building cleaner by capturing dirt before it enters the building—and thus reduce the costs of cleaning. A natural landscape created with native plants generally requires significantly less maintenance than conventional turf and shrubbery.

Reduced costs of churn

Reconfiguring office spaces and relocating office workers (churn) is a huge cost for many companies and agencies. The average churn rate in offices is about 25% per year, and some experience more than 100% churn per year. Certain green building strategies, principally raised access floors and modular wring, can dramatically reduce this expense.

Lower insurance costs

While few insurance companies currently recognize the lower risks that green buildings carry, compared with conventional buildings, this benefit of green may soon be more widely recognized. Insurance companies are increasingly aware of the risks posed by mold in buildings, and green building design protocols that substantially reduce risk of moisture problems and mold could, in the future, result in lower insurance premiums.

Reduced waste generation within the building

Many green buildings are specifically designed to minimize waste generation. Many types of buildings can incorporate facilities for recycling waste. Hotels and motels can incorporate soap and shampoo dispensers to minimize throw-away soaps and shampoo bottles. Dining areas in commercial buildings can be designed to rely on washable utensils and chinaware rather than throw-away products.

OTHER ECONOMIC BENEFITS

Increased property value

With any income-generating (rental) property, reducing operating cost can boost the property value. This occurs because the lower operating costs increase the building's net operating income (NOI). According to the publication *Benefits Guide: A Design Professional's Guide to High Performance Building Benefits,* published by the New Buildings Institute, increasing the NOI of a building increases the building's appraised value by ten times the annual cost savings—a *capitalization rate* (cap rate) of 10%. For example, a 75,000 ft^2 (7,000 m^2) office building that saves \$0.50/ft^2 (\$5/m^2) per year in operating costs (\$37,500 per year), will see the value of the building increase by \$375,000. A higher building value (appraisal) can increase the loan amount available from lending institutions.

More rapid lease-out

Green buildings—whether office space or high-rise residential property—often lease out more quickly than conventional buildings, and often with higher rental prices! Reasons for this include media exposure about environmental and health features, marketing materials that tout the low operating costs or enhanced comfort, and word-of-mouth comments about the look and feel of such buildings. Developer Joe Van Belleghem of BuildGreen Developments, Inc., in Victoria, British Columbia, credits green features for the rapid lease-out of his Vancouver Island Technology Park during a period of downtime in the high-tech sector. Minimizing the number of months for which lease space remains unoccupied reduces carrying costs and increases profits.

More rapid sales of homes and condominiums

Green homes and condominiums often sell more quickly than their conventional counterparts. Developers Tom Hoyt of McStain Enterprises, Inc., of Boulder, Colorado, and Dennis Wilde of Gerding/Edlen Development Company of Portland, Oregon, report far more rapid sales of green buildings. Faster sales mean lower carrying costs and lower interest on swing loans, both of which increase bottom-line profits.

Easier employee recruiting

Recruiting quality employees can be a challenge for any employer, whether a private company, government agency, hospital, or school. The quality of the space in which prospective employees will be working, including such features as daylighting, views to the outdoors, and indoor air quality, can have a significant impact.

Reduced employee turnover

Green, healthy, comfortable buildings are more pleasant to work in, and employers with such buildings are likely to experience less employee turnover. With the high cost of employee recruiting and

training, this benefit can offer significant economic value. In Michigan, the firm Deloitte & Touche estimates the cost of recruiting and training employees to be $12,000 for a nonprofessional worker and $35,000 for a professional employee. The Families and Work Institute estimates that replacing a nonmanagerial worker costs about 75% of his or her annual salary, with the figure closer to 150% for a manager. At the PNC Firstside facility in downtown Pittsburgh, employee retention was a major factor in the requirement that at least 90% of employees have views to the outdoors. Retention of military personnel in the U.S. Navy has been a major impetus for greening Naval housing.

Reduced liability risk

Lawsuits over mold in buildings and sick-building syndrome are increasingly common. Green buildings that have been designed with state-of-the-art knowledge about building science and moisture control pose a much lower risk of lawsuits related to these problems. It will surprise many building owners to learn that problems related to mold are increasingly being *excluded* from insurance coverage, and it is certainly within the realm of possibility that mortgage holders and commercial real-estate lenders will begin requiring some sort of quality-control certification relating to mold and durability.

Staying ahead of regulations

Many of the most expensive lawsuits faced by companies today (for example, lawsuits over asbestos and PCBs) could have been avoided if companies had been more proactive in avoiding practices that might later be banned. The same goes for building owners. Planning now for future stormwater control regulations, or bans of HCFC refrigerants, certain flame retardants, or other potential health or environmental hazards could save significant costs down the road. According to the Rocky Mountain Institute book *Green Development,* "it is almost always more expensive to comply with regulations after the fact."

Positive public image

The positive public image that can be realized through a commitment to healthy, environmentally responsible buildings can be tremendously beneficial. The development Dewees Island (see *EBN* Vol. 6, No. 2) garnered highly valuable press due to the project's leading-edge environmental policies—so much so that building lots almost sold themselves, even as their costs increased. Stanley Selengut's Maho Bay eco-resort in the U.S. Virgin Islands has realized millions of dollars' worth of free publicity through articles in the popular press about the facility's green features. Ford Motor Company's revitalization of its Rouge Plant was covered in dozens of national magazines, including five pages in *Time* magazine, due to the green features; purchasing that coverage would have cost hundreds of thousands, if not millions, of dollars.

New business opportunities

Specializing in green development and in green building design and construction has proven to be lucrative for many of the pioneers. As word has spread about the success of these buildings, new opportunities have fallen into the laps of many green building experts. Though difficult to measure, these benefits can be substantial.

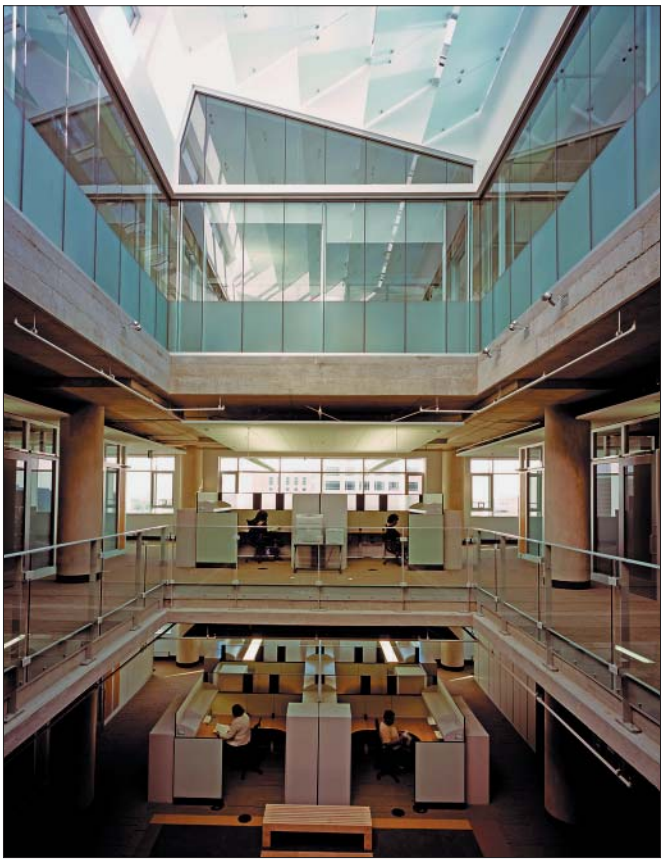
HEALTH AND PRODUCTIVITY BENEFITS

Improved health

By virtue of the materials used, moisture-control detailing, pollution- and contamination-rejection strategies, and ventilation strategies, green buildings are healthier buildings. Americans spend 85–95% of their time indoors, so the quality of the indoor environment is extremely important. Indeed, in many building sectors, ensuring healthy living and working spaces is likely to become the single most important driving force for a transition to green building.

Enhanced comfort

Measures that reduce drafts, minimize floor-to-ceiling temperature stratification, and control noise improve comfort in buildings. With houses in particular, a well-insulated, tight building envelope not only reduces energy consumption but also increases comfort—and the latter is just as important to many homeowners. In commercial and institutional buildings, the controllability of individual workspaces—a feature in many green buildings—addresses the fact that different people have different needs when it comes to temperature, ventilation, and light levels. Individuals often benefit psychologically just from knowing that they have this control over their workspace environment.



The 200,000 ft² (18,000 m²) School of Nursing and Student Community Center at the University of Texas Health Science Center in Houston was completed in August 2004. Interior meeting rooms and workspaces open onto three atria that bring controlled, diffuse daylight deep into the building. Source: BNIM Architects & Lake Flato Architects

Reduced absenteeism

Keeping workers healthier—for example, through control of contaminants and displacement ventilation strategies (as achieved when raised access floors are used for conditioned air supply)—can significantly reduce work lost to illness. In the oft-cited Lockheed-Martin Building 157, absenteeism dropped 15% (see *EBN* Vol. 14, No. 3). William Fisk, P.E., head of the Indoor Environment Department at Lawrence Berkeley National Laboratory, has demonstrated that improved ventilation systems would reduce respiratory illness by 9–20%, yielding a savings in the U.S. of $6–$14 billion per year (see *EBN* Vol. 13, No. 10).

Improved worker productivity

The economic benefits of boosting productivity are tremendous, with salaries and benefits costing on average $318 per ft^2 per year in a U.S. office building—compared with $50 for technology, $16 for the mortgage or lease, $2.35 for energy, and $1 for churn ($3,420, $540, $170, $25 and $11 per m^2, respectively). Just a 1% increase in productivity, for example, will more than offset the total energy costs in the average building. Studies by Carnegie Mellon University have shown productivity increases in green buildings ranging from 0.4% to 18%. As more companies come to appreciate the value of productivity improvements, this is likely to become an increasingly important driver of green building. For more on productivity benefits, see *EBN* Vol. 13, No. 10.

Improved learning

In schools, such green features as daylighting, noise control, and views to the outdoors are being shown to increase rates of learning. A landmark 1999 study by the Heschong Mahone Group (HMG) found that daylighting in the Capistrano, California, school district increased the rate of learning by 20–26% (see *EBN* Vol. 8, No. 9). More recent studies by the same group in a different school system found a positive correlation between views to the outdoors and learning rates. Awareness of these benefits will influence school boards in their decision-making about school building design.

Faster recovery from illness

Views to the outdoors and connections to nature have been shown to promote more rapid healing in hospitals, while displacement ventilation can dramatically reduce the spread of illness through airborne viruses and bacteria—an increasing problem in many hospitals. Green building features such as these are increasingly being viewed as strategies for reducing healthcare costs. The nation's largest healthcare provider, Kaiser Permanente, which plans to build more than two dozen hospitals in the next decade, is committed to a comprehensive green building agenda.

Increased retail sales

A 1999 HMG study of 108 big-box stores in California found that daylighting increased sales by 40% (see *EBN* Vol. 8, No. 9). A more recent HMG study of another retailer's 74 stores in California found a 1–6% increase in sales that was correlated with daylighting. While less dramatic than the earlier study, the new study showed the increased sales benefit of the daylighting to be worth at least 19 times as much to the company as the energy savings provided by that daylighting. As this sort of information trickles down to the management of retail chains, daylighting and other green building strategies are likely to become the norm.

COMMUNITY BENEFITS

Reduced demand on municipal services

Many green buildings have lower water demands and produce less wastewater than conventional buildings, thus reducing demand on municipal services. In areas where droughts are frequent or where municipal water utilities are already pushed to capacity, this benefit of green building can be significant. With Oakes Hall at the Vermont Law School (see *EBN* Vol. 9, No. 5), a moratorium on new hook-ups to the town's wastewater treatment plant drove a very aggressive water conservation agenda, which included composting toilets in the building. Even when capacity is not a problem, the use of energy and chemicals in sewage treatment plants is proportional to treatment volume, so reducing sewage volumes is environmentally attractive.

Reduced erosion and stormwater runoff

Some of the most localized environmental impacts of buildings are the erosion that occurs during construction and the increase in stormwater runoff that results from added impervious surface. Site management, landscaping, and other features of green building can dramatically reduce both of these problems. By incorporating green roofs (see *EBN* Vol. 10, No. 11), rooftop rainwater harvesting systems (see *EBN* Vol. 6, No. 5), porous pavement (see *EBN* Vol. 13, No. 9), and other practices to provide for on-site stormwater infiltration (see *EBN* Vol. 3, No. 5), the environmental impacts of stormwater runoff can be significantly reduced.

Reduced automobile use, traffic congestion, and sprawl

Green building should look beyond the individual building to how well that building is integrated into the community and the regional highway infrastructure; a high priority should be to lessen dependence on automobiles. Clustering buildings, mixing residential and commercial uses, linking buildings by pathways, building near light-rail and bus routes, and providing facilities and incentives to encourage commuting by means other than private automobiles can all help to reduce automobile use and traffic congestion. Reduced traffic congestion in an area improves the quality of life, boosts productivity (because people spend less time in traffic), and reduces air pollution. Such changes can also keep people healthier by enabling them to get more exercise (see *EBN* Vol. 13, No. 2).

Creating "community"

Development patterns that have been common during the last half of the 20th century have contributed to a loss of community in many areas. Green development, when implemented on a community scale, can help to reverse these trends and return to people-focused neighborhoods in which residents interact with their neighbors. Safety increases with more "eyes on the streets," and dependence on automobiles decreases. These ideas are among the key principles of New Urbanism or neo-traditional development—design and planning ideas advanced by the Congress for the New Urbanism. While not all New Urbanist development is as green as it could be,

green building and new Urbanism should go hand-in-hand.

Support of local agriculture

A key feature of green development is the preservation of open space—both for ecosystem benefits (see below) and to protect farmland. Some of the most exciting green developments that have been created over the past few decades, such as Village Homes in Davis, California, Prairie Crossings north of Chicago, and numerous cohousing projects, incorporate sustainable agriculture as a key component of the development. Often, houses are located on steeper topography so that the flatter land best suited for agriculture can remain in productive use.

ENVIRONMENTAL BENEFITS

Reduced global warming impacts

To the extent that green buildings use less energy and generate less carbon dioxide through their operation, require less transportation energy for their occupants, or avoid release of other greenhouse gases (such as HCFC and HFC refrigerants and foam insulation blowing agents), they contribute less to global warming, which is clearly one of the greatest environmental threats we face today. It is important to recognize that climate change impacts are global in nature—what we do in one part of the U.S. affects the world's climate, and, conversely, anything we do to reduce greenhouse gas emissions results in global benefits.

Minimized ozone depletion

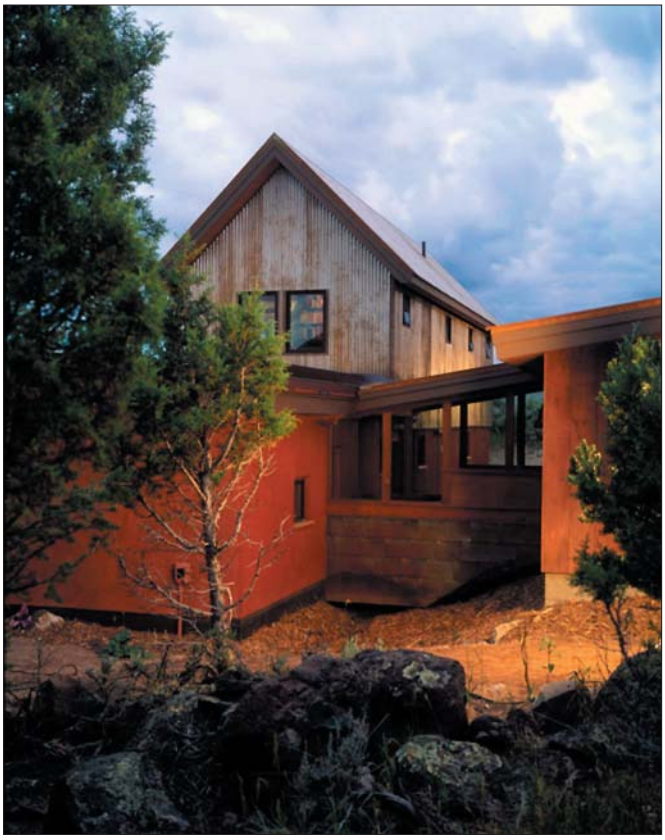
Green buildings minimize the use (and release) of ozone-depleting substances. This involves replacing CFC-based chillers, specifying non-HCFC mechanical equipment, and avoiding foam insulation produced with HCFC blowing agents. Note that with refrigerants, there is often a trade-off to be considered between ozone-depletion and global-warming potential. With renovation of existing buildings, measures can be taken to capture and destroy ozone-depleting refrigerants and blowing agents.

Reduced resource extraction impacts

When we use materials to construct an office building or house, the impacts of that material use are not limited to our building location. The aluminum may have came from bauxite ore mined in what had been tropical rainforests in Brazil, the steel likely came in part from iron ore mined in Minnesota, the mahogany used in our decks or hardwood doors might have come from clearcut land in Indonesia, and the chrome finish on our bathroom vanities most likely came from high-impact mining in Zimbabwe. These impacts are all embodied in the materials we use. With green building, there is often an effort to consider those impacts—through a process called life-cycle assessment (LCA). Specifying green building materials can help to minimize these impacts of resource extraction.

Reduced toxic emissions

The manufacture of certain building materials, including some types of plastic, results in the emission of toxic air pollutants. The same materials (and others) may also emit toxins at the end of their lives, when they are landfilled or incinerated. There is growing concern about additives such as phthalate plasticizers and brominated flame retardants that are added to some plastics. A commitment to green building materials is a commitment to considering these LCA issues. Natural building materials often pose the lowest environmental risks.



For this Carbondale, Colorado, residence designed by Graybeal Architects, site-excavated rock and native vegetation were used to create drainage swales, reducing the cost of stormwater management while preserving wildlife habitat. Photo: Pat Sudmeier

Reduced energy and other impacts of transporting materials

The greater the distance building materials and products need to be shipped (and the distance raw materials have to be shipped in the manufacturing of these finished goods), the greater the energy use and environmental impacts. With green building, there is often an effort to select more local materials—indeed, the LEED® Rating System provides up to two points for use of local materials, and many projects have received innovation credits for significantly exceeding those thresholds.

Reduced contributions to local and regional air pollution

Burning fossil fuels to operate buildings and to transport people to and from those buildings causes local and regional air pollution—so any measures that reduce this energy use will help control air pollution. Some building materials also contribute to air pollution (smog) through the release of volatile organic compounds (VOCs). With green building, and the selection of green building materials, the air pollution sources should be minimized.

Reduced local and regional water pollution

Buildings contribute to water pollution in a number of ways: stormwater runoff that carries contaminants into nearby surface waters, effluent from manufacturing plants that produce the products used in constructing a building, and the wastewater generated by a building that either introduces residual pollutants into surface water after treatment or more directly contributes pollutants to the groundwater with onsite wastewater treatment. With green building, efforts are made to minimize these impacts and select products that carry minimal "upstream" or "downstream" water-pollution impacts.

Reduced urban heat islands

Reflective roofs and green roofs do not contribute significantly to the *urban heat-island effect*, which causes urban areas with many dark surfaces to be up to 15° F (8° C) warmer than surrounding, undeveloped countryside. Higher air temperatures result in more smog and higher cooling costs.

Protection of biodiversity

Some environmentalists argue that the greatest damage we are currently doing to the environment—"the folly that our descendants are least likely to forgive us," in the words of Harvard biologist E.O. Wilson—is the catastrophic loss of biodiversity we are causing globally. Green developments can help to protect biodiversity. They can do this locally by protecting open space, restoring ecologically damaged sites, and creating wildlife habitat—even on top of buildings in cities. They can do this more broadly through the specification of products and materials that do not damage ecosystems elsewhere.

Increased environmental awareness

Green buildings can be learning laboratories for all who use them. Interpretive signs about the benefits of low-water-use faucets in commercial restrooms, about how to sort recyclables in a building, about xeriscaping practices to conserve water outdoors, and about the use of energy-saving lighting controls educate those using the building, which in turn should further the penetration of green building practices throughout our building stock. Even in homes there are opportunities to increase awareness about the environment—children growing up with green features will consider that the norm. Green buildings that offer a direct connection with the natural environment may also nurture a more wholesome relationship with that environment among populations that are increasingly isolated from it.

SOCIAL BENEFITS

Support of sustainable economies

A green agenda can extend beyond the built environment into the economy at large. Locally based manufacture of building materials and local agriculture are opportunities that green building helps foster. Putting money into local companies that weatherize homes or install solar equipment can keep money within the community instead of sending it out of the community (and much of it out of the country) in purchasing fossil fuels.

Support of companies with socially responsible policies

While green building products have been identified to date based largely on their environmental characteristics (recycled content, low VOC emissions, and so forth), a next step might be broadening selection criteria to consider such issues as a company's internal environmental policies, labor practices, and other measures that are typically addressed under the banner of "corporate social responsibility." *– Alex Wilson*

From the Library

Green Remodeling
Changing the World One Room at a Time

by David Johnston and Kim Master.
New Society Publishers, Gabriola Island, British Columbia, Canada, 2004.
Paperback, 400 pages, $29.95.

Remodelers are the unsung heroes of the building industry—adding functionality and beauty to extend the lives of existing buildings. Their work is much trickier than new construction because the rooms they start with are rarely square or plumb, and are often full of surprises. *Green Remodeling* shows how this inherently resource-efficient industry can become even more environmentally conscious, and it does so in a way that is both accessible and comprehensive.

Lead author David Johnston has extensive experience both as a remodeling and renovation contractor and as the developer of green building programs. *Green Remodeling* begins with a detailed account of Johnston's own recent remodeling project, which lends a great personal touch, as well as a reality check about the challenges inherent in any major renovation. The book then leads the reader through all the important issues, first thematically (costs, process, building science), then room-by-room, and, finally, by building element (site, foundation, structure, etc.). Detailed checklists, recommendations, and action items are provided throughout.

We did notice a few unfortunate technical inaccuracies. For example, PVC is mistakenly described as a known carcinogen. (Some chemical precursors to PVC, such a vinyl chloride, are carcinogens, but PVC is not.) On the whole, however, this book has a lot to offer to a homeowner contemplating a renovation, and to professional remodelers who want an introduction to green approaches. *– NM*

Calendar

APRIL

10-12 • Engineering Sustainability 2005, Pittsburgh, PA. *Sponsor:* Mascaro Sustainability Initiative. *Information:* msi@engr.pitt.edu; www.engr.pitt.edu/msi/conference.html.

16-16 • Designing High-Performance Commercial Buildings, Warren, VT. *Sponsor:* Yestermorrow Design/Build School. *Info:* 888-496-5541; kate@yestermorrow.org; www.yestermorrow.org/courses/wbc/highperf.htm.

18-21 • 8th National Mitigation & Conservation Banking Conference, Charlotte, NC. *Sponsor:* National Mitigation Banking Association. *Information:* 703-837-9763; cbahler@jtainc.com; www.mitigationbankingconference.com.

20-22 • EnvironDesign9, New York, NY. *Sponsor:* Interiors & Sources and green@work magazines. *Info:* 800-537-4271; www.environdesign.com.

20-22 • 49th Annual CSI Show & Convention, Chicago, IL. *Sponsor:* Construction Specifications Institute. *Information:* 800-689-2900; membcustsrv@csinet.org; www.thecsishow.com.

27-May 1 • EDRA 36, Vancouver, Canada. *Sponsor:* Environmental Design Research Association. *Information:* edra@edra.org; www.edra.org.

27-29 • Denver Green Building Conference, Lakewood, CO. *Sponsor:* Sustainable Conferences, Inc. *Information:* 970-328-6449; John@SustainableConferences.com; www.DenverGreenBuilding.com.

29-29 • Gulf Coast Green 2005: Symposium on Building, Houston, TX. *Sponsor:* American Institute of Architects – Houston. *Information:* 713-426-7473; brianm@kirksey.com; www.aiahouston.org/cote/GulfCoastGreen.

MAY

4-6 • Greening Rooftops for Sustainable Communities Conference, Awards, and Trade Show, Washington, DC. *Sponsor:* Green Roofs for Healthy Cities. *Information:* greenroofs.org/washington.

4-6 • 13th National Conference on Building Commissioning, New York, NY. *Sponsor:* Portland Energy Conservation, Inc. *Information:* 503-595-4484; slewis@peci.org; www.peci.org/ncbc.

4-6 • Green Design Solutions, Chicago, IL. *Sponsor:* Environmental Design+Construction. *Information:* 248-244-6463; wrobelk@bnpmedia.com; www.greendesignsolutions.com.

12-13 • 10th Canadian Conference on Building Science and Technology, Ottawa, Canada. *Sponsor:* National Building Envelope Council of Canada. *Information:* www.nbec.net/conference.

16-21 • Affordable Comfort 2005: Annual Conference & Trade Show, Indianapolis, IN. *Sponsor:* Affordable Comfort, Inc. *Info:* www.affordablecomfort.org.

19-21 • AIA National Convention and Design Expo, Las Vegas, NV. *Sponsor:* American Institute of Architects. *Info:* www.aiaconvention.com.

25-26 • Energy-Efficient Lighting Conference, Albany, NY. *Sponsor:* Association of Energy Services Professionals. *Information:* 561-575-2334; eboardman@aesp.org; www.aesp.org.

JUNE

1-3 • Greening the Heartland 2005: Cost, Practice and Policy, Chicago, IL. *Sponsor:* USGBC-Chicago and Heartland Regional Chapters, City of Chicago. *Information:* 215-428-9655; www.greeningtheheartland.org.

13-15 • NeoCon 2005: World's Trade Fair, Chicago, IL. *Sponsor:* NeoCon. *Information:* www.neocon.com/neocon.

20-23 • Ecobuild America 2005: The Environmental Systems Technology Conference & Exhibition, Orlando, FL. *Sponsor:* Ecobuild America. *Information:* conference@ecobuildamerica.com; www.ecobuildamerica.com.

AUGUST

6-12 • ISES 2005: Solar World Congress, Orlando, FL. *Sponsor:* American Solar Energy Society. *Information:* bchowe@ases.org; www.swc2005.org.

14-17 • Energy 2005 - The Solutions Network, Long Beach, CA. *Sponsor:* U.S. DOE Office of Energy Efficiency and Renewable Energy. *Information:* 800-608-7141; energy2005@doeevents.com; www.energy2005.ee.doe.gov.

SEPTEMBER

27-29 • 2005 World Sustainable Building Conference: Action for Sustainability, Tokyo, Japan. *Sponsor:* Conference Secretariat of SB05Tokyo. *Information:* Fax: +81-3-3437-6482; info@sb05.com; www.sb05.com.

NOVEMBER

9-11 • Greenbuild International Conference & Expo 2005, Atlanta, GA. *Sponsor:* U.S. Green Building Council. *Info:* info@usgbc.org; www.greenbuildexpo.org.

More complete info and additional listings are online at www.BuildingGreen.com.

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