Why Build Green?

RMI / ENSAR Built Environment Team

A green building project does not have to cost more up front. In fact, building green often costs less. Careful "front-loaded" planning and design can pay for itself—with interest—in avoided downstream costs such as elaborate mechanical systems, expensive redesigns, drawn-out approvals, litigation, and stalled construction.

The goal of green building is not to squeeze energy-efficiency features into a tight development budget. **The goal, rather, is to analyze such interconnected issues as site and building design, energy and water efficiency, resource-efficient construction, lighting and mechanical design, and building ecology, and optimize all these aspects in an integrated design.** Features that might have higher individual costs (*e.g.,* better windows) may actually reduce the whole building cost because other elements such as the heating system can be down-sized or eliminated. In order to capture these multiple benefits of synergistic design elements, the building must be evaluated as a whole, not "value-engineered" item by item.

RMI's super-efficient HQ building.

Green building experts encourage project teamwork to promote an open exchange of ideas and generate integrated, whole-system solutions. In the conventional, linear development process, key people are often left out of decision-making or brought in too late to make a full contribution. Collaboration, on the other hand, can reduce and sometimes eliminate both capital and operating costs while at the same time meeting environmental and social goals. In addition, the process can anticipate and avoid technical difficulties that could add expense later in the process. It can also produce a "big picture" vision that goes beyond the original problem, permitting one solution to be leveraged to create many more solutions—often at no additional cost.

The U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) rating system for new and existing commercial, institutional, and high-rise residential buildings is a tool to evaluate environmental performance from a "whole-building" perspective over a building's life cycle, providing a definitive standard for what constitutes a green building. The Council has asserted that a LEED-Silver-rated building should not cost more than a conventional building. (LEED Platinum does typically cost more because it may involve cutting edge technologies and levels of performance that are far above and beyond standard construction.)

Many players in the real estate market are realizing that green development is good business. Developers, builders, and buyers are discovering that "green" enhances not only health and quality of life, but also the pocketbook.

Case Studies

Single Family, Residential Construction

The **ACT² House** in Davis, California integrated a whole-system design into a residential construction project, cutting energy use by more than 75 percent. Completed in 1992, the home looks like a typical single family dwelling, but is entirely passively heated and cooled. The project combined a number of efficiency measures that allowed for the elimination of the major mechanical equipment—furnace, air conditioning and some building infrastructure. The performance of the home was not compromised, as the home stayed cooler than surrounding residences during a week of temperatures greater than 100 degrees.

Urban Redevelopment

Rather than contribute to urban blight and sprawl, a redevelopment in Vancouver, British Columbia used the site of a former car lot to create a mixed-use retail, office, and apartment space. The project, **2211 West 4th Street**, is a four-story building with retail space on the ground floor, office space on the second floor, and residential apartments on the upper floors. The stores chosen to fill the spaces provide services that were missing in the existing neighborhood, and the building currently operates with a 40-percent energy savings.

The majority of the thermal energy for the building is provided via a ground source heat pump, a saving passed on to tenants. Waste heat (from the restaurant and grocery store) is used to preheat domestic water for the residences above. Perhaps the most intriguing benefit is the positive press that the project received during design and construction that led to 85 percent of the spaces being either pre-leased or pre-sold before completion. This resulted in several hundred thousand dollars in marketing cost savings.

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The **Denver Dry Goods Building** in downtown Denver, Colorado is a mixed-use project that includes retail, office, and both affordable and market-rate housing. Located on a site that has access to mass transit, the project re-used an existing building and focused on energy- and water-efficient design.

The project leased all housing units within six months of opening, pre-leased all office and retail, and saved $96,000 due to a substantial amount of press. Currently there is a waiting list for apartment space. The project saves $75,000 annually on operating expenses, while increasing the building's value by $750,000 when capitalized. This very successful project has encouraged other developers to incorporate affordable housing into the downtown core.

The Green Highrise

The Condé-Nast Building at Four Times Square, New York, New York, is the first large-scale speculative office building in the United States to be marketed as green. The 47-story office tower is designed with attention to energy efficiency, indoor air quality, and material selection. Four Times Square has photovoltaics integrated into the building's spandrel glass, producing significant power on hot summer afternoons—the time of peak electrical demand in New York City. Other green technologies include gas-absorption chillers and fuel cells for power generation.

The 1.6-million-square-foot building was part of an experiment run by Rocky Mountain Institute, The Energy Foundation, and Eley & Associates on energy-related performance-based compensation. In this system, the design team shares in the energy savings if they design a higher-performance building. The development team is also working with lead tenants on measures that can improve the energy and environmental performance of their interior improvements. The high-quality, high performance green building was largely pre-leased before construction was completed.

An Organic Building

The ING (formerly NMB) Bank in Southeast Amsterdam, Netherlands was completed in 1987 with two mandates. The first was that the design would be "organic," full of light, water

The energy efficiency features themselves of the ING bank were paid back in just three months.

features, art, and happy workers. The second mandate was that the building would not cost one guilder more than conventional construction. The headquarters accomplished both mandates and much more.

The building featured an integrated design team process, passive solar heating and ventilation, daylighting, water-efficient landscaping, and rainwater capture. ING bank has seen a 92 percent reduction in energy used when compared to a conventional building of similar size, resulting in $2.9 million in annual savings. The energy efficiency features themselves were paid back in just three months. Most valuable of all, the bank saw a significant increase in worker productivity, with absenteeism dropping 15 percent. ING has since grown to become one of the largest banks in the Netherlands.

The value of the Inn increased by more than $2 million in less than three years with the help of an 83 percent average occupancy rate.

Cultural Restoration

The Inn of the Anasazi, in Santa Fe, New Mexico is located adjacent to the historic Palace of the Governors in what used to be a steel and concrete, international-style juvenile detention center and office building for the State Penitentiary.

Remodeled in 1991, the building is now a 60-room luxury resort hotel. The well-daylit adobe design reflects the diverse cultures of the Southwest with locally-sourced, non-toxic building materials. The hotel has forged extensive connections to the community by supporting local artisans and organic Hispanic farmers (they supply 90 percent of the restaurant's produce) and by offering conference space for local dispute resolution.

The development team's attention to environmental and community issues has boosted the performance of the Inn and its restaurant by 15–20 percent. The value of the Inn increased by more than $2 million in less than three years with the help of an 83 percent average occupancy rate.

Educational Environment

Oberlin College's **Adam J. Lewis Center for Environmental Studies** serves as both an example of a building of the future and a tool for teaching students. The 10,000-square-foot building is located in Northern Ohio and features extensive daylighting, use of photovoltaics, and a "living machine" for biological wastewater treatment. The eventual goal of the project is to be a "net-exporter" of energy, by capitalizing on energy-efficient design and power production within the facility. The building was designed to be responsive to its surrounding climate and landscape, and to be capable of evolving over time as technologies advance.

Office Environment

The SC Johnson Worldwide Professional Building in Racine, Wisconsin was occupied in the summer of 1997. This building exemplifies exceptional performance using commercially available equipment and technologies. The 23,234-square-foot headquarters contains offices, laboratories, meeting rooms, and dining facilities.

The building uses 50 percent less energy than conventional office buildings in the region.

Extensive use of computer and physical models created optimal daylighting conditions throughout the building. The facility also uses a raised access floor for both wiring and air distribution. A pressurized underfloor air plenum delivers cool air low into the space, displacing warm stale air, which is exhausted at the ceiling. This displacement ventilation ensures that all the air in the space is replaced (improving indoor air quality), provides more even temperatures, eliminates drafts, and uses substantially less energy than

Many of the Olympic homes have roof-integrated photovoltaic systems, each generating 1 kW of electricity

Office Environment (continued)

conventional mechanical systems. The displacement air system, in combination with the daylighting, improved building envelope, and task lighting/ambient lighting design has led to a 50 percent reduction in energy use compared to conventional office buildings in the region. Despite this significantly better performance, the building was built at regional market average cost for Class A office space.

Environmental Communities

Newington, the Sydney 2000 Olympic Village, is located in Homebush Bay, 14.5 kilometers west of downtown Sydney, New South Wales. The site was an abandoned munitions depot that was restored to native savanna. Three neighborhoods were constructed, each within a five minute walk to a village green and a 27,881-square-meter commercial center. The village housed 15,000 athletes and coaches during the Olympics; afterwards houses were sold on the market. The project has proven to be immensely popular. Houses originally priced at U.S. $180,000 are now selling for $223,000. Great care went into energy efficiency design and the choice of building materials. Many of the homes have roof-integrated photovoltaic systems, each generating 1 kW of electricity, financed by the NSW Sustainable Energy Development Authority. Overall, this is one of the largest building-integrated PV systems in the world, and will be used as an experiment to understand how a grid behaves with distributed electrical generation.

Village Homes in Davis, California is a green, planned residential community of single family detached homes and apartments built in 1981. The 70-acre development also includes 12 acres of greenbelts and open space, 12 acres of common agricultural land, and 4,000 square feet of commercial office space. Designed to take maximum advantage of the sun, the annual household bills are one-half to one-third lower than in surrounding neighborhoods. Natural drainage systems on site saved $800 per lot and proved more effective for handling stormwater. Narrow streets reduced the amount of pavement needed, lowered ambient air temperature by 15˚, increased pedestrian safety; and allowed for future reductions in the cost of repair and maintenance. Edible landscape, pedestrian walking paths, and bike trails have also proved popular with residents.

The original investors of Village Homes have made a profit of 30 percent per year. In 1995, homes sold for $10–$25 per square foot higher than market rate. They continually have a low turnover rate and sell faster than is typical for the region.

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