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SmartMarket Report

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Green Building: Retrofit and Renovation SmartMarket Report

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McGraw Hill CONSTRUCTION

About McGraw-Hill Construction

McGraw-Hill Construction (MHC), part of The McGraw-Hill Companies, connects people, projects and products across the design and construction industry, serving owners, architects, engineers, general contractors, subcontractors, building product manufacturers, suppliers, dealers, distributors and adjacent markets.

A reliable and trusted source for more than a century, MHC has remained North America's leading provider of construction project and product information, plans and specifications, industry news, market research, and industry trends and forecasts. In recent years, MHC has emerged as an industry leader in the critical areas of sustainability and interoperability as well.

In print, online, and through events, MHC offers a variety of tools, applications, and resources that embed in the workflow of our customers, providing them with the information and intelligence they need to be more productive, successful, and competitive.

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Introduction

Only 1.5–2.5% of the U.S. building stock is new each year. Additionally, many of the 4.4 million non-residential buildings that make up this space are highly inefficient and represent a prime opportunity for green building retrofits.

Therefore, we thought it was critical to investigate the share of the retrofit and renovation market that was green.

What we found is that growth in green retrofits is occurring more rapidly than growth in new green buildings. **Today, green building comprises 5-9% of retrofit and renovation market activity by value—projected to grow to 20-30% in just five years.**

Additionally, the trends revealed by the market research and qualitative case studies profiled in this report point to dramatic growth in the longer-term (10-20 years) as owners—both public and private—face mounting pressures to upgrade their buildings to be green, and as tenants look for ways to improve satisfaction with and the performance of their building spaces.

Several key results:

- **86% of commercial building owners expect the green retrofit market to grow, with half expecting it to increase 20% or more over just three years.**
- **The downturn is encouraging adoption of energy- and water-efficient practices in renovation projects.**
- **70% of owners who have engaged in green retrofit or renovation activities are planning to continue to do so for over 15% of future renovation projects; 24% will do so on over 60% of projects.**

The fact that such high rates of future activity are reported—coupled with significant government intervention—suggests tremendous market opportunity for industry players offering green building services and products. Not surprisingly, those products and services oriented around energy-efficiency, such as lighting and building controls, have the greatest opportunity.

For the first time, we also profiled over 20 projects (pages 40-64). We felt their inclusion was critical in order to provide qualitative insights to accompany the data. It became clear that though projects are unique in many ways, they all share one thing in common—quantifiable business benefits (demonstrated through energy and water bills and audits). In some cases, further paybacks were measured and reported, such as higher occupancy, rents and tenant satisfaction.

We are very pleased that Autodesk, Siemens and UL Environment, Inc. supported this study to help bring it to the market. We also thank our partners at CB Richard Ellis and the U.S. Green Building Council for helping this study come to light.

As always, we at MHC are committed to continuing to serve as the “voice of the industry,” creating a complete “network” of green building information, resources and expertise through our publications, analytics work, market research and Network database of construction projects and products.

For more information on the methodology, see page 38.



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Russo is also a contributor to The McGraw-Hill Companies' corporate initiatives around sustainability. Previously, she served as Executive Director of the Clean Beaches Council and Deputy Director of the National Pollution Prevention Roundtable. She has authored several articles around pollution prevention and toxics reduction and is a frequent speaker on green building trends and environmental policy. Russo has a B.S. in Chemical Engineering from Cornell University and a Masters in Public Policy from Harvard University's Kennedy School of Government.

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 Empire State Building,
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 Restaurant,
 Washington, DC

Market Summary

Green Retrofit and Renovation

Pose Significant Future Market Opportunity for Green Building

With 76.9 billion square feet of existing building stock and a number of inefficient buildings, green building has a tremendous long-term opportunity to dramatically reduce U.S. energy consumption and greenhouse gas emissions.

The results of this latest research, combined with McGraw-Hill Construction proprietary data, demonstrate a growing share for green building in the retrofit and renovation marketplace. Furthermore, market opinion as well as other government and market indicators suggest ongoing, dramatically higher activity in the longer term (10-20 years)—both for retrofit and renovation activity overall as well as for the green share.

Green Building Retrofit Market Poses Strong Growth Over Next 5 Years

The growth in green building retrofit projects represents significant opportunity for the industry.

2009

- Green building retrofit and renovation market share: 5–9% by value
- Market opportunity for major projects (those over \$1 million): \$2.1–3.7 billion

2014

- Green building retrofit and renovation market share: 20–30% by value
- Market opportunity for major projects (those over \$1 million): \$10.1–15.1 billion

More broadly, there is significant opportunity in the retrofit market for energy-efficient buildings—one aspect of a green building (see page 8). Currently, this market share is estimated at 66–75% by value and expected to grow to 85–95% in five years (see values in chart at top right).

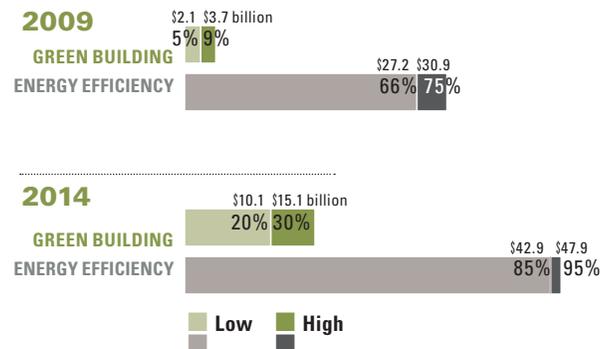
Owners and Tenants with Green Retrofit Experience Are Likely to Do More Green Retrofit Projects

Owners and tenants who have completed green retrofit and renovation projects are likely to repeat that activity. Furthermore, level of involvement is strong.

- 70% of owners indicate that over 15% of the retrofit projects they have done or have planned are green.
- 24% are greening over 60% of their projects.
- More tenants fall into the two extremes—One-third are committed to green retrofits for over 60% of their projects, while 17% are not yet committed.

Green Retrofit Market Opportunity (Nonresidential Buildings), in billions of dollars

Source: McGraw-Hill Construction, 2009

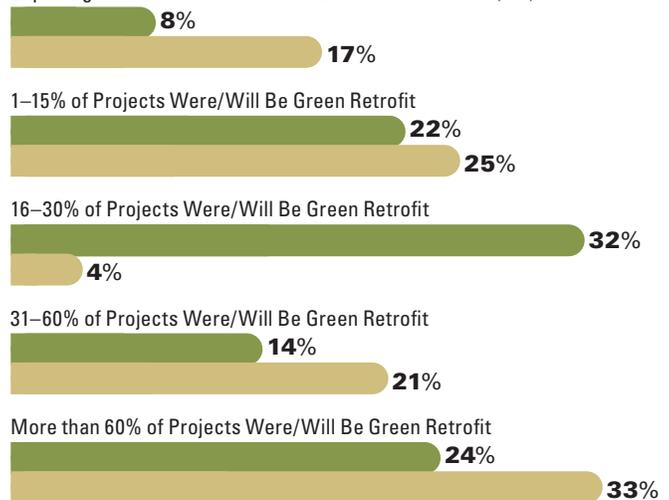


Current Level of Green Retrofit Activity

Source: McGraw-Hill Construction, 2009.

■ Owners ■ Tenants

Exploring Whether or Not to Undertake a Green Retrofit (0%)



CONTINUED

Strong Market Growth Expected by Owners

86% of Owners expect the green retrofit market to grow in the next 3 years. That growth is expected at fairly high levels (see chart at right).

- 31% expect the market to grow by over 30%
- Half expect that growth to be 20% or more

Owners Expect to Recoup their Investments Through Cost Savings

62% of Owners expect the savings achieved from energy-efficiency improvements to recoup their investment within 10 years (see pie chart at bottom).

- Almost all of the case study participants report expecting payback within 5 years on the operating cost savings of their green retrofit projects, demonstrating the market's conservative nature in estimating payback times.

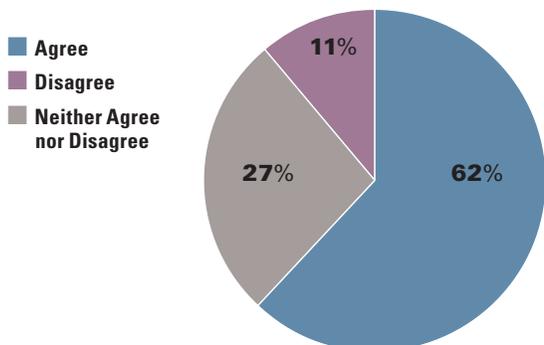
Green Retrofit Activities

All owners report using more energy-efficient lighting or natural daylighting in their green retrofit and renovation projects. Nearly all (92%) also report installing more energy-efficient mechanical and electrical systems.

The other major categories of activities are all being pursued by over 50% of owners, suggesting strong opportunities for all green products and systems across various product category areas.

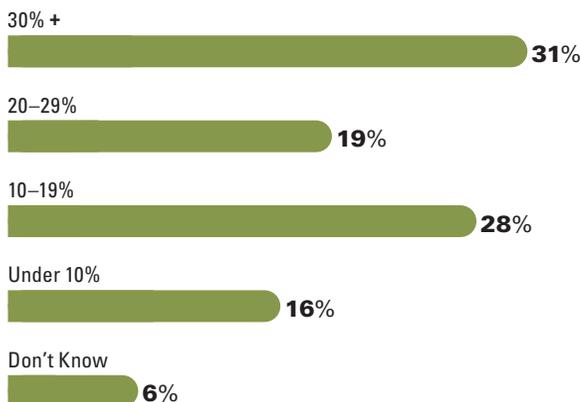
Expectation that Energy Cost Savings Will Be Recouped in 10 Years

Source: McGraw-Hill Construction, 2009.



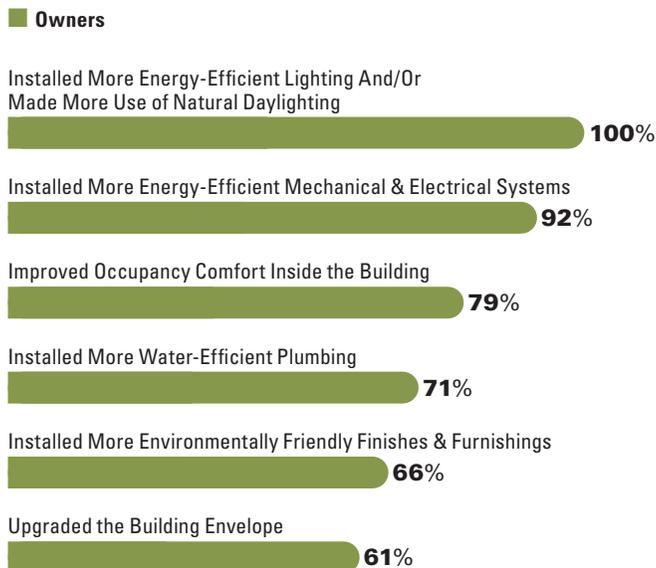
Level of Green Retrofit Market Growth Expected (Owners)

Source: McGraw-Hill Construction, 2009.



Green Retrofit Activities

Source: McGraw-Hill Construction, 2009.



Recommendations

Key Conclusions and Recommendations

There is tremendous opportunity in the existing building market for green building products, processes and services. Through strategic planning, preparation and initiatives, industry players of all types can maximize this expanding retrofit market, and the growing share that is green.

Focus on Business Benefits and Paybacks

Financial benefits are the primary driver for encouraging owners and tenants to pursue green retrofits.

Additionally, owners and tenants recognize that there are financial rewards they can reap from green building retrofit and renovation activities.

As a result, industry players, especially service providers and product manufacturers, need to be able to convey the business benefits of their green products and services. Product manufacturers and contractors should understand LEED, since it still plays an important role in the market.

Industry players should also foster relationships with owners and owner representatives. In the green retrofit market—especially for the plethora of smaller projects under \$1 million—owners are making final decisions, or their consultants are. This is different from the new green building market where architects and designers wield significant influence.

Energy-Efficiency Reigns Supreme, but Other Motives Matter

Energy-efficiency improvements offer the broadest opportunity in the current market, and given the specific attention being placed on curbing carbon emissions and reducing energy consumption, energy efficiency will continue to be a requirement for green renovation activity. In fact, we believe it will be embedded into all retrofit activity in coming years.

However, green building retrofits include more than just features that improve energy performance. And those additional advantages are appealing—not only do they yield financial rewards, but they also are accompanied by environmental and social paybacks that can, in certain circumstances, be as powerful as money. This is especially true of owners of education and healthcare buildings.

Industry players should not confine themselves to thinking about green in water and energy-saving terms. Instead, they should be able to speak to the larger gains green offers.

Measurement Matters

There is a noticeable lack of sufficient measurements of the benefits achieved in green retrofits reported by owners and tenants. Furthermore, as policy continues to focus around public reporting, building owners that don't have systems in place to effectively measure their performance—minimally as it relates to energy and water—will lag in the market and ultimately find it costs them significant money to not have these systems in place.

Major opportunities exist for those who can help owners and tenants capture the data they need to find inefficiencies, establish appropriate benchmarks and set long-term goals.

Current Technologies Can Yield Major Benefits

One theme running through many of the case studies was the big boost available from off-the-shelf technologies. Contractors and building product manufacturers need to be able to effectively convey what can be achieved today for minimal investment.

Once a Firm Conducts a Green Retrofit or Renovation, They Are Likely to Do It Again

Owners and tenants who have completed green retrofit and renovation projects are likely to repeat that activity. As such, they can be a focal point for green building product manufacturers and service providers as their receptivity to green expertise is highly likely.

Expand and Promote Your Green Building Knowledge

Firms are embracing commitments to sustainability. This trend is supported by the emergence of the new Chief Sustainability Officer position at large corporations, expansion of large green building portfolio commitments and increasing investment in bringing new and innovative products to market that have environmentally, fiscally and socially beneficial properties.

As a result, industry players that have knowledge about green building trends—particularly as they relate to existing buildings—will be well-positioned for future personal professional growth. ■

Green Retrofit Market Opportunity

The market opportunity for green building has grown dramatically—in both new and existing buildings. By 2014, the green building market share of all retrofit, alterations and renovation activity is expected to be 20%–30% by value.

Existing Buildings Today

The current U.S. built environment is comprised of 76.9 billion sq. ft.¹, including over 4.4 million nonresidential buildings². In comparison, only 1.8% of this was new in 2008.³

Today's building stock also includes some extremely inefficient buildings. As can be seen below, buildings constructed after 1970 consume significantly more energy per square foot as compared to older buildings. Given that they comprise 60% of the building stock, there exists strong opportunity for green.

In 2009, the value of the overall major retrofit and alteration market (projects over \$1 million) is forecast to be \$41.2 billion. It is expected to grow to over \$50 billion by 2014⁴.

However, because the renovation market also includes thousands of small projects not captured in this value, the full renovation market is likely 1.5 to 2 times higher.

Green Building Retrofits

Today, we project the green share (see page 8 for definition) of the retrofit and renovation market to be 5–9% by value—equating to a \$2–4 billion marketplace for major projects.

By 2014, that share is expected to increase to 20–30%—a \$10–15 billion market for major retrofit projects.

More broadly, we expect an overwhelming amount of the retrofit market to pose an opportunity for energy efficiency since the nature of a retrofit or renovation project is to

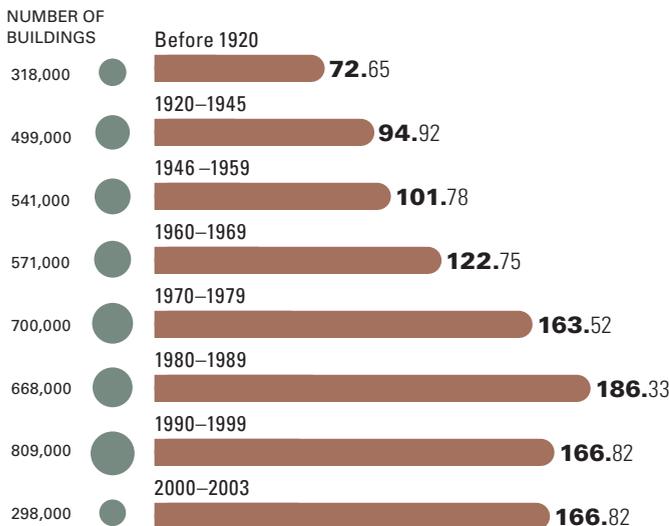
create a higher performing building. Today, that market is expected to be 66–75% of retrofit activity, growing to comprise 85–95% by 2014.

Dramatic increases in green retrofit activity is expected over the longer-term (10–15 years) after major legislative and competitive drivers force building owners to engage in retrofit projects (most notably to address climate change). This will significantly increase both the base of all retrofit activity as well as the green share, which by then, is expected to have reached its tipping point.

The sectors with the largest green retrofit opportunity are education and office (~50% of all retrofit activity), with the biggest growth in retail. ■

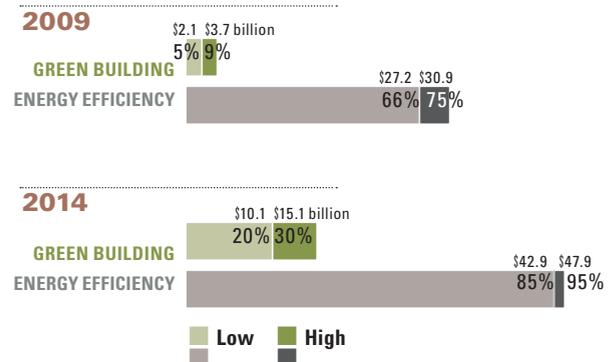
Energy Use in Buildings by Age (thousand Btu/sq. ft.)

Source: U.S. Department of Energy, Energy Information Administration, 2006.



Green Retrofit Market Opportunity (Nonresidential Buildings), in billions of dollars

Source: McGraw-Hill Construction, 2009



¹ McGraw-Hill Construction Building Stock Database (2009, data through end of 2008); ² U. S. Department of Energy, Energy Information Administration, 2006; ³ McGraw-Hill Construction Building Stock Database (2009, data through end of 2008); ⁴ Construction Market Forecasting Service, McGraw-Hill Construction as of October 2009

Data: Introduction

The greatest opportunity for green design and construction activity lies not in constructing new green buildings, but in engaging in the retrofit and renovation of the existing building stock. Recent legislation has focused on increasing energy efficiency in existing buildings (see page 30), but a true green retrofit addresses more than energy performance. In fact, green approaches to retrofit and renovation projects lead to a multitude of benefits: lower energy use, reduced greenhouse gas emissions, water savings and better indoor environmental quality.

This study focuses on the attitudes and behaviors of commercial building owners and tenants who had already committed to doing green retrofits before many of the major incentives—from the American Recovery and Reinvestment Act to potential incentives from climate legislation—were known or available. Therefore, the results reveal what drives the private sector to embrace green retrofits, what benefits they expect to receive and where they think this market is going in the future.

Note About the Data

The sample of building owners who have done or will do a green retrofit interviewed in this survey is statistically valid. However, the sample size of tenants who qualified was smaller.

Findings and conclusions about building owner opinions are considered quantitative, while interpretations of tenant behavior are qualitative in nature.

For full methodology, see page 38.

Market Activity

Level of Green Retrofit Activity

Owners who engage in green retrofit and renovation* activity tend to do so for multiple projects—70% of owners who have done or are planning to do a green retrofit project state that 16% or more of their projects are green retrofits. Furthermore, nearly a quarter of owners (24%) engaging in retrofit activity report that more than 60% of those projects are green.

This finding suggests that building owners undertake green retrofit and renovation projects in a holistic fashion, rather than just doing one or two showcase green projects.

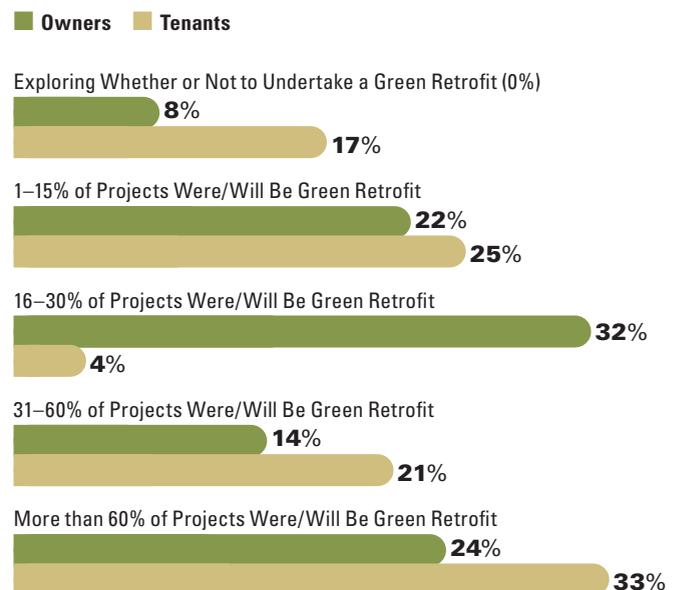
On the other hand, tenants appear to fall at either the high or low end in terms of level of green retrofit activity.

- 33% highly dedicated to making the majority (more than 60%) of retrofit projects green
- 17% not yet committed

* A “green” project is one that employs multiple practices, products and processes covering a minimum of three out of five aspects of green building—energy, water or resource efficiency, improved indoor environmental quality or responsible site management.

Current Level of Green Retrofit Activity

Source: McGraw-Hill Construction, 2009.



Future Growth of the Green Retrofit Market

GREEN BUILDING RETROFIT AND RENOVATION DATA

Eighty-six percent of building owners expect the U.S. commercial green retrofit market to grow. Out of the remaining 14%, no building owners expect the market to decline—all believe it will at least remain stable.

Once again, this finding confirms the expected growth of the green building market reported in *The Green Outlook, Commercial & Institutional Green Building SmartMarket Report* and other industry studies. Additionally, it demonstrates that this growth applies not only to new construction, but also to retrofits and renovations of existing buildings.

Those building owners who expect growth in the green retrofit market anticipate strong levels of growth: 50% expect an increase of 20% or more.

As a group, building owners—especially those with a portfolio of buildings—are more likely to have active

construction projects on a regular basis than tenants, making their expected growth levels noteworthy.

The overwhelming agreement that the green retrofit market is increasing, coupled with its high rate of expected growth, is particularly notable in the midst of the current economic downturn. Strong growth in green retrofit and renovation activity is predicted by the majority of building owners despite the many downward pressures on overall construction due to today's economy.

These results provide a clear signal to the industry—particularly product manufacturers—that green will play an important role in the future design and construction of renovations and retrofits of existing buildings. Accordingly, the industry should include these considerations in their business planning.

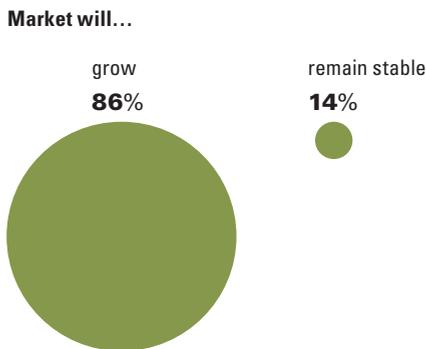
Sizing the Commercial Green Retrofit Market

A qualitative indicator of the level of adoption of commercial green retrofit projects is the incidence of building owners and tenants who qualified to be part of the study out of the overall population contacted.

That incidence was 10%, which does correspond to the overall market size projection across all buildings types on page 7.

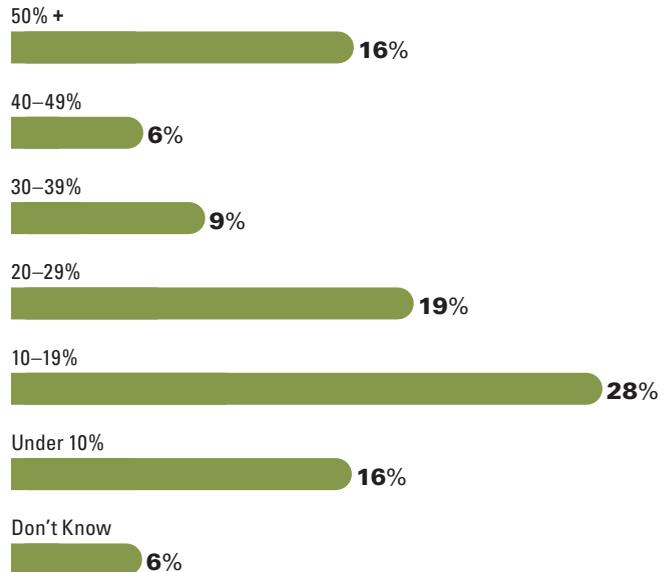
U.S. Commercial Green Retrofit Market (Owner projections for the next 3 years)

Source: McGraw-Hill Construction, 2009.



Level of Green Retrofit Market Growth Expected (Owners)

Source: McGraw-Hill Construction, 2009.



Data: Financing

Owners and tenants most frequently use profits to finance their green retrofit projects, but they also often rely on multiple measures rather than just one means of financing. The fact that green retrofit projects most frequently derive at least part of their financing from the general corporate budget suggests that most firms doing green retrofits consider them part of normal corporate activity rather than a one-time investment.

Owners

A good portion of building owners are using alternative financing measures in addition to company profits.

- 41% also use energy-efficiency savings resulting from the retrofit/renovation.
- 14% use performance contracting.

Owners can capitalize on the expected energy savings by using the services of an Energy Service Company (ESCO). ESCOs finance the upfront cost of the retrofit and take a percentage of the savings achieved. See page 11 for more information on ESCOs and their impact on green retrofits.

Less than 20% of owners indicate that they used bank loans to finance their green retrofit and renovation projects. This could be due to a combination of factors:

- The tightening of credit that has occurred since the fall of 2008.
- The relatively low costs of many renovation projects.

Tenants

A sizable portion of tenant respondents report having the building owner fund their retrofit(s) during their lease negotiations, even without specific prompting. This anecdotal evidence supports the emergence of the following trends:

- Tenants will become a driver to the growth of the green retrofit market in a region where building owners do not take the initiative themselves.
- Tenant expectations of leasing green commercial space can play an important role in driving the green retrofit market.

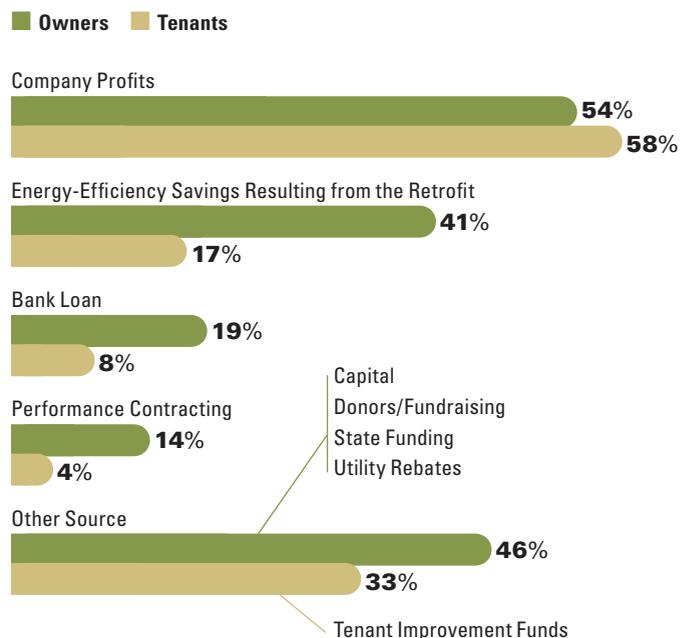
Green Leases

Green leases are a modification of traditional leases that change the conventional distribution of risk and reward between building owners and tenants for alterations, operation and maintenance of buildings. The most widely recommended green lease is a modified "gross lease" with the owner paying all utilities directly and the tenant a fixed fee. Under this agreement, the owner has an incentive to make upgrades that apply throughout the building.

Although owner modifications can have the biggest impact, tenants also need to actively adopt green building goals to achieve maximum efficiency. The most critical improvement an owner can make to encourage change in tenant behaviors is to install separate metering of all utilities and energy for each tenant space. Real-time data and control systems can also influence better energy and water use. Tenant rewards and/or penalties for their impact on the building's energy and water use can be built into the modified green lease.

Financing Green Retrofits

Source: McGraw-Hill Construction, 2009.



ESCOs and the Green Retrofit Market

Current Market and Future Outlook of the Use of Energy Service Companies to Improve Energy Efficiency in Buildings

The business argument for energy-efficiency upgrades has been well established for years. A recent study by McKinsey looking at the potential of the market states that energy-efficiency improvements in buildings adopted broadly across the U.S. can “yield gross energy savings worth more than \$1.2 trillion, well above the \$520 billion needed through 2020 for upfront investment in efficiency measures.”¹

Advantages Offered by Energy Service Companies (ESCOs)

ESCOs offer a way to address several of the challenges behind the effort to improve the efficiency of an existing building, most notably difficulty in acquiring financing for the initial investment.

An ESCO’s core business of providing the design, construction and financing for energy-efficient upgrades of a building, as well as assistance in the maintenance and operations of key systems, helps an owner to enter into such a project with minimal risk.

In return for their investment, the Energy Saving Performance Contract (ESPC) between the ESCO and the building owner calls for a percentage of the savings achieved by the upgrade to be delivered to the ESCO over the length of the contract. After that point, the owner reaps the full benefits of the energy savings.

Obstacles to ESCO Adoption for Commercial Real Estate

Despite the fact that ESCOs have been offering services since the 1970s, the market has been underrepresented. One issue is the complexity of a typical ESPC, which often makes it costly to establish, and therefore limiting ESCO involvement to larger scale retrofits in order to achieve an adequate return.²

In addition, ESPCs are typically long contracts, with an average of 10 years but frequently lasting as long as 12–15 years.³ Therefore, the majority of ESCO revenue (82%) comes from contracts with public and institutional owners who have large portfolios of buildings and anticipate long-term property ownership. Only the largest private ventures easily capitalize on the benefits offered by ESCOs.

Commercial real estate, therefore, is still a largely untapped market, in part due to the need for shorter-term contracts because of the ongoing process of buying and selling individual properties. Some experts hope to make ESPCs more viable for the commercial real estate markets by creating a simpler contract model that can be more easily applied to multiple buildings, lowering the price threshold—and therefore the minimum length—of a typical ESPC.⁴

The federal government has taken a modified version of this approach by creating super ESPC contracts with multiple ESCOs, which allow for

simpler contracts for projects from different agencies.

Current Status and Future Trends for ESCOs

The economic downturn and government response offer both challenges and opportunities for ESCOs. One challenge is the difficulty of obtaining financing during the ongoing credit crisis. This could provide an advantage to larger, more well-established ESCOs who find it easier to obtain financing.

Frost and Sullivan reports that the North American energy management service market earned \$20.35 billion in 2008, and they expect the market to double by 2013.⁵ This growth may mean that when ESCOs are involved in the project, product manufacturers will find they need to work with them versus the owner directly in some product-selection and process decisions.

Though the recent lowering of energy costs has made the paybacks less dramatic from a financial standpoint, current policy trends may influence opportunities for this market. The Obama Administration and dedicated funds in the stimulus package are focused on energy-efficient upgrades for existing buildings. Furthermore, because of its relatively low level of controversy, energy-efficiency in buildings has become a cornerstone to nearly all climate change policies. As such an ESCO may find a future full of opportunity. ■

¹ Granade, Hannah Choi, Creyts, Jon, Derkach, Anton, Farese, Philip, Nyquist, Scott and Ostrowski, Ken. *Unlocking Energy Efficiency in the U.S. Economy*. McKinsey Global Energy and Materials. July, 2009. iii.; ² Ürgel-Vorsatz, Diana. *An Assessment of Energy Service Companies (ESCOs) Worldwide*. Ademe and World Energy Council. March 2007. 33.; ³ *Ibid.*, p 34.; ⁴ Rahim, Saqib. “Selling Private Building Owners Energy Retrofits Depends on the Rewards.” *The New York Times*. August 21, 2009. Retrieved September 1, 2009 from <http://www.nytimes.com/cwive/2009/08/21/21climatewire-selling-private-building-owners-energy-retro-53977.html>.; ⁵ Press Release. “Energy Management Services Market to Reach \$40 Billion by 2013, Finds Frost and Sullivan.” February 11, 2009. Retrieved from <http://www.frost.com/prod/servlet/press-release.pag?docid=158725257>.

Data: Market Profile

GREEN BUILDING RETROFIT AND RENOVATION DATA

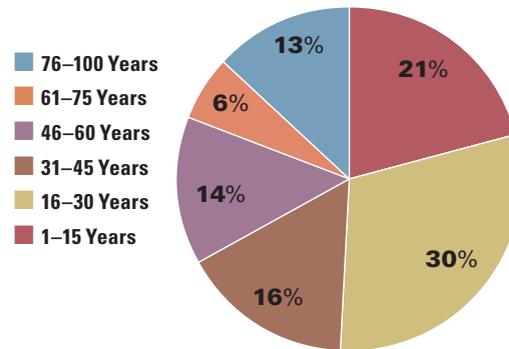
Age of Buildings Involved in Green Retrofit

One-fifth (21%) of the buildings involved in green retrofit projects were built in the last 15 years. As can be seen at right, there is a large distribution in the age of buildings being greened—it is not confined to older buildings or ones built during a specific time frame. Even the most recent buildings are being improved through green practices.

Thirteen percent of the buildings involved in green retrofit projects are at least 76 years old. This relatively low incidence may be due to the fact that buildings built before the 1930s frequently incorporate material and design choices that allow the building to be less dependent on mechanical heating and cooling, helping it be more efficient. This trend was reflected in the case study projects that were historic.

Age of Green Retrofitted Buildings

Source: McGraw-Hill Construction, 2009.



Size of a Firm's Green Retrofit Investment

There is a wide distribution of the size of retrofit projects by owners, whereas an overwhelming majority (75%) of tenants engage in small green retrofit projects. This is consistent with the roles of these players.

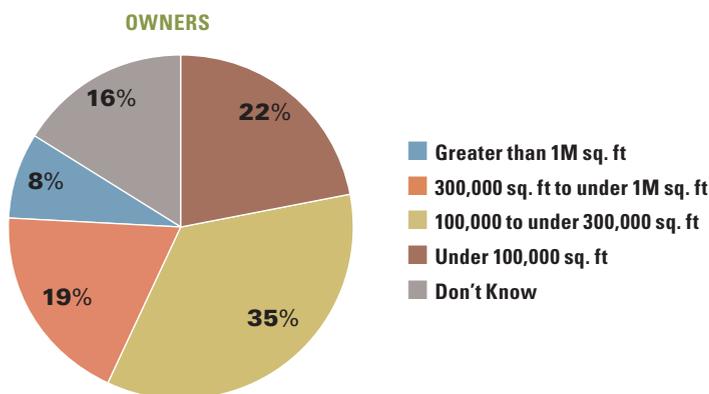
- **Building owners may retrofit or renovate entire buildings rather than portions of buildings like tenants.**

- **Building owners are more likely to have large portfolios of properties than tenants.**
- **As can be seen on page 8, more owners than tenants (70% versus 58%) indicate that they green at least 15% of their portfolio/projects.**

CONTINUED

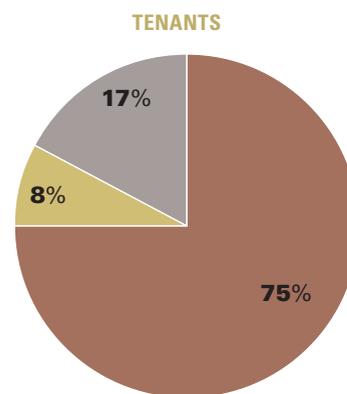
Square Footage of Green Retrofits by Owners

Source: McGraw-Hill Construction, 2009.



Square Footage of Green Retrofits by Tenants

Source: McGraw-Hill Construction, 2009.



Owners

Building owners engage in all levels of green retrofit investments. However, large investments could have multiple explanations—an owner could be making relatively simple upgrades applied to their whole portfolio, or they could be engaging in significant system and envelope changes in a few large buildings.

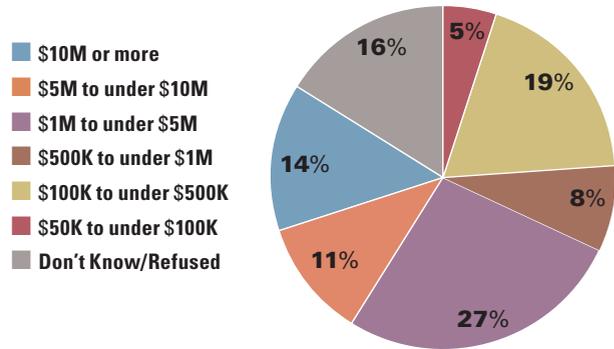
Given the fact that most owners pay for the renovations out of their profits, it is not surprising that almost 60% of those projects cost less than \$5 million.

Tenants

Unlike owners, who have a relatively even distribution of the amounts they invest, tenant responses suggest they are more likely to tackle a small, inexpensive retrofit than a more expensive one—consistent with the size of the projects seen on page 12.

Money Spent by Owners on Overall Green Retrofit Activity

Source: McGraw-Hill Construction, 2009.



Data: Business Benefits

Measuring Economic Impact

The only consistent way that building owners and tenants measure the economic impact of their green retrofit projects is through operating cost and utility expense savings.

■ **The fact that only 32% of owners and 38% of tenants are capturing this relatively easily measured benefit suggests that business benefits of green retrofits are not commonly being tracked.**

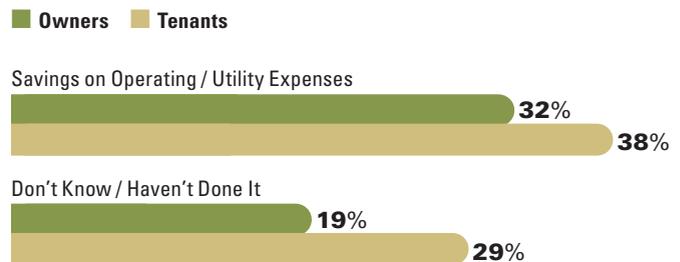
Furthermore, the industry still seems challenged by measurement of any sort. Nearly one-fifth (19%) of owners and 29% of tenants report that they either do not know how to measure economic savings from green retrofit activities or have not engaged in measurement activities at all.

When asked about whether they measure other business benefits—such as ROI, employee absenteeism and carbon footprint reduction—fewer than 10% report doing so.

One likely cause for this lack of measurement is the difficulty created by the separation of accounting for

Measure of Economic Impact

Source: McGraw-Hill Construction, 2009.



capital expenses versus budgets to cover operating costs. In fact, over 50% of those surveyed identify this as a challenge to doing a green retrofit project (see page 25).

Another issue may be that building owners are engaging in retrofit and renovation projects to improve tenant satisfaction, which is difficult to measure. Furthermore, because benefits may pass directly to tenants in some instances, those owners may choose not to measure the impacts.

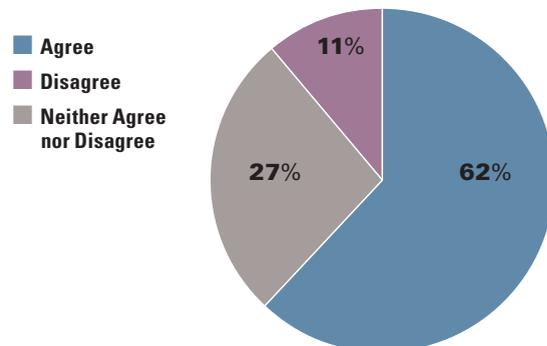
Expectation that Energy Cost Savings Will Be Recouped in 10 Years

Sixty-two percent of owners expect to recoup their investment in green retrofits within 10 years, even with modest savings anticipated. This may indicate that owners do not expect substantial additional costs from going green. With only 11% disagreeing with that expectation, most owners clearly regard green retrofits as a sound business decision.

This result is particularly important when the less-easily measured benefits of a green retrofit or renovation project—such as tenant satisfaction and increased building values—are considered. Design and construction industry professionals and building product manufacturers can capitalize on the owners' confidence in the payback of energy cost savings to encourage greater investment in green retrofits based on the other benefits that may also accrue.

Expectation that Energy Cost Savings Will Be Recouped in 10 Years

Source: McGraw-Hill Construction, 2009.



Despite the lack of measurements, owners and tenants still expect to see significant decreases in operating costs. Yet, how the retrofit cost is shared between owners and tenants and who benefits most from the savings achieved is highly variable based on different lease structures. This may contribute toward the high percentage who do not know what to expect in terms of operating cost decreases.

Decreases in the Next Year

Average expected decrease in the next 12 year:

- **OWNERS:** 8.5%
- **TENANTS:** 10.5%

This result is consistent with MHC studies of new green buildings, where building owners expect similar savings. In those studies, owners predict more modest gains than A/E firms or contractors.

Decreases in 10 Years

Average expected in the next years:

- **OWNERS:** 16%
- **TENANTS:** 15%

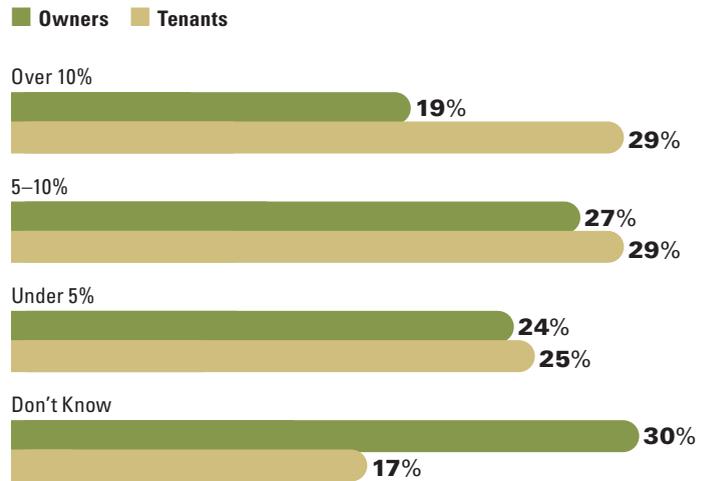
Thirty percent of owners do not know the expected impact on operating costs in one year, and 35% don't know the expected decrease over 10 years. Given that only one-third report measuring these decreases, this result is not surprising.

The fact that measuring results is not yet standard practice for green retrofit projects makes case studies in which measurements have been made—like those on pages 40–64 of this report—valuable because they provide owners and tenants with insights from their peers on how to gauge potential benefits.

Expected Decrease in Operating Costs

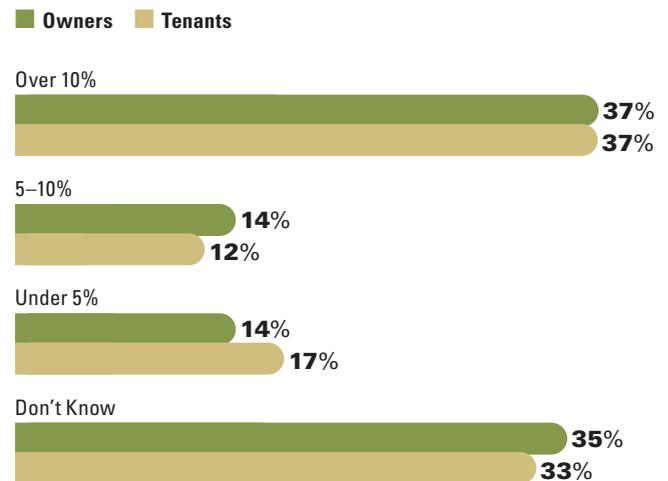
Operating Cost Decrease Expected Next Year

Source: McGraw-Hill Construction, 2009.



Operating Cost Decrease Expected in 10 Years

Source: McGraw-Hill Construction, 2009.



Expected Increase in Building Values from Green Retrofit Improvements

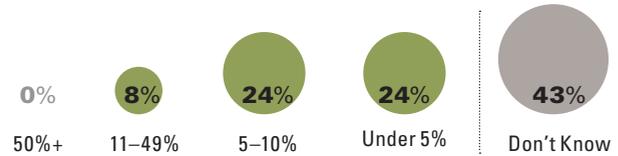
On average, building owners expect a 6.8% increase in the value of their building over the next three years.

Nearly half (43%) of the owners were not sure about building value. That high level of uncertainty is likely influenced by:

- The difficulty in measuring the increase in value related to the retrofit alone.
- Great uncertainty about the value of real estate in general for the next three years.

Building Value Increase over Next 3 Years Due to Green Retrofit (Owners)

Source: McGraw-Hill Construction, 2009.



Expected Increase in ROI

Owners

47% of owners state that they do not know how to measure their ROI. Those who do feel comfortable estimating it are expecting major returns. Owners on average expect a tremendous 19.2% return.

This result is a striking departure from the results of other studies regarding new green buildings. In the *Commercial and Institutional Green Building Smart-Market Report* from late 2008, owners of new green buildings only anticipated an 8.1% increase in ROI. This difference suggests that green retrofits may offer a unique opportunity to achieve a more significant ROI. Alternatively, some owners may be basing their estimates on different benchmarks than those they use to measure the value of new buildings.

One possible reason for the expectation of a higher ROI is the ability in a retrofit to target specific green improvements with a high expected return. Another is the wider range of investment returns available—including increases in efficiency, rent revenue and building value—that may not factor into a new building project.

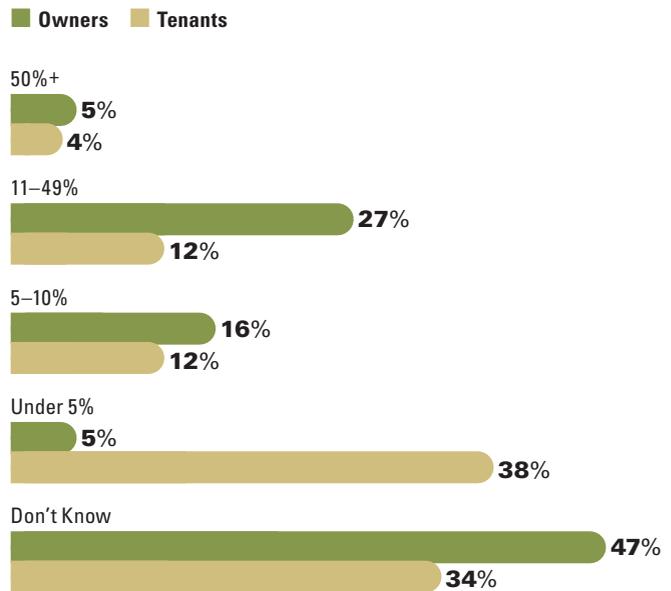
Understanding the different factors that go into ROI calculation and market opinion is a strong opportunity area for further investigation.

Tenants

Tenant respondents are more conservative than building owners when it comes to their expected ROI. Tenants on average expect a 7.8% return.

Expected Increase in ROI

Source: McGraw-Hill Construction, 2009.



Expected Time to Lease Green Retrofitted Space

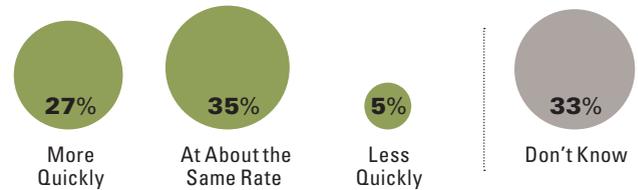
There are still mixed opinions about the impact of green retrofit projects on the expected time to lease a space.

- 27% of owners expect them to lease more quickly.
- 35% expect them to lease at the same rate.
- 33% don't know what to expect.

As green retrofitted spaces become more common, a clearer pattern may emerge about how they compare in leasing rate with traditional spaces.

Expected Time to Lease Green Retrofitted Space (Owners)

Source: McGraw-Hill Construction, 2009.



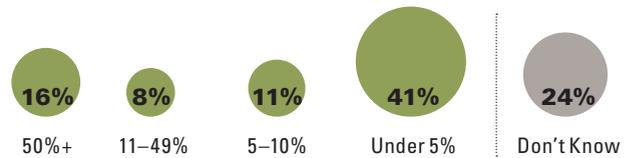
Expected Increase in Overall Occupancy

The median increase in occupancy expected by respondents is 2.5%. However, the mean is skewed by a few respondents expecting large increases, which could be due to the conversion of previously unoccupied space or to shifting a property from Class C to Class A.

Three-quarters of the building owners surveyed expect to see occupancy increase due to their green retrofit and renovation activity.

Increase in Overall Occupancy Due to Green Retrofit over Next Year (Owners)

Source: McGraw-Hill Construction, 2009.

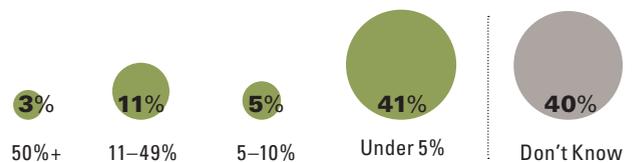


Expected Rent Increase Due to Green Retrofits

Most owners (60%) expect to be able to charge an increased rent due to the green retrofits, though their estimates of those increases are conservative, with a median expected increase of 1%. There are a few outliers with significantly higher estimates of rent increases, which suggests that some commercial owners are seeing a willingness to pay in the market. Lack of certainty about the real estate market and the nascency of green building also likely contribute to the high percentage of owners who do not know what level of rent increase to expect.

Overall Rent Increase Due to Green Retrofit over the Next 3 Years (Owners)

Source: McGraw-Hill Construction, 2009.



Tenant Willingness to Pay a Premium for Green Retrofits

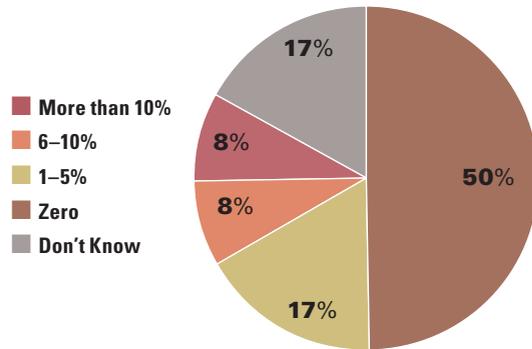
One-third of tenants surveyed say they would pay a premium price for a green retrofitted space—16% even say that they would pay more than 5% in additional rent for the space.

■ **Not surprisingly, 50% of tenants say that they will not pay more.**

However, given the current economic downturn and the reluctance of any firm to pay more for rent than absolutely required, the number of tenants who do agree that they would pay more for green retrofitted space suggests there truly is a premium that can occur in the market for green space.

Rent Premium Tenants Prepared to Pay for Green Retrofitted Space

Source: McGraw-Hill Construction, 2009.



Importance of Green Retrofitting to Companies Leasing Space

Owners

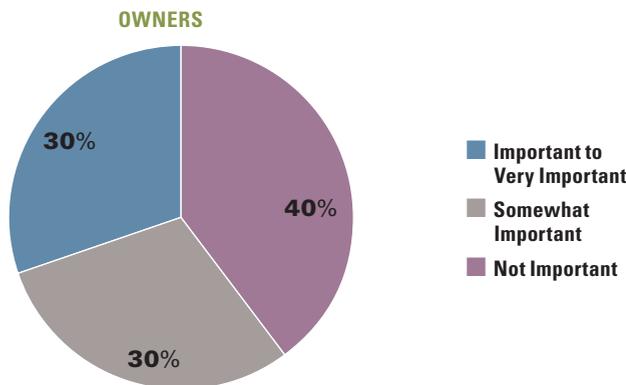
Owners believe that 60% of the companies leasing space regard green retrofits as at least somewhat important. The level of this opinion provides insight into how much influence owners perceive tenants as having in the market. In this case, 60% are seeing demand in the marketplace.

Tenants

Tenant responses on the importance of green in their leased space aligns closely with the perceptions owners have about their answers. Owners' relatively strong grasp of overall demand for green by their potential tenant marketplace **suggests that greater tenant demand could have a noticeable impact on the size of the green retrofit market.**

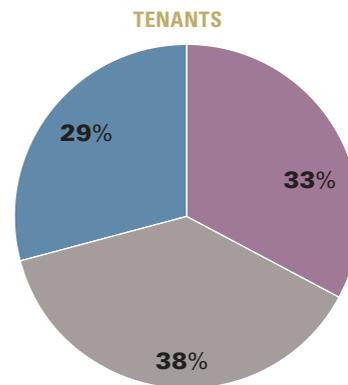
Importance of Green Retrofit to Leasing Companies (Owners)

Source: McGraw-Hill Construction, 2009.



Importance to Company of Leasing Green Retrofitted Space (Tenants)

Source: McGraw-Hill Construction, 2009.



Maximizing Business Benefits

A Portfolio-Approach to Greening Existing Buildings and Focus on Sustainable Operations and Maintenance Maximizes Benefits of Green Retrofit and Renovation Project

As owners seek operational cost savings, increased building values and faster returns on investment, they are approaching green retrofit and renovation activity by greening their building portfolios versus a single-building approach.

Advantages to a Portfolio Approach

In just one building, research has shown cost savings from energy-efficiency upgrades alone (not including water or other efficient practices) are saving firms money. When firms green their buildings from a broader portfolio viewpoint, their savings multiply dramatically—particularly crucial in a down economy.

Corporations tend to operate a range of buildings that vary in size, usage and energy loads. Case study research conducted by ICF International, a global environmental consulting firm, has shown that evaluating resource consumption trends from an entire portfolio perspective allows owners to assess potential savings and achieve maximum results.¹

Identifying the most energy-intensive buildings in a portfolio is not necessarily intuitive, as it depends significantly on tenant behavior and operations. Plotting buildings by size and energy usage can help companies target outliers and implement effective portfolio-wide green retrofits. Some of the companies that have experienced success with

green portfolio upgrades include retail grocery company Food Lion, who achieved 28% annual cost savings through low-cost and no-cost operational upgrades and Starbucks, with \$1.5 million saved per year through lighting upgrades and the implementation of a store energy checklist.²

Commitments to Greening Existing Portfolios

The U.S. Green Building Council's Volume Certification program enables companies to achieve LEED certification across multiple buildings. Many large companies—market leaders that can drive future activity at significant levels—have engaged in the program. Some of these firms include commercial real estate services companies like Transwestern, CB Richard Ellis and Cushman & Wakefield as well as other large commercial building owners, such as Citi, Wachovia, Office Depot and Kohl's. USGBC reports that to date, the pilot program covers 1,700 buildings and approximately 135 million square feet of building space. Many of these same firms are active partners in government voluntary programs—such as Energy Star or U.S. Department of Energy's Commercial Building Energy Alliances.

According to Doug Gatlin, vice president, market development for USGBC, one of the major advantages of volume certification is that it "provides companies with the tools to

integrate LEED into new and existing building projects as a standard feature of design, construction and operations [which will]...help streamline the certification process and...move closer towards the ultimate goal of market transformation.

Role of Operations & Maintenance

While commitment to improving buildings through green retrofit and renovation projects is important, simple changes in operations and upgrades in maintenance procedures can maximize energy and water performance. New policies such as green cleaning and environmental procurement programs can lead to healthier workplaces and catalyze larger market shifts (similar to the effect the federal government's policy on recycled content paper had on increasing availability and decreasing costs of this paper in the larger marketplace). It also allows firms that cannot afford renovation activity across their portfolios to reap benefits that will ultimately help improve the environment.

As Gatlin says, "By improving performance of existing buildings, owners and operators will experience substantial cost savings stemming from a number of sources, including reduced maintenance/repair expenditures, resource consumption through improved efficiency and increased occupant productivity due to high indoor environmental quality." ■

^{1, 2} Anderson, Don. "Green Operations: An Overlooked Opportunity in Existing Buildings." Presentation made at the 2009 China Green Building and Energy Efficiency Conference, August 19, 2009.

Data: Market Intelligence

Business Motivations for Green Retrofits

GREEN BUILDING RETROFIT AND RENOVATION DATA

Tenants and owners agree that lowering operating/lifecycle building costs is the prime motivation for engaging in a green retrofit project. This result is consistent with other studies conducted by McGraw-Hill Construction on the green building market, in particular the *Commercial and Institutional Green Building SmartMarket Report*, in which the same percentage of respondents (76%) report lifecycle costs an important business motivator for new green building.

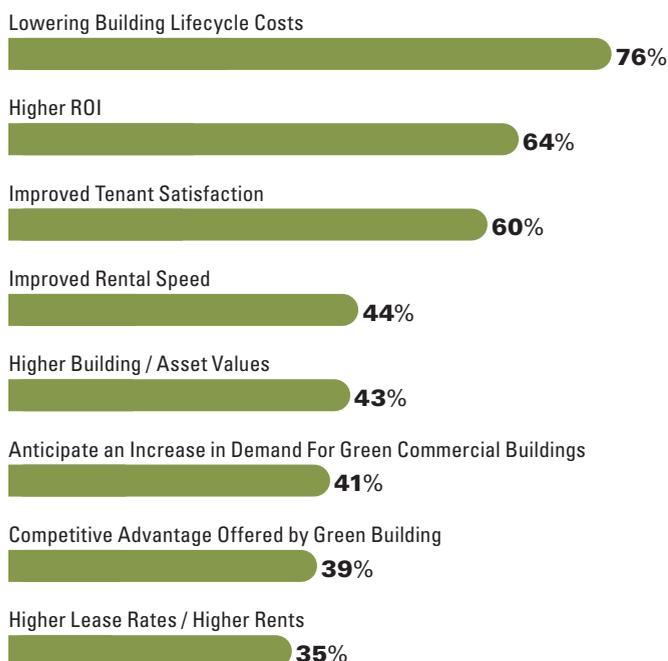
Owners

Direct financial benefits of the retrofit itself, not the expected desirability of the space to tenants, are the biggest business motivates for building owners to engage in a green retrofit project.

- **76% cite lowering building lifecycle costs.**
- **64% cite higher ROI.**
- **60% cite improved tenant satisfaction.**

Green Retrofit Business Motivation (Owners)

Source: McGraw-Hill Construction, 2009.



These results highlight the influence of the down economy:

- **LIFECYCLE COSTS:** Some owners reap the financial benefits directly because they have set up fixed utility rates in leases. Others will pass benefits along to tenants but can still market their properties based on reduced energy costs, potentially allowing for higher rents and faster turnaround when leasing.
- **ROI:** In an economic downturn, cost savings are particularly critical to achieving a higher return on investment.
- **TENANT SATISFACTION:** Tenant satisfaction may carry particular weight given the current economic downturn. Even in a strong leasing market, keeping tenants is more cost-effective than seeking new ones, so it is not surprising that tenant satisfaction is selected by a significant percentage of owners as an important driver for engaging in green retrofit and renovation activities. As vacancy rates continue to grow in the office sector in the second quarter of 2009, retaining existing tenants becomes even more critical.

The high level (60%) of owners who expect improved tenant satisfaction also speaks to trends documented in the *The Green Home Consumer SmartMarket Report* and *The Green Home Builder SmartMarket Report*. MHC research demonstrates that green building practices are associated with higher quality buildings, which could account for the strong connection indicated by building owners between tenant satisfaction and green practices.

While tenant satisfaction and direct financial payback are clearly the primary drivers for building owners to engage in green retrofit projects, many owners also indicate that attracting new tenants to their spaces is an important driver for engaging in green efforts. Most of the other factors measured—such as improved rental speed (44%) and the competitive advantage offered by a green building (39%)—provide insight into owner estimation of tenant demand for green. The level of response for these factors suggests that tenant demand can function as a driver for the green retrofit market, but that the majority of owners do not perceive a strong demand to date.

CONTINUED

Tenants

The greatest business motivation for tenants is lowering operating costs, followed by improved employee satisfaction.

Productivity gains were noted by almost half (48%) as another important business motive behind green retrofits. In commercial ventures, workers' salaries are the largest corporate expense.

According to the Building Owner and Managers Association and the Electric Power Research Institute, office workers' salaries are 83.4% of total annual commercial expenditures.

While productivity gains offer the largest potential for monetary paybacks, most types of work output are not easily measured. Therefore, these gains are infrequently tracked, especially with new green buildings. One study from Australia on productivity in a green law office revealed a 39% reduction in average sick leave days, a 44% reduction in the monthly average cost of sick leave and a 7% increase in lawyers' billing rates.

As the green retrofit market increases, more exact understanding of the impact of green building on employee productivity may be gained. Case studies on pages 40–64 offer some insight into these soft benefits.

Environmental and Social Motivations

The most important environmental motives are the same for both building owners and tenants.

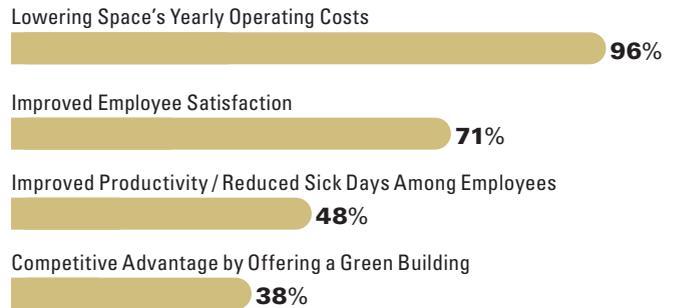
■ Eighty-nine percent of owners and nearly all (96%) tenants cite reduced energy use as the most important environmental motivation. Energy use is easily quantifiable, so reductions can be equated to financial savings without difficulty.

■ Most owners (87%) and tenants (79%) cite improved indoor environment/air quality as also important.

The high rate of response for these two factors is consistent with similar findings about environmental motivations behind new green buildings in the *Commercial and Institutional Green Building SmartMarket Report*.

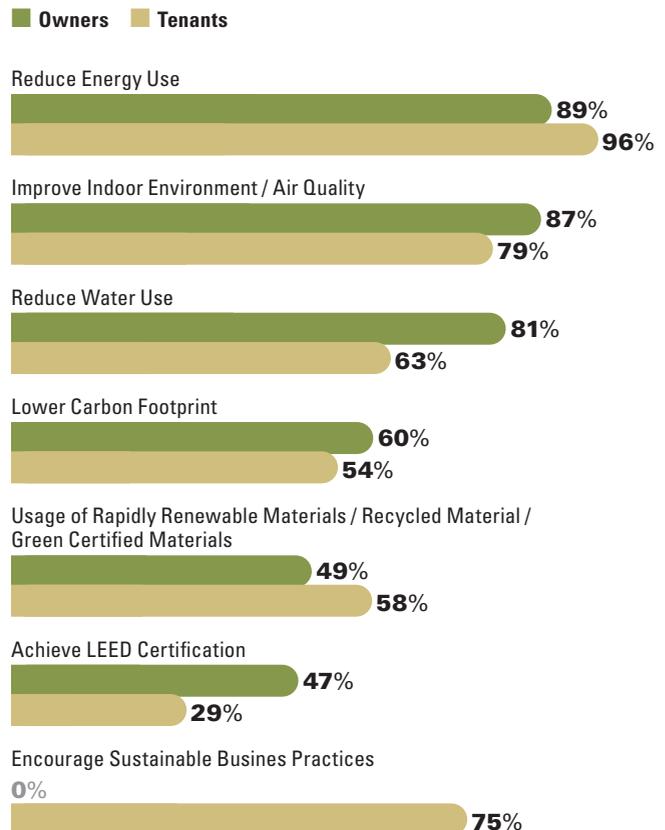
Green Retrofit Business Motivation (Tenants)

Source: McGraw-Hill Construction, 2009.



Environmental Motivations for Green Retrofit Projects

Source: McGraw-Hill Construction, 2009.



The case study data support these findings. For example, two of the three of U.S. General Services Administration (GSA) profiled green retrofit projects (see page 44) were in part motivated by the GSA’s interest in improving indoor air quality for their tenants.

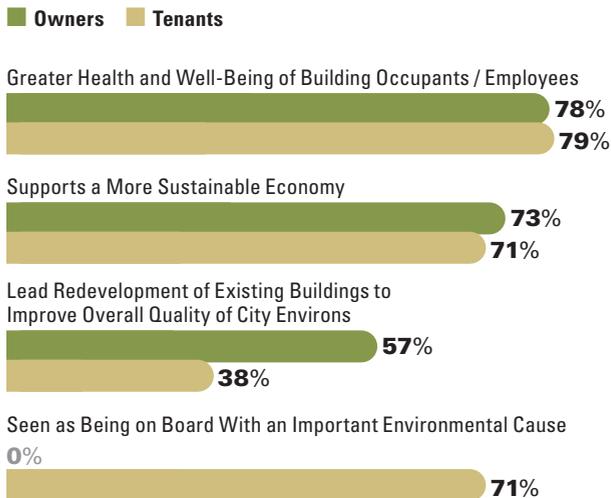
Nearly 80% of owners and tenants most often cite improved health and well-being of building occupants/employees as their top social motivator for going green in retrofit and renovation projects. This finding corresponds to the high level of concern about improved indoor environment/air quality as an environmental motivator.

Owners

Economic concerns are the primary motivation for owners. As shown on page 21, 81% of owners cite reduced water use as an important environmental motivation, making it the third most common environmental motivation for owners (behind reduced energy use and improved indoor environment). Aside from its environmental benefit, water conservation also provides a direct economic benefit for the owner.

Social Motivations for Green Retrofit Projects

Source: McGraw-Hill Construction, 2009.



Social motivations for building owners are inspired by a macro-level view of their building in relation to their immediate vicinity and the larger economy:

- **73% are motivated to support a more sustainable economy.**
- **57% want to redevelop existing buildings to improve the overall quality of the built environment in their cities.**

The value of real estate is tied to client perception of the building and its environs. Among firms who have already committed to green retrofits, therefore, it is consistent that they want to see growth in the overall and perceived value of sustainability.

As early adopters of green retrofit and renovation projects, these owners also frequently cite activities that have a less direct economic benefit but offer marketing potential:

- **60% aspire to lower their carbon footprint.**
- **49% are motivated to use renewable/recycled/certified materials.**

Tenants

While the smaller number of respondents makes specific conclusions difficult, there is a clear tendency that tenants are influenced by public perception of their company and the green movement in general.

- **SOCIAL: 71% want to be seen as being on board with the environment as a cause.**
- **ENVIRONMENTAL: 75% want to encourage sustainable business practices.**

Achieving Optimal Performance in Green Retrofit & Renovation Projects

Design, Benchmarking, Measurement & Reporting Critical to Achieving Success

As can be seen throughout the market research contained in this report, there is a significant portion of the industry unable to evaluate the full impact of their retrofit and renovation project(s). On page 14, a fifth of owners either don't know how to measure economic impact or they haven't done it.

Achieving the optimal performance of a project, however, requires good upfront planning, ongoing monitoring and appropriate end-use reporting to demonstrate returns.

However, with the wide array of methods, finding appropriate benchmarks, measures and reporting is complicated. As various industry players (including government, nonprofit organizations and trade associations) have pointed out for years, if measures are not evaluated based on appropriate benchmarks and comparable projects, it can make the eventual reported results misleading and not optimal for the ultimate goal of conducting those measures—improving the building performance and yielding financial, environmental and social benefits.

Designing for Performance

The design phase of a project is an ideal time to address different aspects of a green retrofit project, such as selection of products, systems and processes.

Integrated project delivery that involves all players in the project has been consistently reported by industry leaders and successful green project teams as key to efficient, cost-

effective solutions leading to better quality and higher performing buildings. In fact, many of the case studies profiled in this report involved teams that engaged with each other from the earliest stages of the project.

Virtual tools, such as Building Information Modeling (BIM), facilitate the exchange of information among project team members leading to a better and more-efficient work process. Furthermore, simulation models can help estimate a project's eventual energy performance. The industry is making these connections between BIM and green building. In McGraw-Hill Construction's *The Business Value of BIM SmartMarket Report* released in September 2009, 73% of the entire industry (owners, contractors, architect and engineers) expect use of BIM to increase on LEED projects—46% believe it will see a high increase.

Setting Effective Benchmarks and Measures

There are a number of ways that owners are creating benchmarks for the performance of their buildings, but there is wide variation in how they actually go about that measurement. Some forms of measuring energy use, tracking utility bills (before versus after or comparable to similar space by building type, size and location), conducting engineering audits and analysis and creating simulations with computer modeling tools (as mentioned above).

Finding the right measures is important both for making the internal business case as well as for justifying future projects.

Reporting and Transparency

There are several pressures underway encouraging—or even requiring—public reporting of building performance data, most notably around energy and water use.

One motivator has been the growing trend in legislative policies requiring public reporting of a building's energy use. Though mandates around specific reduction goals have not been set to date, this trend suggests that policy is moving in that direction. It also indicates that the Energy Star program, its Portfolio Manager and DOE's High Performance Buildings database will become more widely used and influential in the future.

Another market motivator may be the U.S. Green Building Council's new Building Performance Initiative, which includes a comprehensive effort to collect performance data from all LEED-certified buildings. Since USGBC has proved adept at previous market transformation initiatives, it will be notable to track this effort as well as the potential legal implications that might arise as a result.

Finally, competitive advantage will also play a significant role—particularly for commercial building owners. In fact, in the new study by Siemens and McGraw-Hill Construction, *2009 Greening of Corporate America*, 66% of a representative sample of C-suite executives of the largest firms in America report that competitive advantage is driving their corporate sustainability commitments and efforts. ■

Green Retrofit Triggers

Triggers

Energy costs and the desire for high performing/high quality buildings are the two top triggers for green retrofit and renovation activity by building owners.

- **ENERGY COST INCREASES:** Regarded as a critical trigger by the highest percentage of owners (72%) and tenants (71%).
- **SUPERIOR PERFORMANCE/QUALITY:** Regarded as a critical trigger by the second highest percentage of owners (68%) and by a similar percentage of tenants (63%).

These results are consistent with previous green building studies, including those conducted by McGraw-Hill Construction, suggesting that the factors that drive green construction are the same whether the project is new or a retrofit.

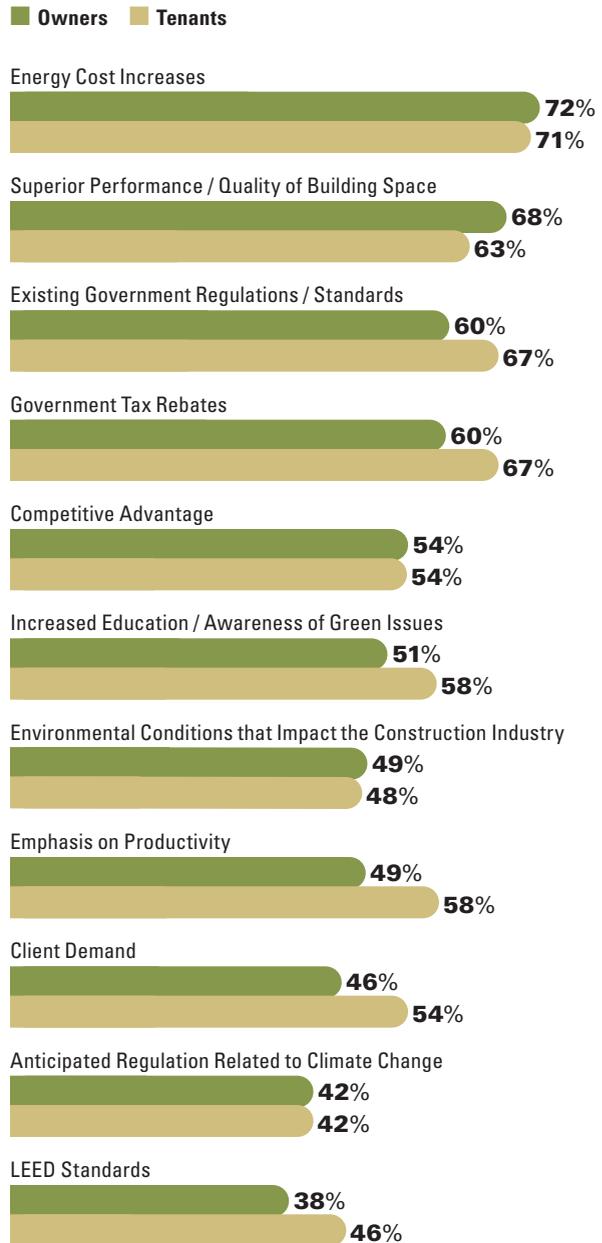
For industry players—building product manufacturers, design professionals, contractors—who want to encourage owners to engage in green building practices, energy cost increases and the desire for superior performance and quality are highly impactful, whether the proposed project is for a new building or an existing one.

In addition to the strong agreement about energy costs and building performance/quality as critical triggers, many other factors in the survey have a heavy impact on the decision of owners and tenants to go green. These include business issues—like competitive advantage, productivity concerns and client demand—as well as government regulations and incentives.

This result demonstrates that a single strategy to increase the green retrofit market is unlikely to succeed as well as a broad, multipronged approach that incorporates government mandates/incentives and market/profitability considerations would. This is also evident in the market because green building is still increasing even though the price of energy has gone down in recent months.

Most Important Triggers to Green Retrofit

Source: McGraw-Hill Construction, 2009.



Green Retrofit Challenges

Challenges

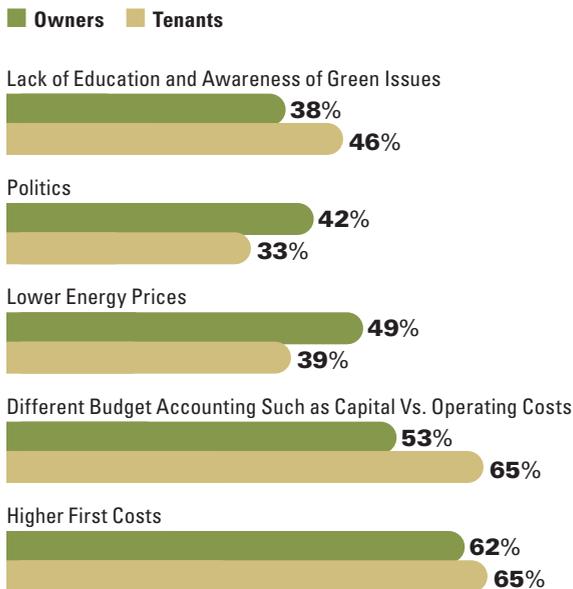
For both owners and tenants, financial concerns are also the biggest challenge to engaging in green retrofit projects.

- **PERCEIVED HIGHER FIRST COSTS:** Are the biggest challenge to going green, with 62% of owners and 65% of tenants selecting this as an important challenge.
- **DIFFICULTIES DUE TO ACCOUNTING ISSUES:** Also considered a significant challenge by 53% of owners and 65% of tenants.

These results are consistent with other studies on green building, including MHC's *Commercial and Institutional Building SmartMarket Report*. That report demonstrated that, generally, design and construction firms consider perceived higher first costs as a larger challenge than project owners.

Challenges with the Highest Impact on the Decision to Retrofit Green

Source: McGraw-Hill Construction, 2009.



Owners

In addition to higher first costs (62%) and different budget accounting (53%), owners also select lower energy prices (49%) as a challenge. This finding reinforces the findings in this study and in other industry research that bottom-line issues significantly impact owners when it comes to green building in any form.

While a segment of the leasing market is seeking green spaces, owners' responses reinforce that the green tenant market as a whole is still developing.

- 38% note lack of education and awareness of green issues as a challenge.
- 33% report lack of market demand as limiting their ability to go green. However, it is important to note that more owners (55%) do not perceive this to be an obstacle, compared to just one-third that do. Again, this suggests that to date, owners do not believe tenants are driving their green activity.

Tenants

Tenants are challenged differently than owners are. They perceive a bigger impact in different budget accounting and green washing concerns. They are *less affected* by politics as compared to owners.

- **DIFFERENT BUDGET ACCOUNTING:** The percentage of tenants who indicate that different budget accounting is a challenge is as high (65%) as those who select perceived higher first costs. This result may be due to the fact that owners more often engage in construction work as part of their regular course of business than do tenants.
- **GREENWASHING:** Even though more tenants indicate that greenwashing is not a significant challenge compared to those that do, it is still notable that significantly more tenants are concerned about this issue as compared to owners. This result is consistent with the fact that tenants may need to rely on owners' claims about the spaces they lease.

Data: Government Effect

Attitudes about Green and Energy-Efficient Policies

Energy Audits

Nearly half the owner respondents (46%) believe that energy audits will be mandatory within five years. This result may be influenced by the fact that all owners interviewed are early green retrofit adopters.

Tenants respond similarly to this issue, with 43% agreeing that energy audits will become mandatory.

Nearly one-third of owners and tenants are undecided about the likelihood of mandatory energy audits.

Job Creation

A majority of building owners (54%) and tenants (65%) agree that making buildings more energy-efficient will create new construction jobs. At least half of those who do not agree are ambivalent about it.

These results are consistent with the media's focus on energy efficiency and renewable energy as the main sources of new construction jobs. Green jobs are considered one of the prime benefits of the recent government legislation. For more information green jobs and related investment in preparing the workforce for these jobs, see page 27.

Stimulus Funding and the Energy-Efficiency Market

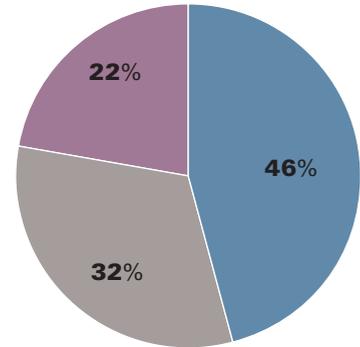
The American Recovery and Reinvestment Act (ARRA) encourages private commercial investment in green retrofit and renovation projects by providing additional funds for two programs administered by the U.S. Department of Energy—the Energy Efficiency and Conservation Block Grants program and the State Energy Program.

Tenants clearly feel the impact of the stimulus funding more than the owners do, with 70% expecting ARRA to catalyze the drive for energy efficiency in older buildings, compared to 38% of owners. This differential may be due to the fact that green retrofit and renovation projects undertaken by tenants tend to be smaller and involve fewer activities. Therefore, the grants available from federal incentives can cover a larger percentage of their total project cost. Further, if owners are viewing green activities as part of their standard business practices, incentives from government would have minimal influence.

Energy Audits Will Become Mandatory for Commercial Buildings within 5 Years (Owners)

Source: McGraw-Hill Construction, 2009.

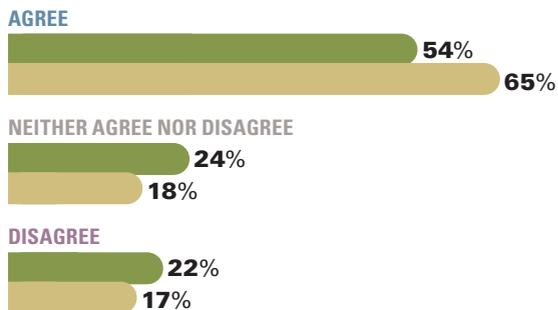
- Agree
- Neither Agree nor Disagree
- Disagree



Making Buildings More Energy Efficient Will Create New Construction Jobs

Source: McGraw-Hill Construction, 2009.

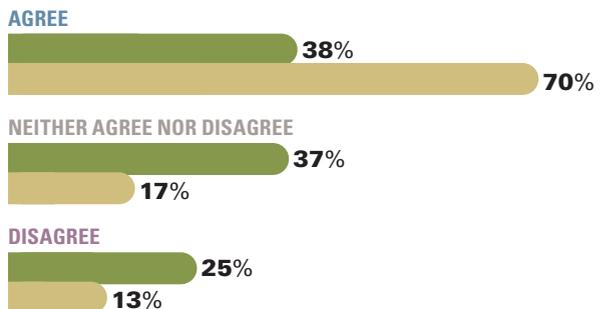
- Owners
- Tenants



ARRA Funding Will Catalyze the Drive for Energy Efficiency in Older Buildings

Source: McGraw-Hill Construction, 2009.

- Owners
- Tenants



Green Jobs and Training

Given the current economic downturn, increasing attention is being placed on job opportunities related to a 'green economy.'

Green Jobs in Construction

Although no specific, agreed upon definition for green jobs exists, they tend to focus on careers related to energy efficiency and renewable energy. Green jobs are considered professions that lead to greater protection of the environment, decreases in the impacts of climate change and global warming and reduction in energy use.

Several studies point to an increasing demand for green jobs related to retrofit and renovation activity in buildings. Most of the estimated job opportunities are based on expected changes in building codes and increases in renewable energy demand. Employment for green jobs covers both 'green collar' workers, such as laborers, HVAC technicians, electricians and carpenters, as well as traditional white collar jobs that support these industries, such as legal and consulting professionals.

New Training Required for Green Jobs

Many of the green jobs created by a growing green retrofit market will require re-training current construction workers. As a result, a number of different initiatives have emerged.

COMMUNITY COLLEGES

According to a 2009 report released by the National Council for Workforce Education and the Academy for Education Development, community colleges serve as a beneficial means for green jobs training because they

often have connections to local and regional labor markets and the flexibility to respond to emerging industries.

APPRENTICESHIPS

Apprenticeships, whether offered directly with employers or through labor unions, provide hands-on training for various green job trades. Combining both basic instruction and on-the-job training, apprenticeships link green-collar workers to actual job sites and increase the opportunity for future employment.

GREEN JOB CERTIFICATIONS

Non-profit organizations such as the North American Board for Certified Energy Practitioners (NABCEP) and the Building Performance Institute (BPI) are offering green job certifications. The NABCEP focuses on renewable energy and energy efficiency training with its Solar Photovoltaic and Solar Thermal Installer Certifications. BPI's certification areas include Building Analyst, Air Conditioning and Heating, Building Envelope and Multifamily.

Local Green Job Training

Below are a few examples of the many local green job training programs.

AUSTIN, TEXAS

In June 2009, the Austin Chamber of Commerce unveiled its green jobs training program as part of "Opportunity Austin 2.0"—an economic plan that includes development of green industries. Austin will take a multi-pronged approach relying on both the Austin Community College and local trade unions (e.g., electricians, plumbers, sheet metal workers) to provide green job training.

CALIFORNIA

On August 31, 2009, California Governor Schwarzenegger unveiled the nation's largest state-sponsored green jobs training program—the Clean Energy Workforce Training Program. The \$75 million in funding comes from grants from the ARRA, public-private partnerships and other state and local funding.

The program will focus its green job training on unemployed construction workers, existing workers who require re-training, low-income wage earners and youths seeking to enter the workforce.

SOME OTHER PROGRAMS

- **Chicago, IL: Green Corps Chicago runs one of the oldest green-collar training programs in the country.**
- **Washington, DC: The Green Jobs Advisory Council was set up to help city agencies develop green job training policies.**
- **Wisconsin: The Regional Training Partnership has built relationships to facilitate green job creation.**

Trade Unions and Green Jobs

In addition to regional and state-wide initiatives, unions are also engaging in green jobs training. Two examples:

- **32BJ Service Employees International Union (SEIU)'s "One Year, One Thousand Supers" green jobs training program.**
- **Laborers Local 55, as part of a pilot program in Newark, NJ, is reaching out to non-union members to train underemployed and unemployed residents of Newark on green retrofits by the fall of 2009.** ■

Impact of the American Recovery and Reinvestment Act (ARRA)

GREEN BUILDING RETROFIT AND RENOVATION DATA

The majority of building owners and tenants believe that targeted financial incentives in the ARRA can affect very specific activities, but they cannot impact the general corporate decision to go green.

The impact of ARRA on a company's decision to go green seems to be minimal. Only 16% of owners and 17% of tenants report being influenced by ARRA in their company's decision to go green. This suggests that the incentives available in ARRA are not sufficient to convince most companies to embrace overall green policies, even though they welcome the benefits.

For many of the respondents, the decision to embrace green practices was made before the stimulus bill was passed and often for internal cost savings and competitive advantage.

Expectations about ARRA impact on green retrofitting in particular are significant. Sixty-one percent of owners and 74% of tenants agree that ARRA will impact the green retrofit market overall.

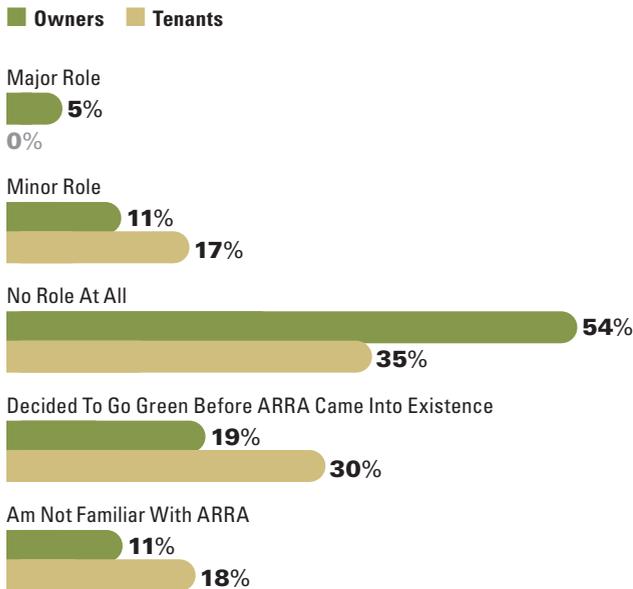
A significant percentage of respondents expect to see ARRA impact green retrofit and renovation activity in both commercial and government buildings:

- **OWNERS: 90%**
- **TENANTS: 71%**

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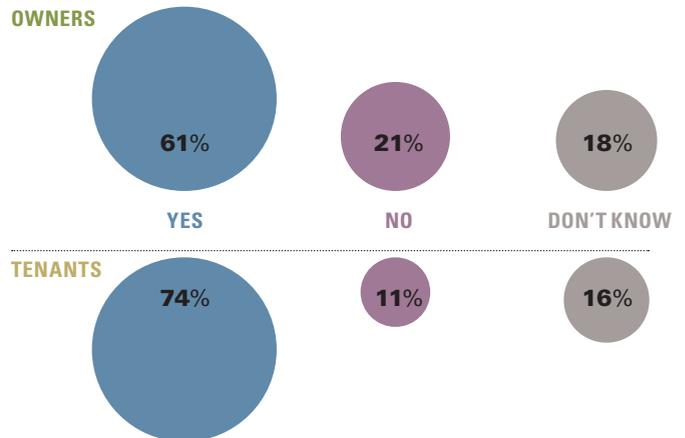
Role of ARRA in Going Green

Source: McGraw-Hill Construction, 2009.



Will ARRA Affect Green Retrofitting?

Source: McGraw-Hill Construction, 2009.



Effectiveness of Government Incentives

The response to the ARRA impact on green retrofit and renovation activity supports the larger trend evident in the owner and tenant data in general. Government mandates and incentives have an impact on the size of the green building market. However, that market is ultimately driven by the underlying business case for green retrofits.

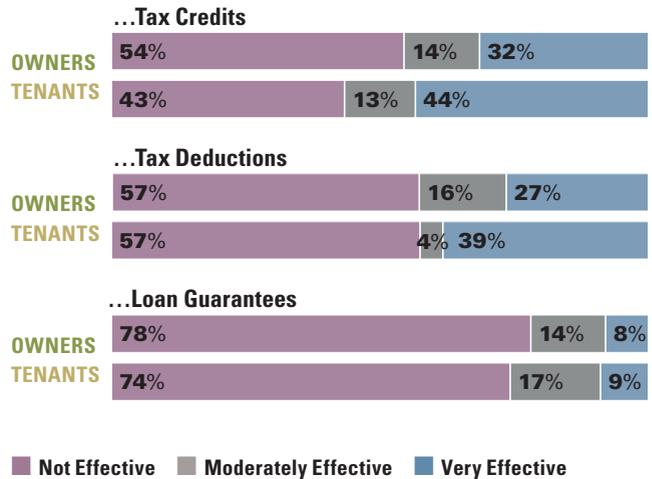
Owners and tenants consider tax credits and deductions far more effective than loan guarantees. In general, owners' and tenants' views correspond on the effectiveness of the three types of government incentives. The expectation that the ARRA will increase green retrofit and renovation activity corresponds to this finding since the stimulus largely uses tax incentives to encourage investment in high-performance retrofit projects.

- **TAX CREDITS:** Deemed the most effective overall, they are considered at least moderately effective by:
 - 46% of owners
 - 57% of tenants
- **TAX DEDUCTIONS:** 43% of owners and tenants identify them as at least moderately effective.
- **LOAN GUARANTEES:** Roughly three-quarters of the owners and tenants surveyed indicate that loan guarantees are not effective.

Effectiveness of Government Incentives

Source: McGraw-Hill Construction, 2009.

Effectiveness of...



Government Policies Driving Green in Existing Buildings

Government actions—including legislation, policy, voluntary programs and financial incentives—have a long history in encouraging green practices in existing buildings.

Government Voluntary Programs

The federal government has several strong voluntary programs that support green building efforts.

The Energy Star program (joint U.S. Environmental Protection Agency (EPA) /U.S. Department of Energy (DOE) program) is widely popular, and it has led to energy reductions in buildings as well as in the appliances, products and equipment located in those buildings. Energy Star's Portfolio Manager is increasingly being used by building owners as legislative trends shift toward public reporting of building energy consumption. The EPA also has voluntary programs around water efficiency in buildings (WaterSense) and corporate climate change commitments (Climate Leaders).

DOE initiatives include its high performance buildings database, its encouragement of new technology and innovation adoption in order to create marketable Net-Zero Energy Buildings (NZEB), and the Commercial Building Energy Alliances, which bring together building owners to create market shifts.

Executive Orders

An effective mechanism for increasing green building activity at the federal level has been the use of Executive Orders.

- **Clinton Administration: Required federal agencies to implement energy efficiency and water**

conservation (2004); also initiated a project to green the White House

- **Bush Administration: Supported energy and water efficiency in federal facilities (2007)**
- **Obama Administration: Issued an order requiring federal agencies to measure, manage and reduce greenhouse gas emissions (2009). Included are specific goals for water efficiency, recycling and waste diversion, and implementation of the 2030 NZEB requirement.**

Federal Legislation

- **The Energy Policy Act of 2005: Provided tax credits for energy efficiency and renewable energy in buildings, homes and products.**
- **The Energy Independence Act of 2007: Established targets for DOE's NZEB by investing in education and research in energy efficiency and renewable energy, and also funded energy-efficiency training.**
- **The Emergency Economic Stabilization Act of 2008: Extended the 2005 energy-efficiency tax credits to 2013.**
- **The American Recovery and Reinvestment Act (ARRA): Included many provisions encouraging investment in energy-efficiency improvements in buildings, primarily existing ones, with total allocation of approximately \$26–\$30 billion.**
 - Specific allotments were issued to a number of federal agencies including the U.S. General Services Administration, DOE, Department of Defense, Department of Housing and Urban Development and Department of Veterans

Affairs for hospital and medical facility upgrades.

- \$9.75 billion was dedicated to schools, but not specifically to construction. However, MHC's Dodge Network identifies a number of ARRA-funded education renovation projects as green or energy-efficient, which suggests that some ARRA funds are being directed toward greening existing school buildings.

Climate Change Legislation

Congress and the Obama administration are working on creating climate change legislation—particularly as the U.S. faces mounting international pressure to do so.

While the U.S. House of Representatives passed the American Clean Energy and Security Act in June 2009, the U.S. Senate version faces challenges both inside and outside Congress.

However, one area of relative agreement for policymakers and industry players is around the energy efficiency of buildings. Given this relative support, it is likely that whatever policy emerges will have provisions dedicated specifically to greening existing buildings.

State and Local Initiatives

Many state and local initiatives focus on encouraging the greening of existing buildings. Fourteen states offer corporate tax incentives for energy efficiency, and others provide loans and other incentives through block grants and state revolving funds. For more information on specific state programs, see the DSIRE website at www.dsireusa.org. ■

Data: Green Retrofit Practices

GREEN BUILDING RETROFIT AND RENOVATION DATA

Use of Green Consultants

About one-third of owners and tenants hired a green consultant on their projects.

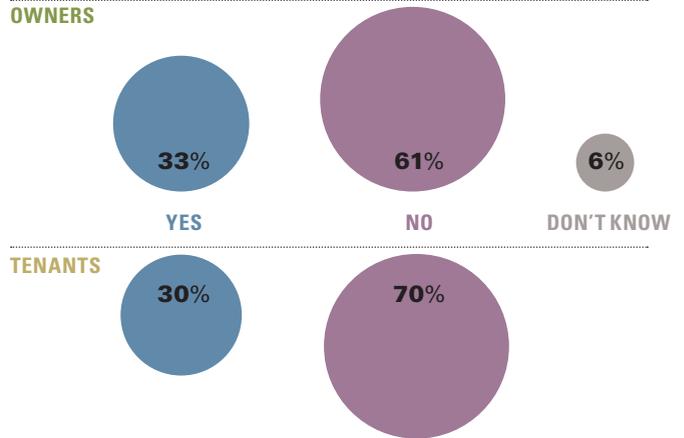
- Among those who did hire a green consultant, the only required skill reported by a significant percentage of respondents was LEED knowledge/accreditation.

Since the majority did not hire outside experts, they must either have in-house staff who understand green construction practices and processes or rely on design and construction professionals with sufficient green expertise.

This result demonstrates that, as the green retrofit market continues to grow, more opportunities will be available for design and construction firms that can provide green expertise. The market has already responded with the continual growth of LEED Accredited Professionals (APs) in design and construction firms as well as the U.S. Green Building Council's shift to include continuing education credits and practical experience for ongoing accreditation under the LEED AP designation.

Hired Green Consultant

Source: McGraw-Hill Construction, 2009.



Level of Green Retrofit Activities

As early adopters, owner and tenant respondents are committed to greening their projects, with the majority citing engagement in at least four green building activities in a typical retrofit project.

- 81% of owners engage in four or more green activities in a typical retrofit or renovation project.
- 45% of tenants report the same.

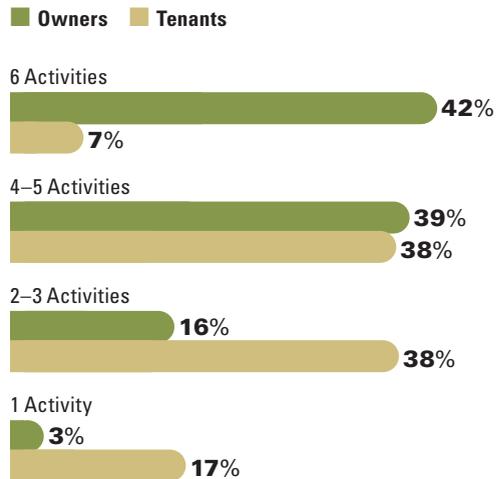
This result suggests that retrofits and tenant fit-outs involve more than simple quick fixes and easy initiatives like upgrading light bulbs and replacing carpets.

As a result, the green retrofit and renovation market provides significant opportunities for product manufacturers and green building service providers that offer environmental and performance benefits other than energy efficiency.

CONTINUED

Number of Green Retrofit Activities

Source: McGraw-Hill Construction, 2009.



Types of Green Retrofit Activities

Owners

Building owners focus on a number of activities that result in financial savings.

- **All owners (100%) report installing more energy-efficient lighting or making more use of natural light.** Because lighting accounts for roughly 37% of the energy use in a commercial building, the potential savings can equal 25–50%. Lighting is also relatively inexpensive to replace, so the payback time is minimal.
 - **92% of owners installed energy-efficient mechanical and electrical systems.** Because of the up-front investment these systems require, the fact that such a high percentage engage in this practice reveals a strong commitment to energy savings and a long-term perspective on the advantages of green retrofitting.
 - **71% installed more water-efficient plumbing.** This corresponds with the results of the *Water Use in Buildings SmartMarket Report*, which reveal that 85% of the industry ranks water use reduction as an important green building practice.
 - **61% upgraded the building envelope.** Building envelope improvements also offer significant efficiency gains and can lead to strong energy cost savings.
- Owners also engage in green retrofit activities that lead to greater tenant satisfaction and that may result in long-term tenant retention.
- **79% engaged in an activity that improved occupancy comfort.**
 - **Increased daylighting has been associated with increased occupant satisfaction and productivity.** Studies demonstrate that natural light increases productivity and improves health and well-being in medical facilities. Studies of schools also reveal the positive effects of natural light on achievement, health and productivity.

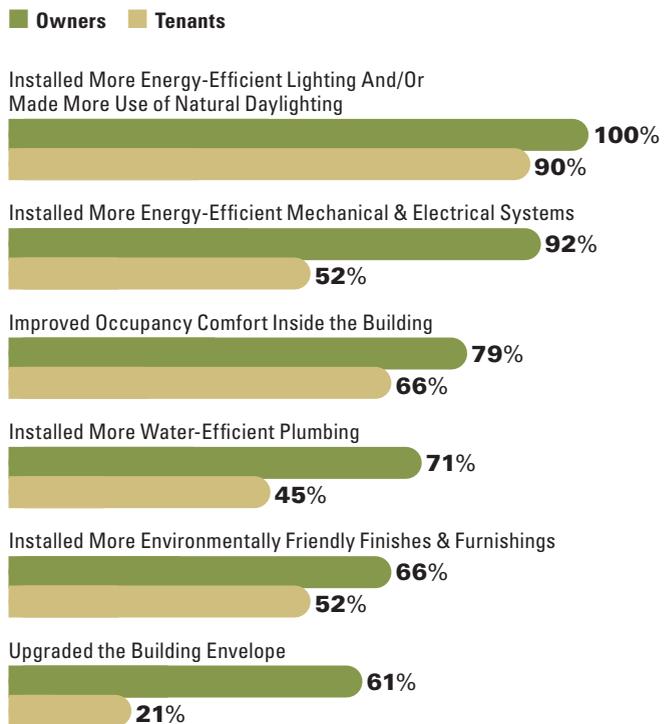
Tenants

Tenants' activity levels are generally lower than owners' and their participation in each individual activity reflects that.

Activities that more than half of the tenants report engaging in also cover the range of product areas, with most focused on installation of more efficient lighting or increasing daylighting, and in improving employee comfort—both key factors toward employee satisfaction.

Green Retrofit Activities

Source: McGraw-Hill Construction, 2009.



Specific Green Retrofit Systems and Product Types

HVAC systems, most lighting improvements (including occupancy sensors, controls and light shelves), nontoxic cleaners and low-emitting materials are all selected by the majority of respondents as specific materials and systems they use in green retrofit and renovation projects.

Energy-Efficient Mechanical Systems

Nearly all owners (91%) and tenants (93%) who installed energy-efficient mechanical and electrical systems included a new HVAC system.

Energy-Efficient Lighting

The majority of building owners installed energy-efficient lighting systems, occupancy sensors and individual controls.

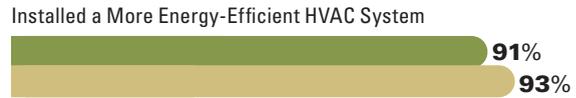
Tenants were very active in all types of improved lighting, with at least 70% involvement in all categories.

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Energy-Efficient Mechanical Systems

Source: McGraw-Hill Construction, 2009.

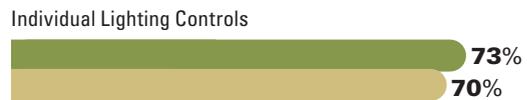
■ Owners ■ Tenants



Energy-Efficient Lighting

Source: McGraw-Hill Construction, 2009.

■ Owners ■ Tenants



Occupancy Comfort

Ensuring use of nontoxic cleaning products is the most common activity owners are engaging in related to the improvement of occupancy comfort. Those improvements that involve construction and have a much more significant impact on occupancy comfort, such as installing controls or monitoring systems, are also reported to be used by at least half of the owners surveyed.

Tenants appear to be concerned with complying with ASHRAE Standard 62 as well.

Other Product Systems and Types

While the small number of owners and tenants surveyed who use the remaining green building practices (see page 32 for those percentages) precludes quantitative conclusions. However, some trends can be gleaned from the responses.

WATER-EFFICIENT PLUMBING

The most popular categories are:

- Installing low-flush toilets
- Installing high-efficiency fixtures

ENVIRONMENTALLY-FRIENDLY FINISHES AND FURNISHINGS

The most popular categories are:

- Low-emitting materials (paints/adhesives/carpets) are used by nearly all owners and tenants engaged in this activity (see page 32 for overall level of use).
- A little more than half used the following:
 - Certified wood
 - Rapidly renewable materials
 - Composite wood and agrifiber products that do not contain urea-formaldehyde resin

UPGRADE BUILDING ENVELOPE

The most popular categories are:

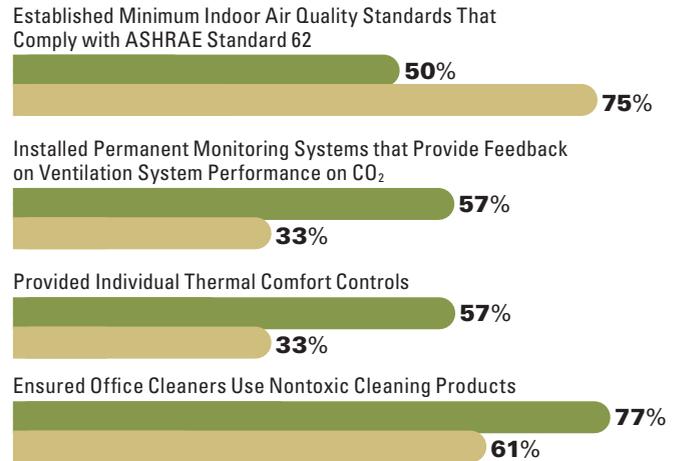
- Installing high-performance windows
- Adding insulation

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Improved Occupancy Comfort

Source: McGraw-Hill Construction, 2009.

■ Owners ■ Tenants



Green Building Products

Product Brand Awareness

Less than half of the respondents are able to name a green building brand for seven out of the nine product categories surveyed. This suggests a broad market opportunity for building product manufacturers to increase their green brand reputation.

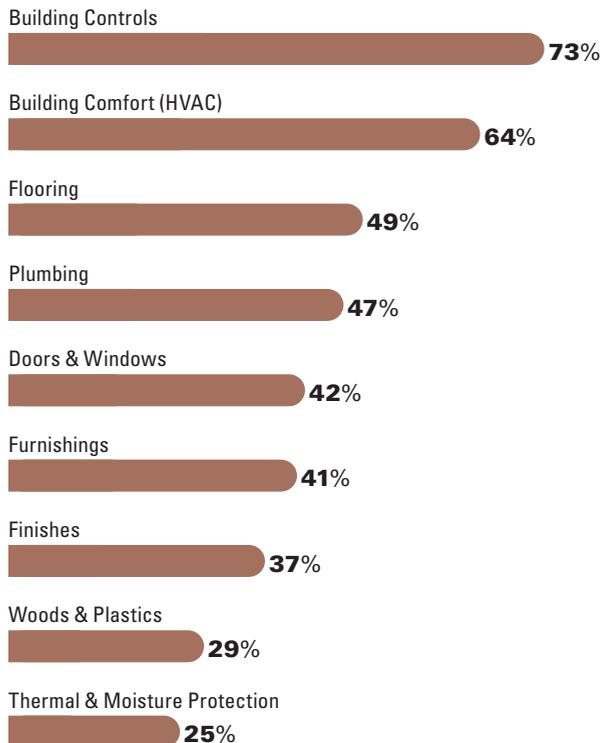
Two building product categories have a high level of green brand awareness:

- **BUILDING CONTROLS: 73%**
- **BUILDING COMFORT (HVAC): 64%**

These results are consistent with the ability of a representative sample of owners (in the *Commercial and Institutional SmartMarket Report*) as well as architects and contractors (in two separate surveys— *Commercial and Institutional SmartMarket Report* and *Water Use in Buildings SmartMarket Report*) to also cite a green building product brand. This similarity suggests owners and tenants are actively thinking about green products and not relying only on architect and contractor recommendations.

Ability of Survey Respondents to Name Any Green Brand

Source: McGraw-Hill Construction, 2009.



Top-Of-Mind Brands Mentioned by More than One Respondent

Source: McGraw-Hill Construction, 2009.

PRODUCT CATEGORY	Product Brand with the Highest Awareness
BUILDING CONTROLS	Johnson Controls 20%
	Siemens 7%
	Honeywell 7%
	Trane 7%
	Automated Logic 3%
BUILDING COMFORT (HVAC)	Trane 31%
	Carrier 7%
FLOORING	Shaw 14%
	Armstrong 5%
	Interface 5%
	Mohawk 3%
PLUMBING (TOILETS & SINKS)	Kohler 12%
	Toto 10%
	Sloan 5%
	Polar 5%
DOORS & WINDOWS	Pella 9%
	Andersen 7%
	Stanley 3%
FURNISHINGS	Herman Miller 10%
	Steelcase 7%
FINISHES	Sherwin Williams 9%
	The Home Depot 5%
	Benjamin Moore 5%
WOODS & PLASTICS	Weyerhaeuser 9%
	Georgia-Pacific 5%
	Formica 3%
THERMAL & MOISTURE PROTECTION	Owens Corning 7%
	CertainTeed 3%

Data: Performance Ratings & Green Certification

Use of Green Certification Systems

Only a few owner (16%) and tenant (13%) respondents currently use a green certification program for their green retrofit and renovation project(s).

When these respondents were asked which certification program they use, the most commonly cited are LEED and Energy Star. The unprompted responses reveal confusion about the distinction between green building and energy efficiency in general, as well as confusion about certification versus benchmarking the performance of a specific aspect of green building (e.g. energy), such as that provided by Energy Star Portfolio Manager.

Use of Energy Star Scoring

To date, the percentage of owners who have used Portfolio Manager to calculate the Energy Star score for their buildings is very low, at just 8%. **However, that percentage more than doubles to nearly one-fifth (19%) after completion of a green retrofit project.**

The relatively low use of Energy Star Portfolio Manager is consistent with the fact that less than one-third of building owners are engaging in any level of measuring performance of their buildings (see page 14).

Future Implications

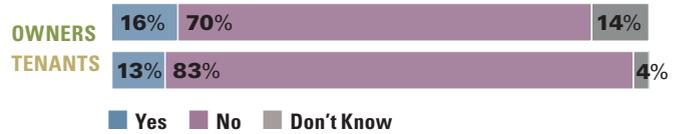
Already in Washington, D.C., and California, building owners are being required to report their building's energy consumption. These policies reflect a legislative trend toward requiring more public reporting and transparency around building energy consumption and emissions. This required reporting suggests a future legislative trend benchmarks and emission reduction goals, since these are only possible with measurement systems and reporting mechanisms already in place.

Owners that recognize this coming trend and start to engage in setting performance goals and establishing measurement systems will be well-positioned to meet future legislative requirements as well as to gain competitive advantage.

The new LEED 2009 standards will also impact measurement of basic energy and water use. For all LEED 2009 projects, the USGBC is requiring energy and water use data for five years after certification.

Use of Green Certification Programs

Source: McGraw-Hill Construction, 2009.



Company Has Calculated Energy Star Score using Portfolio Manager

Source: McGraw-Hill Construction, 2009.



Green Retrofitting in the Global Marketplace

China Slowly Turns to Existing Buildings for Savings Opportunities

After years of steady growth in the U.S., green retrofitting is beginning to gain visibility in construction markets around the world. In recent years, construction in rapidly growing emerging markets such as the UAE, India and China has been focused on highly visible, large-scale projects breaking boundaries in scale, iconic design and height. However, in the wake of the global financial crisis, and as these countries face increasing global pressure to make carbon emission reductions, they are beginning to look at existing building stock for dramatic savings in natural and financial resources.

China provides an interesting model of the potential impact of and obstacles to widespread improvement to the efficiency of existing buildings.

Green Building Growing in China

In China, signs of a growing commitment to energy efficiency indicate a steady and significant shift toward green design and construction. Green building standards—including the country's own Three-Star label and an increasing presence of LEED-registered projects (USGBC cites 265 as of August 2009)—and the creation of a China Green Building Council in March 2009 indicate further changes in this carbon-heavy economy.

Government Enforcement Required to Green Existing Buildings

Despite the increased presence of green building practices in new

construction, industry players are looking to the Chinese government to tackle the issue of greening their existing building stock. In 2006, the Chinese Ministry of Construction announced energy efficiency targets through 2010 that called for 50% improvement and use of renewable energy in 25% of new buildings, as well as a range of targets for improved efficiency in existing and public buildings. However, measuring the success of these targets is complicated by the scattering of enforcement responsibilities across regional and local construction administration departments.

Moving forward, more consistency and stringency in the implementation of energy policies will be needed to ensure measurable results. "There is significant potential for China's building sector," Kevin Mo, senior sustainable building specialist at the Natural Resources Defense Council, said in August at McGraw-Hill Construction's third annual China Green Building and Energy Efficiency Conference in Shanghai. "If all our buildings complied with current energy standards, it would have a tremendous impact."

Potential for Growth in Chinese Green Buildings

With an estimated 44 billion square meters of existing buildings—projected to contribute 30% to the country's total energy consumption in the coming years—China's market opportunity for green retrofitting is tremendous. A range of obstacles exist including a lack of education about the potential savings from

small upgrades—generally preferred among owners—and China's energy-efficiency standards for existing buildings that are currently optional.

Despite the setbacks, the market is showing signs of growth. Large-scale owners in China, such as Starbucks, Nike and Shanghai's own Jin Mao tower, which recently achieved 20% increased savings through simple operational improvements, are already achieving benefits through portfolio-wide retrofits and upgrades. According to Don Anderson, vice president at ICF International, "Energy prices in China are at or above international levels, so many solutions here will be equally beneficial in terms of cost."

Initiatives such as the U.S.-China Sustainable Building Partnership, a program overseen by the U.S. Agency for International Development, and other partnership efforts led by the U.S. Department of Energy are helping create case studies that demonstrate the savings potential of green upgrades for buildings in China. Product manufacturers are also contributing to awareness through their own educational efforts, such as classroom educational programs about green lighting run by Philips Lighting.

However, the real boost in activity will require buy-in from key owners and stakeholders. "If we just continue with the current renovation rate, it's going to take decades to really make a major impact," says Olivier Piccolin, senior vice president and chief commercial officer for Philips Lighting Commercial Asia. "It's just not sustainable." ■

Methodology:

Green Retrofit Study Research

Research Data

The survey research focused on the extent of green retrofit tenant improvements or renovations of existing commercial buildings across the U.S. from the perspective of both building owners and tenants. The study was conducted from May 20 to June 12, 2009.

A representative nationwide sample of 738 existing office and retail commercial buildings, with square footage ranging from 5,000 sq. ft. to in excess of 200,000 sq. ft was provided by CB Richard Ellis. The sample was composed up of both building owners and tenants who leased space in the buildings. There were no instances where both the owner and the tenants of the same building were interviewed.

A total of 61 completes were achieved dispersed geographically across the U.S. This total sample size benchmarks at a 90% confidence interval with a margin of error of +/-10%. Findings where the n was less than 15 are considered qualitative in nature and point to trends in the write-up versus any representative statement.

For the purposes of this study, a “green retrofit” was defined as the addition (or replacement) of new green technology or features to an older existing building that has the net effect of reducing the building’s impact on the environment. In order to qualify as a “green retrofit,” the following screening criteria had to be met:

- Own or rent space in a commercial office or retail store building which was at least five years old.
- Have already completed or plan to complete at least two activities in

each of the following categories (which map against the U.S. Green Building Council (USGBC) LEED for Existing Building: Operations and Maintenance):

- Installed more environmentally-friendly finishes and furnishings (e.g., laid new flooring made from rapidly renewable materials; installed interior composite wood containing no added urea-formaldehyde resins; used low-emitting interior paints/coatings/adhesives/sealants; used FSC-certified wood)
- Installed more energy-efficient mechanical and electrical systems (e.g., more energy-efficient HVAC system; geothermal heating and cooling system; electrical power from a green energy provider)
- Installed more water-efficient plumbing (e.g., low-flush toilets; recycled rain or wastewater for toilet flushing)
- Installed more energy-efficient lighting and/or made more use of natural daylighting (e.g., LED lighting; individual lighting controls; increased use of natural daylighting)
- Improved occupant comfort inside the building (e.g., better internal air quality; occupancy sensors)
- Upgraded the building envelope (e.g., installed a green/vegetated roof system; installed low-emissivity energy films on windows; replaced exterior hinged doors with revolving doors; added insulation between the interior and exterior walls)

- Committed to spending at least \$50,000 on retrofit tenant improvements or renovations.

Case Studies

The 19 profiled case studies were compiled using a number of sources, including the USGBC LEED Certified Project list, editors at *GreenSource* magazine, recommendations of sponsors and partners and input from other MHC subject-matter experts. Decisions were made independently by MHC SmartMarket editorial staff based on geographic location, building type and quantitative results. All interviews were conducted by MHC staff. As a minimum requirement, every case study building had to have actual energy reduction and water reductions, with documentation for verification. In nearly all cases, projects were compared against their previous space. Where not applicable, comparative benchmarks were applied. MHC corroborated data with various sources.

Categories of case studies:

- **Age of Building that Was Retrofitted/Renovated:**
 - 11 built prior to 1950 with several on the National Register of Historic Places.
 - 8 built after 1950.
- **Multi-Tenant and Owner-Occupied Buildings:**
 - Solely owner occupied: 11
 - Buildings with multiple tenants: 6
 - Tenant fit-outs: 2
- **Building Types:**
 - Office: 12
 - Other (e.g. restaurant, theater, courthouse, childcare, school, manufacturing): 7
- **Level of Investment:**
 - Half \$1 million and \$5 million.
 - 25% below \$1 million.
 - 25% over \$5 million

Introduction:

Results Achieved

While each project featured resulted in water and/or energy savings, either as compared to previous facilities or as compared to standard buildings of its type, there is no clear pattern in the savings achieved. Energy savings range from 10% to 59%, and water savings range from 22% to 79%.

However, with respect to expected payback on investment, a clearer trend emerges. Almost all of the projects calculating payback expect to achieve it in 5 years or less.

Key Trends Revealed by the Case Studies

Retrofit Today Versus the Past

Projects that were conducted within the last few years explicitly state that greening posed no particular problems. However, those that conducted projects earlier reported significant challenges associated with making their projects green. Many of the project managers on the more recent green retrofit projects feel that making their projects green was just “common sense.”

Achieving Results

While a few of the green retrofit projects do feature renewable or cutting-edge technology, a significant number report that their best results were achieved from common, off-the-shelf technologies like insulation. A consistent focus on achieving energy efficiency may account for this trend.

Multi-Tenant Buildings

In multi-tenant buildings, engaging tenants is critical to achieving maximum building performance

With only a few minor exceptions, tenants embrace the idea of going green. Even where there was initial resistance to issues like recycling and waterless urinals, every case study reported eventual tenant support.

Owner-Occupied Buildings

Most owners of buildings that are solely owner-occupied place more emphasis on budgetary concerns than do owners of tenant or multi-tenant buildings (with the exception of the multi-tenant owners who are also non-profit organizations). Marketing strategies aimed at this group should emphasize cost competitive green products and services.

LEED EBOM Versus Other LEED Rating Systems

LEED EBOM differs from other LEED rating systems in that participants consider greening the building to be a process rather than a single activity. **No strong distinctions were made between process improvements and small renovations when achieving LEED EBOM certification was the focus of the project.**

Greening Historical Buildings

Historical buildings present specific challenges and certification problems that restrict the green possibilities that can be pursued, but they also offer strong potential for greening. Many owners report “recovering” the original performance of the building.

Case Studies in this Report:

- 40 Center for Neighborhood Technology, CHICAGO, IL
- 42 Carriage House Child Care Center, PITTSBURGH, PA
- 43 Thought Leader Perspective: **Bob Peck, GSA**
- 44 **U.S. General Services Administration (GSA)**
Howard M. Metzenbaum
United States Courthouse, OH
John J. Duncan Federal Building, TN
U.S. Custom House, PORTLAND, ME
- 46 100 Montgomery Office Building, SAN FRANCISCO, CA
- 48 Idea Center at PlayhouseSquare, CLEVELAND, OH
- 49 Scowcroft Building, OGDEN, UT
- 50 Iconic Green Retrofit: **Empire State Building**
- 51 Skanska NY Headquarters, EMPIRE STATE BUILDING, NEW YORK, NY
- 52 SoFlo Office Studios, SAN ANTONIO, TX
- 53 Founding Farmers, WASHINGTON, DC
- 54 Thought Leader Perspective: **Adrian Smith & Gordon Gill on the Green Retrofit Marketplace & Upgrading the Historic Willis Tower**
- 56 Merchandise Mart Building, CHICAGO, IL
- 58 Armstrong Headquarters Building, LANCASTER, PA
- 59 One Harvard Circle, Suffolk Construction Southeast Headquarters, WEST PALM BEACH, FL
- 60 National Life Office Building, MONTPELIER, VT
- 61 Mountain Gear Headquarters and Warehouse, SPOKANE, WA
- 62 Loyola Elementary School, LOS ALTOS, CA
- 63 200 Market Office Building, PORTLAND, OR
- 64 PepsiCo Headquarters Building, CHICAGO, IL

Center for Neighborhood Technology

Keeping Green Building Affordable—Platinum Certification on a Budget

CHICAGO, IL

Motivation to Green

Before green building retrofits entered the common industry vernacular, the Center for Neighborhood Technology (CNT) had already purchased a former 1920's weaving factory and, in 1989, turned the upper two floors into a workable office space through an energy-efficient retrofit. By 2000, this 31-year old non-profit organization dedicated to livable and sustainable communities had outgrown its space and decided to retrofit the entire building.

Working within a tight budget, CNT's office building became only the second LEED Platinum building in Chicago. As Nicole Gotthelf, director of development and communications, put it, "We wanted to show that a non-profit could do this [green retrofit] with very little bells and whistles We got people involved in a way that they didn't even think about being green at the time."

The three primary goals for the project included:

- **Achieving LEED Platinum at a cost comparable to conventional rehab.**
- **Prioritizing energy efficiency.**
- **Serving as a demonstration project for others.**

In addition to the primary motivations, CNT's ultimate goal was to implement sustainable practices as an ongoing process. "Constructing to LEED Platinum was a natural choice given CNT's longstanding commitment to sustainable development," says Kathy Tholin, CEO. "But our job is far from complete. Now that we're utilizing the space, sustainability means focusing on ongoing operations and maintenance. We're striving for continuous improvement."

Achieving Green Within a Basic Budget

When asked about CNT's green renovation, Stephanie Folk, the communications and marketing manager at CNT Energy, comments, "One of the most unique aspects about the project is that it was accomplished on a budget similar to that of a standard retrofit. We came up with a variety of creative ways to keep costs down in a LEED Platinum building." These included, but were not limited to: patchwork carpet of recyclable tiles that can be removed/added one tile at a time (as opposed to one consistent carpet scheme); a conference table made out of reclaimed marble from old bathroom dividers from a local school; and wood from fir tree beer barrels used to construct the stairway.

With building costs at \$82/sq.ft., CNT aimed to balance its goals of keeping costs low and maximizing energy efficiency. To achieve this, CNT used "state of the shelf"

CONTINUED

stats

Scope of Project

Major building renovation

Project Type

Office

Original Building Age

1920s

LEED Rating

LEED-NC Platinum

Location

Chicago, IL (urban)

Project Start/End
2000/2003

Players

Owner

Center for Neighborhood Technology

Contractor

Phoenix Builders

Designer/architect

Jonathan Boyer, Farr Associates

Consulting Engineers

- EME Consulting Engineers
- CxA, LEED AP
- J.T. Katrakis & Associates



Center for Neighborhood Technology, Chicago, IL

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Center for Neighborhood Technology

CHICAGO IL

technologies and quality construction practices to focus on the energy efficiency basics—tight envelope, high insulation levels and high efficiency systems. These practices paid off for CNT and resulted in energy costs of only \$1.29/sq.ft.—a 46% reduction in energy use (average for 2005–2007) compared to that of a conventional building.

Overcoming Challenges: Available Experience

In order to achieve these cost savings, various challenges arose, and overcoming them was especially important to CNT as an early adopter of LEED back in 2000. Rachel Scheu, Green Building Research Coordinator CNT Energy, says, “There were not a lot of contractors in place at the time who had experience in this green arena. There just wasn’t the knowledge base that there is now on sourcing local materials and recyclable materials, etc.” In order to overcome this obstacle, the project team worked hard to source appropriate materials, products and processes to meet the “new” LEED standards.

An Ongoing Process

In keeping with CNT’s mission to make sustainability practices an ongoing process, CNT uses two tools to track performance—EPA’s Portfolio Manager and a web-based tool developed in-house. These tools help calculate and display the energy use, carbon emissions, water use and transportation energy impacts of the building. Scheu comments, “This building is going to be here for a long life span and it’s our job to make the building last. Even though the use and the occupancy may change over time, this retrofit process continues.” ■



Center for Neighborhood Technology, Chicago, IL

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**Size of Building/
Size of Renovation**
14,961 sq.ft. (3 stories)

Project Cost
\$1,200,000 (\$82/sq.ft.)

**Percentage of Project
Cost Attributed to Green**

- Before incentives: 11.5% (\$137,791)
- After grants and incentives: 7% (\$85,000)

**Annual Purchased
Energy (avg. '05-'08)**
841,000 kBtu (\$19,314)

(56 kBtu/sq.ft., 10.34 kWh/sq.ft.)

Annual Water Use (avg. '05-'08)
101,600 gallons (6.79 gallons/sq.ft.)

**Energy, Water & Resource
Savings and Paybacks**

- Energy Savings (actual)**
- \$18,000/year (avg. '05-'08)
 - 46% savings compared to if built 'just to code'

**Percent Water Use Savings
(actual, before versus after)**
30%

Materials
31% materials and products manufactured within 500 miles, of which 78% was extracted regionally

**Additional Business
Benefits**

Rent & Occupancy
100% occupancy with waiting list
Higher rents (not specified)

Other Benefits

Occupancy Comfort
Greater than 50% satisfaction in 25 of 26 categories, which included air quality, lighting, temperature, acoustics (survey conducted 2007)

Products and Processes

Green Products & Technologies
Photovoltaic Panels; Thermal ice chiller system; Low- and no-VOC paints, adhesives, finishes and carpeting; Ventilation auto controls; 7.07% of the total value of the materials in the project comprised of post-consumer content; 12.27% of the total value of materials comprised of post-industrial recycled content; Low-flow showers, toilets and faucets

Green Process Improvements

- Raingarden and native garden that absorb stormwater
- Interactive, web-based monitoring tool that displays ongoing performance data for energy use, carbon emissions, water consumption and transportation energy intensity
- Daily commute mode entries on employee time sheets: 83% report using alternative transportation

results

Carriage House Child Care Center

Renovating to Meet Children's Needs

PITTSBURGH, PA

Motivation to Green

As a non-profit organization that serves children, two primary motives were behind the decision to renovate the historical Wightman School building—energy efficiency to save money and improved health. Bob Michel, the building manager explains, “Carriage House’s original mission has always been the health and well-being of the children. The best thing you can do for children is give them a healthy environment.”

The Decision to Certify

In the last phase of their 20 year master plan, which included replacing the boiler and central heating equipment and adding air conditioning to two floors, the board decided to pursue LEED for Existing Buildings certification (LEED-EB). In the words of the project architect, Gary Moshier, “They wanted to set the right example of being green and have that as part of their curriculum for the kids.” To date, no other childcare center has achieved LEED-EB certification.

Overcoming Unique Challenges of a Child Care Facility

There are two main challenges facing The Carriage House as a child care facility: water use and waste.

■ **Water Use:** The new National Association for the Education of Young Children standards for hand washing issued in 2008 require children to wash their hands any time they change location or activities, which, according to Michel, adds up to 26 times a day. Further, water is used in some play activities. In order to reduce this large water volume, they installed water-efficient fixtures in bathrooms and on hoses, lowering costs by one third. Additional benefits were gained by changing water play time and other procedures.

■ **Diapers in Waste & Paper Towels in Bathrooms:** Unique to a child care facility is continual diaper waste, which has limited recyclability. Despite this, Carriage House was able to institute a successful recycling program and to adopt sustainable purchasing policies. The result: 60% reduction in waste. ■

results

**Size of Building/
Size of Renovation**
40,000 sq.ft. (3 stories)/9,720 sq.ft.

Project Cost
\$2,200,000

**Percentage of Project
Cost Attributed to Green**
9% (\$198,000)

Expected Payback
10 years

Annual Purchased Energy
57.82 kBtu per sq./ft.

Annual Water Use
530,000 gallons

Cost Reduction and Paybacks

Operating Cost Savings (actual)
\$25,000/year

Areas of Savings

- 59% natural gas
- 13% electricity
- 22% water
- 40% in cleaning chemicals

Energy Savings (actual)
\$21,000/year

**Percent Energy Savings
(before versus after)**
59% savings in natural gas /
13% savings in electricity

Water Savings (actual)
\$275/year (153,000 gallons/year)

**Percent Water Use Savings
(before versus after)**
22%

Products and Processes

Green Products & Technologies

Shaw CRI approved carpets; PPG low-VOC paints; Low-VOC sealants & adhesives; Toto hand-free faucets; Kohler waterless urinal; Watt Stopper daylighting system; FSC-certified wood; Lochinvar Knight 93% efficient boiler plant; Aaon M2 air handler with energy recovery system; Sloan dual flush valves on toilets; Insinger Commander 1 gallon per rack dishwasher.

Green Process Improvements

Green cleaning system; Recycling center; Overall building operations manual; Recycled 95% of construction waste diverted from landfills.

stats

Scope of Project

Total renovation of base-ment and the addition of two out buildings

Project Type

School/Childcare

Original Building Age

1896

Project Financing

Donations, Grants, Bank Loan

LEED Rating

LEED-EB Gold

Location

Pittsburgh, PA (urban)

Project Start/End

April 2006/October 2007

Players

Owner

Carriage House
Children's Center

Contractor

Jendoco Construction
Corporation Inc., Elk Air
Conditioning (HVAC)

Designer/Architect

Moshier Studio

Consultants

Mechanical, HVAC

engineering,
commissioning
BDA Engineering, Inc.

Electrical, Lighting

Carlins Consulting

Structural

Waterson Engineers

Perspective: Thought Leader



Robert A. Peck on GSA's Commitment to Green Retrofit and the Impact of ARRA Funds

Robert A. Peck,
Commissioner, Public Buildings Service,
U.S. General Services Administration (GSA)

How would the GSA characterize its green retrofit efforts? What specific goals have been targeted as an organization for greening the GSA's existing building stock?

PECK: GSA has been a leader in the green world since the 70s and now we have a once-in-a-lifetime opportunity with our American Recovery and Reinvestment (Recovery) Act funds to really catapult many of our buildings forward in a significant green and sustainable way.

We were appropriated \$5.5 billion under the Recovery Act to create jobs and convert many of the buildings into high-performance green facilities and construct new federal buildings, courthouses and land ports of entry that are models of energy efficiency.

We'll continue to be a leader in the green and sustainable world, and we have a terrific opportunity to be a proving ground for green architecture. These projects will modernize our buildings and save taxpayer dollars by reducing our consumption of energy and water, and increasing our use of clean and renewable sources of energy. Through our use of state-of-the-art green technologies, our construction projects are creating jobs in traditional construction sectors and in emerging green industries.

What do you think is the future for green retrofitting for the GSA in particular and government agencies in general?

PECK: GSA has recognized for decades the critical importance

of green initiatives. Our emphasis on high performing green buildings will result in buildings that are better for the environment, better for our tenants and improve workplace productivity.

We want to, and should, employ state-of-the-art technologies to see what works, what doesn't. And since we have such a big inventory—we own 1,500 buildings—our quantity buys will give us an opportunity to create the market and hopefully drive down costs for everyone else.

I'd say that GSA is driving growth and innovation that will ensure American leadership in the new energy economy of the future. For green retrofitting of government agencies in general, President Obama just signed an Executive Order that mandates that federal agencies become models

of sustainability for the nation. Our direction is certainly clear.

Are there any regions around the country that are particularly active (or inactive) compared to others for the GSA when it comes to retrofitting?

PECK: GSA has Recovery Act projects that will touch all 50 states, the District of Columbia, and two U.S. territories. Our largest project is the Department of Homeland Security consolidation at the St. Elizabeth's campus in Washington, D.C. Overall, we selected the best projects for accomplishing our Recovery Act goals based on two over-arching criteria: the ability of the project to put people back to work quickly, and transforming our buildings into high-performance green buildings. ■



John J. Duncan Federal Building, Knoxville, TN (left);



Howard M. Metzenbaum United States Courthouse, Cleveland, OH (right)

LEFT TO RIGHT: © COURTESY OF GSA; © KEVIN G. REEVES, COURTESY OF WESTLAKE REED LESKOSKY

U.S. General Services Administration (GSA)

Leading the Way in Greening Existing Buildings

For decades, GSA—the largest landlord in the United States—has been following an evolving mandate to make its buildings greener and more efficient. GSA's portfolio of properties extends from simple office buildings to historically significant structures. Each building presents a unique challenge, whether it is an architectural gem on the National Register of Historic Places or a modern office building engaged in an on-going process of going green.

Greening Historic Buildings

Howard M. Metzenbaum United States Courthouse

CLEVELAND, OH

Historic federal courthouses were typically built to be grand and long-lasting. The project manager of the renovation of the Howard M. Metzenbaum Courthouse Building, Pam Howe, states that the original architect of that building, Arnold Bruner, selected materials that he thought “would last 100 years, like marble wainscoting and beautiful millwork and the murals in the courtrooms.”

Howe describes the efforts to green the building—which focused on updating an old HVAC system and improving indoor air quality—as a “common-sense approach.” She describes how she met more resistance from her clients about recovering interior historical details than about the green elements of the building.

She cites the green retrofit as a wise investment with a goal of “breath[ing] another 100 years of life into the courthouse.”



KEVING REEVES, COURTESY OF WESTLAKE REED LESKOSKY

U.S. Custom House

PORTLAND, ME

Similar concerns about efficiency and air quality drove the installation of a geothermal system for heating and cooling at the Custom House in Portland project. Roman Piaskoski, the project manager, asserts that the retrofit of this building in 2001 “demonstrates the GSA’s sustainable stewardship of public buildings.”

The geothermal system, combined with the recovery of natural ventilation by restoring the original air riser shafts, helped improve the air quality and reduced energy consumption by close to 50%. After 8 years of service, the system has been virtually trouble free. This project allowed the GSA to resolve their efficiency and air quality issues with minimal impact on the historic interior of the building.

As Piaskoski says, this project “serves as a model and a reference [for GSA]. Even today, we are talking about it.”

Greening Modern Buildings

John J. Duncan Federal Building

KNOXVILLE, TN

Modern buildings also present great opportunities for achieving efficiencies, as Johnathan Sitzlar demonstrated with the upgrades to the Duncan Federal Building.

Sitzlar and his team embraced the mandated energy efficiency required in Executive Order 13123 issued in 1999 (see page 27). When various systems in the building started to fail or operate inefficiently, they consistently considered environmental impacts and efficiencies, along with savings to the tax payers, when making needed upgrades.

Unlike the two historic renovations, Sitzlar did not have one major renovation or initiative. Instead, he and his team worked steadily on one system and on one tenant fit-up at a time to improve the building.

By 2007, the building received an Energy Star rating of 95 and won numerous awards for those efforts. GSA is also exceeding the requirements of E.O. 13123 by 33% through steady improvements.

Sitzlar emphasizes that their mantra for the efforts was to “maximize opportunities as they became available to make good financial sense and be sustainable.”

CONTINUED

	Howard M. Metzenbaum U.S. Courthouse	Portland U.S. Customhouse	John J. Duncan Federal Building
Original Building Age	1910	1871	1987
LEED Rating	LEED-NC certified		LEED-EB certified
Energy Star Score	82		95
Location	Cleveland, OH	Portland, ME	Knoxville, TN
Project Start/ End Date	2002/2005		2004/2006
Project Type	Courthouse/Office	Office	Office
Size of Project	235,600 sq.ft. (6 stories)	25,269 sq.ft. (3 stories)	172,684 sq.ft. (6 stories)
Project Cost	\$51,000,000	\$1,000,000+	\$269,000
Percentage of Cost Attributed to Green/ Payback Expected			5%/ 3.7 year payback
Annual Energy Use	87 kBtu/sq.ft.		36kBtu/sq.ft.
Annual Water Use	537,000 gallons		2,027,000 gallons
▼ COST REDUCTIONS & PAYBACKS			
	Energy Savings (annual) 15%	Energy Savings (annual)	Energy Savings (annual) 290,000 kWh (baseline of 2,025,000 kWh/year)
	Water Savings (annual) 32.4% reduction	<ul style="list-style-type: none"> ■ 50% all energy types ■ 60% reduction in gas ■ 100% elimination of coal ■ 24% <i>more</i> electricity (to cover energy supplies no longer comign from other sources) 	Water Savings (annual) 400,000 gallons
Other Benefits	Employee Satisfaction 90%		Employee Satisfaction 93% in 2006, up from 91% Waste 30% diverted from landfill by recycling: <ul style="list-style-type: none"> ■ 3.75 tons mixed paper ■ 1,300 lbs. aluminum ■ 12,000 sq.ft. carpet ■ 700 lbs. moving boxes
▼ PRODUCTS & PROCESSES			
Green Products & Technologies	<ul style="list-style-type: none"> ■ Aggressive waste reduction—material reuse, recycled 55% of construction and demolition waste, resource reuse wherever possible ■ Carbon dioxide monitoring ■ Construction indoor air quality management plan: use of low-emitting materials and humidity control 	<ul style="list-style-type: none"> ■ Groundwater geothermal system ■ Restored natural ventilation system the building originally contained 	<ul style="list-style-type: none"> ■ Purchase renewable energy ■ New building control system that integrate all components to operate efficiently ■ Energy management system ■ Premium efficiency fills and motors on cooling tower ■ High-efficiency lighting ■ Motion sensors ■ Variable frequency drives ■ Enhanced metering ■ 1/2 gpm aerators ■ Low-flow fixtures ■ 1400 gallon rainwater catchment system
Green Process Improvements			<ul style="list-style-type: none"> ■ Green cleaning products ■ Recycled janitorial products ■ Recycling (aluminum, plastic, paper, cardboard) ■ Rubber mulch ■ Recycle/reuse carpet ■ Procurement of recycled-content products ■ Construction debris recycling ■ IAQ plan for construction (e.g., dust, VOCs)

100 Montgomery Office Building

Tenants Are Key to Green Approach

SAN FRANCISCO, CA



100 Montgomery, San Francisco, CA

©HINES

Motivation to Green

When Hines purchased 100 Montgomery, its market strategy to compete with other Class A office space in downtown San Francisco included upgrading the building and making it green. Kari Aycock, the project manager for Hines, explains that Hines chose to do a green retrofit because “it is the smart way to do things, in terms of life-cycle costs, in terms of liability, in terms of responsibility ... [the building] is going to last longer and be cheaper for both us and the tenants in the long run.”

Tenant satisfaction played a key role in Hines’ decision to focus on “mak[ing] the operation of the building as efficient as possible.” Aycock clarifies that increasing building efficiency is the best approach “to keep operating expenses low [and create] appeal in the marketplace in order to retain existing tenants.” That focus on operations led Hines to pursue certification under LEED for Existing Buildings.

Tenant Satisfaction Through Good Air Handling

In order to create a healthy indoor air environment important to tenant satisfaction, both an efficient HVAC system and good air flow balance are critical. “We use a CO2 sensing technology that tells our air-handling units and HVAC when to charge up and bring more fresh air into a space,” Aycock explains. He affirms that making sure that “there is fresh air in the space obviously increases the tenants’ enjoyment of the premises.”

In addition, Hines retained the operable windows—a move that Aycock believes contributes to the

Scope of Project

Renovation:

- Exterior
- Some common areas
- Interiors
- Building system upgrades

Project Type

Office

Original Building Date
1955

Project Financing

Bank loans, Equity, Utility rebates

LEED Rating

LEED-CI Gold

Location

San Francisco, CA (urban)

Project Start/End

January 2006/
August 2009

Players

Owner

Hines/Sterling American Property, Inc.

Designer/Architect

Robert A.M. Stern Architects

Consultant

RetroCom Energy Strategies, Inc.

CONTINUED

100 Montgomery Office Building

SAN FRANCISCO CA

GREEN BUILDING RETROFIT AND RENOVATION



100 Montgomery, San Francisco, CA

building's rating of 94 in Energy Star's Portfolio Manager. Also, as Aycock points out, they made the decision to keep the operable windows because "people love [them]. You can't get away from that."

Achieving LEED EB Helps Tenants Achieve LEED CI

The achievement of LEED-EB Gold is important to tenants who are seeking green certification for their own spaces. In fact, Aycock asserts that LEED-CI is very easy for their tenants to achieve. "Every prerequisite would be satisfied [just by taking space in the building]."

So far, three tenants of 100 Montgomery are seeking LEED-CI. Greg Cunningham, principal of the environmental consulting firm Enovity, cites the "transparency of [Hines'] greening efforts" as extremely helpful in their own LEED-CI certification. Dale Clark, senior vice president of City National Bank—another tenant seeking LEED-CI—states, "The green retrofitting of the 100 Montgomery

building ... was definitely a key factor in going with that location."

Engaging Tenants in Green

Hines also believes tenants are an essential part of success. According to Jack Beutell, sustainability manager for Hines, "It is important to engage the tenants to reduce consumption...that is the big picture."

In order to help facilitate that engagement, Hines sent its tenants regular updates throughout the LEED certification process through "Road to LEED" bulletins. According to Aycock, the updates were much appreciated: "[Tenants] love to know that the money they are investing in rent and operating expenses is...leading to a [higher quality] building."

Hines also engages tenants through its Hines GREEN OFFICE (HinesGO®), a new program recently instituted across Hines worldwide portfolio. HinesGO is founded on principles of education and helps tenants learn more about sustainable office practices.

results

Size of Building

424,454 sq.ft. (25 stories)

Project Cost

\$30,000,000

Expected Payback

- Energy-related upgrades: 2.3 years
- Water-related upgrades: 5.0 years

Cost Reduction and Paybacks

Areas of Savings (actual, before vs. after)

- 13.7% electricity
- 29.5% steam
- 16.1% water

Energy Savings (actual)

- 1.49 kWh per sq.ft. electricity
- 0.2 kBtu per sq.ft. steam

Water Savings (actual)

\$544/year
(29.5% gallons per sq.ft./year or 1.01 gallons/sq.ft.)

Other Business Benefits

Rent Increases

1.4% (to \$38,058 from \$37,514)

Products and Processes

Green Products & Technologies

- Renewable energy certificates and clean power offsets
- Energy efficient lights and lighting fixtures
- Low-flow restroom fixtures
- Shower and bicycle storage facility

Green Process Improvements

- Green cleaning program (with Green-seal cleaning products, microfiber equipment and HEPA filter vacuums)
- Building-wide recycling and composting program
- Hines Efficient Operating Standards

As Beutell points out, "Good design and energy-efficient operations are essential to a sustainable building, but tenants play a big role too." ■

Idea Center at PlayhouseSquare

Making an Historic State of the Art on a Budget

CLEVELAND, OH

GREEN BUILDING RETROFIT AND RENOVATION

Motivation to Green

A merger of a public television and a public radio station brought together PlayhouseSquare, an arts organization, and ideastream, a multi-media nonprofit. The partnership led to a transformation of a 1912 building into a technology center featuring cutting-edge digital broadcast studios, a performing arts center and eclectic, technology-oriented companies.

Because both partners are nonprofit organizations with restricted budgets, the choice to go green was—as Tom Einhouse, vice president of PlayhouseSquare Management makes clear—fundamentally an economic decision. Specifically, he references a directive from some of their funding sources to achieve LEED certification. In the end, the project surpassed the minimum requirement and received LEED-CI Silver certification.

First Costs Not an Obstacle

Financial considerations determined the green objectives of the project. Einhouse identifies “energy conservation and making the most cost-effective building” as the main goals of the project.

Given their tight budget, the

“We had a plan to lease up the building... [in] four years, and we accomplished that in under two.”

main concern at the beginning of the project was estimating the first costs in relation to the long term benefits. However, first costs did not turn out to be a big issue once they got into the project. “Some people were concerned that we were going to spend a lot of money to make tree huggers happy. After the fact, a lot of people said, ‘Wow, this is the right way to go.’”

Green Technology Center Appeals to Tenants

Before it was donated to PlayhouseSquare, the building was Class C office space with a 90% vacancy rate. Einhouse credits the combination of the green qualities of the building and the state of the art technology infrastructure with helping the building to easily attract tenants. “We had a plan to lease up the building that was going to take about four years, and we accomplished that in under two years,” he states. “The building was just that desirable.” ■

results

Size of Building/ Size of Renovation

246,000 sq.ft. (7 stories)/
90,000 sq.ft.

Original Building Age

1912

Project Cost

\$17,000,000

Percentage of Project Cost Attributed to Green

Minimal

Cost Reduction and Paybacks

Energy Savings (actual, before vs. after)

- 59% electricity reduction from lighting power density
- 18% electricity savings from Energy Star appliances and equipment

Water Savings (actual)

1,295,000 gallons

Percent Water Use Savings (before versus after)

20%

Other Business Benefits

Improved Occupancy

88% occupancy from 3%

Products and Processes

Green Products & Technologies

- Low VOC paint
- Environmentally-friendly carpet
- Systems
- Furniture
- Windows/glazing
- T5 lamps
- Energy Star equipment and appliances
- Water-saving plumbing fixtures
- Energy Star roof
- Transformers
- Materials with recycled content
- Regionally-manufactured materials

Green Process Improvements

- Green housekeeping
- Aggressive recycling
- Supporting alternative transportation, such as bicycles & RTA Rider Advantage

stats

Scope of Project

Core and shell renovation, replacement of all MEP, tenant fit-out

Project Financing

- Capital campaign primarily
- Façade easement
- Historic Tax Credits
- Traditional financing

LEED Rating

LEED-CI Silver

Location

Cleveland, OH (urban)

Project Start/End

January 2004/
August 2005

Project Type

Office/Education/
Broadcast Arts

Players

Owner

Playhouse Square and ideastream

Contractor

Turner Construction

Designer/Architect/ Consultant

Westlake Reed Leskosky

Scowcroft Building

Using Innovative Solutions to Green A Historic Building

OGDEN, UT

The Scowcroft building in Ogden, UT, originally built in the 1900s, has a unique history that includes fire damage, long-term vacancy and a spot on the National Register of Historic Places.

Motivation: Preservation and Sustainability

When the U.S. General Services Association (GSA) approached Cottonwood Realty Services about the historic site, they combined their two main goals of not only preserving the over 100-year old warehouse, but also completing a green renovation while earning a LEED Silver certification in the process.

The completed Scowcroft building added to the urban redevelopment of the city of Ogden, a once booming railroad town that was largely abandoned after new industries took root in neighboring cities.

Innovative Solutions to Overcome Challenges

Rachel David, director of sustainability at Cooper Roberts Simonsen Architects, recalls this unique challenge by stating, "It was the

juxtaposition of being able to accomplish restoring and preserving a historic structure and at the same time making it green, efficient and environmentally friendly. This effort required the designers and contractors to be a little more creative and not just apply the traditional standards to the renovation."

One of these creative methods included a center coring technology that drives large drills through the walls of the entire length of the building. Using a rebar structure and filling it with nuproxy allowed the contractors to keep much of the original building structure intact.

David describes another innovative technology called corn cobbing where, rather than sandblasting the building, corn cobs are sprayed. "This [process] allowed us more control and was a less abrasive approach to remove the charred layers left from the fire but still keep the original woodwork largely intact."

These creative processes allowed for 75% of the construction waste to be recycled, even though hazardous materials from the fire in the 1970s had to be taken into account. ■

results

Size of Building

133,000 sq.ft. (4 stories)

Project Cost

\$11,442,000

Annual Purchased Energy

- Electricity: 895,000 kWh (\$44,108 or \$0.42/sq.ft.)
- Natural Gas: 4,550,000 Btu (\$24,963 or \$0.24/sq.ft.)

Annual Water Use

903,000 gallons (8.63 per sq.ft.)

Cost Reduction and Paybacks

Percent Energy Savings (actual, before versus after)
20.6%

Percent Water Savings (actual, before versus after)
23.3%

Products and Processes

Green Products & Technologies

- High efficiency irrigation systems; indigenous plants
- New plumbing and Low-flow fixtures
- Low-emitting carpet
- LOW-VOC paints, adhesives and sealants
- New electrical
- New HVAC
- Raised floors hiding high-efficiency heating system, eliminating the need for ducts in the wood-paneled ceiling
- Double-paned windows
- Reflective roofing
- Two atria increasing natural light
- Innovative seismic reinforce
- Window glazing with a minimum U-value of 0.33 when occupants adjacent to windows
- Salvaged, local materials

Green Process Improvements

- Specify recycling receptacles that are accessible to the occupants
- Limited parking area to encourage use of alternative transportation

stats

Scope of Project

Total renovation of historic building

Project Type

Office, rented to GSA (Federal government)

Original Building Age

1906

Project Financing

Government appropriations, historic tax credits

LEED Rating

LEED-NC Silver

Location

Ogden, UT (urban)

Project Start/End

2002/2004

Players

Owner

Cottonwood Realty Services, LLC

Contractor

Jacobsen Construction Company, Inc.

Designer/Architect

Cooper Roberts Simonsen Architects Designer/Architect

Landscape Architect

Brent Morris Associates

Engineers

- Electrical: Spectrum Engineers
- Mechanical: Colvin Engineering Assoc.
- Structural: ABS Consulting
- Civil: Reeve & Associates

interview

Empire State Building

Applying Modern Upgrades to a Historic Icon

NEW YORK, NY

Interview with **Dana Schneider, LEED AP**,
Northeast Market Lead, Sustainability Services at Jones Lang LaSalle

GREEN BUILDING RETROFIT AND RENOVATION

In 1931, against the backdrop of the Great Depression, the Empire State Building became the world's tallest building and set an inspiring example of what could be achieved in spite of financial constraints. Today, over 75 years later and in the midst of another economic downturn, this global icon is once again on the cutting edge.

"This project is about demonstrating the economic viability of a commercially attractive green retrofit," says Dana Schneider, the Northeast market lead of sustainability services at Jones Lang LaSalle.

The Project & Expected Benefits

Schneider and her team are overseeing a \$500 million green upgrade of the 102-story tower in the middle of Manhattan—one of the most energy-intensive locations in the world. Working under the guidance of building owner Anthony E. Malkin, Jones Lang LaSalle is the project manager of a team that includes the Rocky Mountain Institute, Johnson Controls and the Clinton Climate Initiative, who Schneider credits with initiating the concept.

At the heart of the project is the goal to develop a solid, replicable model for financially sound green retrofits. The team worked for a year on creating the model, starting with a thorough energy audit of the building and identification of 60 potential improvement measures. The final package included 17 options deemed most effective for achieving ROI. The determination was based on cost per ton of carbon reduction, energy savings and net present value returns.



Empire State Building, New York, NY

© EMPIRE STATE BUILDING, COURTESY OF JONES LANG LASALLE

The final package is expected to result in a 38% energy usage reduction and \$4.4 million per year of annual energy savings. "We actually developed packages that would allow us to reduce energy by up to 60% but the best ROI net present value was the package that we ultimately decided to implement," says Schneider. "A huge part of our message, and what we were able to prove, is that it's an incredibly salient investment."

The first five of the project's eight measures are currently underway and will be complete by late 2010. These include a window retrofit and insertion of radiated barriers, reaching a total of 6,524

new windows and radiators. Other features include efficient chillers, air handling units for each floor and demand control ventilation based on carbon dioxide sensors.

When the retrofit is complete, the Empire State Building is expected to achieve an Energy Star rating of 90, making it more efficient than 90% of buildings around the country, with a payback period of three years.

Engaging the Tenant

Describing a comprehensive engagement plan aimed at helping tenants optimize energy performance within their space, Schneider says, "This is to be a whole building model that allows us to see far greater results by engaging the tenants as well as the base building." As part of the education efforts, a pre-built LEED Platinum space in the building will serve as a showcase for tenants.

Though tenants are not required to achieve LEED certification, it is expected their spaces will perform in a way that would enable certification. In fact, it is a goal incorporated into leasing.

Education

The educational benefits of the retrofit will extend beyond tenants to reach the 3.8 million annual visitors and broader industry through an interactive visitors' exhibit and online resources.

Schneider hopes that the project will drive further growth in the green retrofit market. "I really hope that this changes the market by showcasing the economic viability of green retrofitting. It's a money maker." ■

Skanska NY Headquarters

Achieving Platinum in an Iconic Space

EMPIRE STATE BUILDING, NEW YORK, NY

Motivation to Green

For Skanska, being green is second nature. Steve Pressler, area general manager for New York, says that green is “a core value of the company.” When they selected the 32nd floor of the Empire State Building as their new headquarters in New York, he reports that “we tasked ourselves to make this a LEED Platinum space, and our internal goal was to do it for the same cost as a normal, everyday, Class A office space fit-out in New York City.”

Utilizing the Original Green Design of the Empire State Building

The design of the offices in the Empire State Building actually made the project easier. Pressler affirms: “The building itself was designed back in 1930 to be green. One of the original design parameters, as an example, is that no corridor wall could be more than 28 feet from the windows, so it relied on natural light to provide most of the illumination. Similarly, the windows—because of that—were oversized. They are operable windows, for natural ventilation.” In fact,

he describes achieving a LEED platinum interior as “almost like going back to the original design.”

Achieving Platinum Through Innovative Design

Pressler points out some of the innovative features that helped them achieve their Platinum certification: “We have a lighting system that is centrally controlled, and all the individual fixtures have eco-ballasts.” Their lighting control system is not only motion based, but also measures the amount of exterior light available to gain efficiency.

Measuring Success

The energy savings they achieved since they moved in on November 2008 demonstrate that, on a lifecycle basis, Platinum can be achieved for the same cost as Class A office space. “We’re absolutely getting even more energy savings than we thought we were going to. We’re actually spending less on energy in this space, which is 35% larger than our old space.” In addition, he reports, based on initial surveys of the employees, that they “seem happier, more engaged.” ■

results

Size of Project

25,000 sq.ft. (32nd floor of Empire State Building)

Project Cost

\$4,600,000

Percentage of Project Cost Attributed to Green

4.7% (\$216,000)

Expected Payback

5 years

Annual Purchased Energy

144,000 kWh

All is purchased green power

Cost Reduction and Paybacks

Energy Savings

(actual, audit conducted)

\$45,300/year

Annual Percentage Savings

- 51-53% in kWh (primarily from electricity)
- Third larger than previous space, with less energy use

Annual Water Savings

- 40% (below Energy Policy Act)
- No monetary savings because included in the lease

Total Paybacks (est.)

\$ 556,436 over life of lease (15 years)

Products and Processes

Green Products & Technologies

Pressurized raised floor fed by high-efficiency air tower units for HVAC system; Lutron EcoSystem ballasts lighting system; Maximum daylighting; Occupancy motion sensors, motorized; Timed window shades; Dual flush toilets; Water flow restricters; Waterless urinals; Hand-sensored faucets; 90% Energy Star Compliant; 80% of construction waste recycled; 89% FSC wood, paperstone, cork; Low-VOC paints, adhesives and finishes; 28% of materials manufactured within 500 miles.

Green Process Improvements

Installation of sub-meters for electric, steam and chilled water to continually monitor usage; Encouragement of alternate transportation; Office recycling program; Green cleaning program.

stats

Scope of Project

Tenant fit-out for corporate office—interior renovation

Project Type

Office fit-out

Original Building Age

1931 (Empire State Building)

Project Financing

Company profits and tenant improvement allowance

LEED Rating

LEED-CI Platinum

Location

New York, NY (urban)

Project Start/End

September 2008/
November 2008

Players

Owner/Contractor (of interior office space)
Skanska USA Building

Designer/architect
Cook + Fox Architects

Consultants

Mechanical, electrical, plumbing
Cosentini Associates

Lighting

Arup

SoFlo Office Studios

Preserving a Hidden Treasure in South Flores

SAN ANTONIO, TX

When principals Mickey Conrad and Mike McGlone became tired of renting office space in San Antonio, TX, the former college classmates formed a limited partnership and purchased a brown-field junkyard property in the South Flores (SoFlo) neighborhood.

They then transformed the once scrap-filled property into a LEED for New Construction (NC) Silver certified office space, now home to Alamo Architects and O'Neill Conrad Oppelt (OCO) Architects. Mickey Conrad, principal at OCO Architects, comments, "One of our goals was to maintain the bohemian spirit that the building had. We saw a lot of aesthetic value in the old stuff that was in this building and not just a bunch of old rusty pipes, panels and windows."

Sustainable Management of Resources & Waste

The project team embraced this credo and ended up diverting 95% of all construction waste from landfill disposal and 16% of all materials were derived from salvaged material sources. Mike McGlone, principal at Alamo

"We didn't want to hide the [rawness of the interior] but to show it off and celebrate it."

Architects, says, "We knew that we had a lot of stuff laying around on the property so rather than going ahead and reinventing the wheel and buying new products, we started asking ourselves, 'Why can't we use this for that?'"

This philosophy resulted in courtyards paved with recycled concrete; trellis entrances and shade structures made from steel salvaged from previous building alterations; and existing industrial sash windows reused as guardrails.

The Result

By preserving the industrial feel of the building and infusing modern updates, Conrad explains that the most unique aspect is "the rawness of the interior of the space. Both of us had the attitude that we didn't want to hide what was there but to show it off and even celebrate the rustiness of the metals, for instance. We didn't try to doctor any of that up." ■

Size of Renovation

16,600 sq.ft.

Project Cost

\$1,800,000

Annual Purchased Energy

47 kBtu per sq./ft.

Cost Reduction and Paybacks

Areas of Savings (actual baseline year of 2005)

- Energy Savings: 19%
- Water Savings: 30%

Products and Processes

Green Products & Technologies

- 6,500 gallon cistern for rainwater and a/c condensate collection
- Low-flow plumbing fixtures
- Planted native species
- One-inch window glazing insulated with low-emissions coating
- Low-VOC paints, coatings and carpets
- Task lamps for occupant controllability
- Timer/controls on lighting to optimize energy savings
- Diverted 95% of all construction waste from innovative reuse and material recycling (concrete, steel and clay tile)
- EnergyStar appliances

Green Process Improvements

- Recycling facilities (for paper, aluminum, glass, metal and plastic)

stats

Scope of Project

Urban infill development and historic retrofit

Project Type

Office

Original Building Age

1940s

Project Financing

Seven principals formed limited partnership and used loans

LEED Rating

LEED-NC Silver

Location

San Antonio, TX (urban infill)

Project Start/End

October 2005/ February 2007

Players

Owner

Magnificent SoFlo Seven LLC

Contractor

Malitz Construction Company

Designer/Architect

Alamo Architects and O'Neill Conrad Oppelt Architects



SoFlo Office Studios, San Antonio, TX

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Founding Farmers

Combining Sustainable Agriculture & Greening with Fine Dining

WASHINGTON, DC

Offering fresh “farm-to-table” American inspired food and drink, Founding Farmers set out to be a profitable restaurant that represented and promoted American family farmers. As a result, it became recognized as the greenest restaurant in Washington, D.C., by earning both Green Restaurant certification from the Green Restaurant Association and LEED-CI Gold certification. The project has combined a philosophy of sustainable agriculture with the values of green buildings.

Christian Holmes, general manager, comments on the challenge of combining these attitudes by saying, “We had to educate ourselves not only on what it means to run a sustainable business, but also what it means to run a sustainable restaurant.”

Kenneth Langer, president of EMSI—the LEED consultant on the project—points to its success: “The popularity of the restaurant has clearly been a function of many factors but for the customer to experience the lighting and the décor, to see the LEED certification plaque on the wall and to know that all these [green building] strategies were used

has been a strong part of what has driven the success of the restaurant.”

Creating a Sustainable & Attractive Interior

The inside includes tabletops and chairs made from walnut extracted from nearby Harrisburg, PA and all of the seating has access to natural daylight and outdoor views.

Holmes says, “One of the most unique aspects of the restaurant is the décor. We had the extra challenge of making sure the recycled materials we used were also aesthetically pleasing for a Washington D.C. restaurant.”

Green Practices

Founding Farmers installed Energy Star appliances for over 80% of all eligible appliances, purchased green power credits for over 50% of electricity consumption and recycled or diverted 90% of construction waste.

The restaurant also implemented a four-tiered recycling container system for compostable items, recycled items, cooking oil and everything directed to the landfill. This created an additional challenge in staff training for sustainable operations. ■

results

Size of Project

8,500 sq.ft. (2 stories)

Project Cost

\$4,600,000

Percentage of Project Cost Attributed to Green

10%

Expected Payback

less than 1 year (attributed to increase in sales beyond projections)

Annual Purchased Energy

10 kWh per sq./ft.

Annual Water Use

192,000 gallons

Cost Reduction and Paybacks

Origins of Savings

- 60% result from infrastructure efficiency of utilities
- 40% due to regulated, consistent operational standards (e.g., solid waste recycling, composting, oil recycling, green cleaning)

Areas of Savings

(actuals not available because new restaurant)

- Reduced energy costs
- Reduced waste hauling costs
- Reduced water usage
- Fewer sick days
- Improved employee well-being

Products and Processes

Green Products & Technologies

Energy Star high-efficiently equipment and appliances in the kitchens; Reclaimed and recycled materials for all interior finishes such as flooring, walls, fabrics, wood furnishings; Post-consumer based content countertops; Recycled concrete top bars and flooring sections; Low-VOC paints; High efficiency water source heat pumps; Energy-efficient lighting design (reduced lighting power density); Energy Star food service equipment and dishwashers

Green Process Improvements

Sustainable procurement policy for IAQ compliant products; Green cleaning, Sustainable site maintenance, Recycling program that exceeds USGBC recycling criteria

stats

Scope of Project

Commercial interior fit-out for new restaurant in an existing building

Project Type

Hospitality (restaurant)

Original Building Age

2005

Project Financing

Private investment

LEED Rating

LEED-CI Gold

Location

Washington, DC (urban)

Project Start/End

October 2007/
September 2008

Players

Owner

North Dakota Farmers Union

Contractor

Forrester Construction

Designer/Architect

CORE architecture + design

Consultants

LEED Consultant

EMSI

Lighting

MCLA, Inc.

Perspective: Thought Leader



Adrian Smith & Gordon Gill on the Green Retrofit Marketplace & Upgrading the Historic Willis Tower

Adrian Smith, FAIA, RIBA (near left)
Founding Partner, Adrian Smith + Gordon Gill Architecture

Gordon Gill, AIA (far left)
Founding Partner, Adrian Smith + Gordon Gill Architecture

The renamed Sears Tower, now bearing the name of its new tenants Willis Group Holdings, is preparing for another, much deeper transformation. Chicago-based Adrian Smith+Gordon Gill Architects is the design firm behind the skyscraper's upcoming green retrofit—which includes measures to reduce energy consumption by 80% as well as plans for a new, 50-story, off-grid sustainable hotel on the site that will operate off energy savings from the renovated Tower.

Adrian Smith and Gordon Gill, founding partners of Smith+Gill and co-designers of the Willis Tower project, spoke recently with MHC's Catlin O'Shaughnessy about plans for the two buildings and their perspectives on the growing green retrofit marketplace.

In your view, what are the real benefits/opportunities presented by green retrofitting?

ADRIAN SMITH: The main benefit is avoiding the obsolescence of older commercial buildings. Green retrofitting of historic or older buildings positions them to be more competitive and attractive to tenants. And, obviously, there's the potential to save tremendous amounts of energy because, historically, these buildings are inefficient.

What is the key message that needs to get out to owners and the industry about this?

GORDON GILL: The message is that green retrofitting is economically viable and, in many cases, minor in terms of the level of intervention in the buildings. There are certain financial vehicles available to owners and tenants that allow them to offset the costs of retrofitting through governmental aid. Tax increment funding is part of it, but in a lot of cities there are also sustainable or green funds available to people who are going to implement photovoltaics, for example.

From your experience, what is the owner perspective of green retrofits versus new construction when looking at green buildings?

GG: Most owners think it's easier to integrate green strategies into the design of a new building than they do in retrofits because they have a sum of money for this project and a percent of that is going to go to green initiatives. But in thinking that way, it's a segment of the project, when in fact it should be everything about the project, a much more holistic approach to the economics and life cycle of the building.

AS: A lot of existing buildings today can be looked at as deficits in terms of energy consumption and carbon, but you could reverse that in terms of a financial portfolio, especially for people who have large holdings of existing buildings. It could become a tremendous asset—not just from a real estate standpoint, but from

a carbon and energy standpoint.

Why do you think the benefits and opportunities of green retrofit projects have been overlooked in the past?

GG: I think they've been overlooked in the past because there simply wasn't an awareness of the impact of buildings on the environment. I think most people looked at building as simply a consumption of land. People didn't understand what it meant in terms of carbon, and how it was tied directly to energy consumption.

AS: And a lot of that was because we always had very cheap energy and abundant resources. Even today, we still think we have abundant resources, and to a point—compared to some other countries—we do. But especially as we export our culture, those countries are demanding—especially from architects and urban planners—that we be highly sustainable. As we've begun to understand that, the education about energy in this country has shifted. You can see it from government and corporations to school children.

GG: My own children now are very aware of sustainable measures and what it means to save energy, and they're highly critical of people who don't.

How might highly visible projects like the Willis Tower impact the green retrofit market? Will they lead to more activity in the future?

PHOTO: GORDON GILL ARCHITECTURE

CONTINUED

Adrian Smith & Gordon Gill

on the Green Retrofit Marketplace & Upgrading the Historic Willis Tower

GREEN BUILDING RETROFIT AND RENOVATION

CONTINUED

AS: I think it will [drive market activity]. This is the tallest building in America. It has the observation deck at the top floor. It has between a million and 2 million people per year coming to the observation deck, so we think the educational component to this is pretty significant. I think we'll see a lot more green retrofits of iconic structures, especially because of the economic situation around the world. I think you're going to see people looking to renovate buildings as opposed to building new—for a while, anyway. And once they see that the renovation can reposition the building more favorably for tenants, it's going to be even more attractive. And if there's long-term savings, in terms of energy savings and a return on the investment, that will also be attractive for the owner.

What other sectors might become more active with green retrofitting?

GG: The education sector is also going to be key for green retrofits.

“[Large holdings of green existing buildings] could become a tremendous asset—not just from a real estate standpoint but from a carbon and energy standpoint.”

Universities are going to understand that all their building holdings on campus are going to be able to become a lot more valuable as a result of retrofitting. Other institutions with large building holdings, such as the GSA, will also be able to take advantage.

Looking ahead, what obstacles or challenges might stand in the way of the growth of this market around the U.S. and in other regions?

GG: There are various policy issues there. In the most successful model of green retrofitting, you are able to share energy between buildings. Part of that concept is the ability to offset or shave peak load energy by

sharing energy between office and residential buildings—day use versus night use. But owners need to be willing to share their energy savings, and there needs to be a policy intact that allows them to do that. Policy needs to be adjusted for cities to allow energy to be more fluid, to be shared, for grids to accept energy savings and then return that savings to buildings and building owners

AS: Culture is also an obstacle. Right now in the U.S. not everyone understands that green retrofitting has tremendous value. Everybody thinks it's a capital cost, [but] that's not necessarily true. Second, you have to change the culture from thinking about capital costs to thinking about life-cycle costs. Our culture tends to be about the immediacy of gain [and this] has to change to a long-term approach to energy savings and the quality of the environment. That's really the biggest obstacle.

Looking ahead, do you see green retrofitting growing globally?

AS: I think it will go global. It has to. If all the projections are accurate, and the 2020 and 2030 goals are to be met, then there's no choice. You're not going to get there by changing just the transportation systems. Buildings will represent close to 60% of the energy used in our society. You have to address that, and most of the building stock is existing buildings. ■

Willis Tower Retrofit Project Overview

Owner: 233 South Wacker

Designer: Adrian Smith+Gordon Gill Architecture

Key Components: Green retrofit and operational upgrade of Willis Tower

Project Cost: \$350 million (expected \$50-\$75/sq. ft.)

Retrofit Components

- Window replacement and glazing of tower's 16,000 single pane windows
- Mechanical system upgrade with new fuel-cell gas boilers

- On-site renewable energy to be tested in form of wind turbines and solar hot-water panels
- High-efficiency chillers and upgraded distribution system
- Efficiency upgrades to 104 high-speed elevators and 15 escalators
- Upgrade to water efficient bathroom fixtures
- Condensation recovery system and water efficient landscaping
- Lighting upgrades

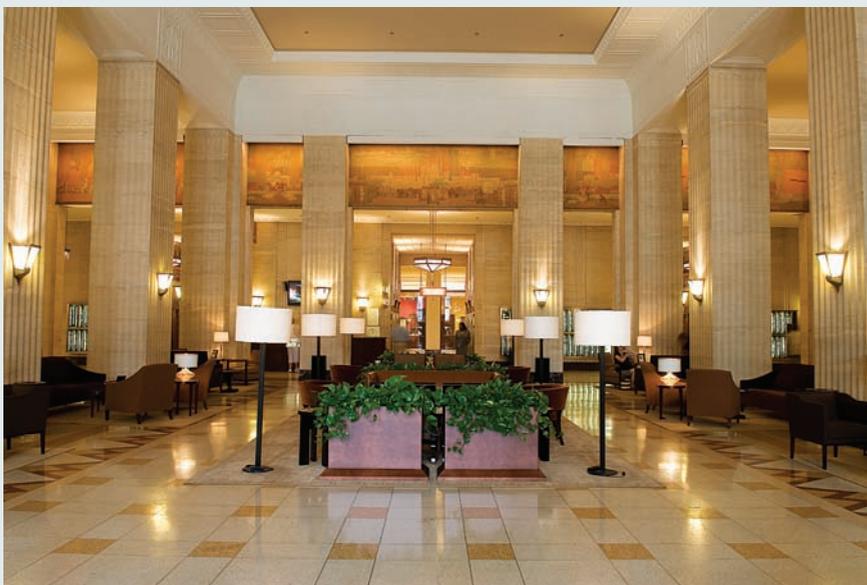
Expected Results and Savings

- Comprehensive energy savings of up to 80%
- Heating Energy reduced by 60%
- Elevator/escalator energy cut by 40%
- Lighting energy consumption cut by 40%
- Water use reduced by 40% (24 million gallons/year)

Merchandise Mart Building

Decades of Improvement at a Historic Landmark

CHICAGO, IL



The Merchandise Mart, Chicago, IL

© THE MERCHANDISE MART

For the facilities team at the Chicago Merchandise Mart, green retrofitting is an ongoing process. Constructed in 1930 and encompassing four million square feet of wholesale retail showrooms, the building has undergone a thorough transformation over the past 20 years to become one of the greenest historic structures in the country.

Translating Efficient Practices into Green Certification

“We actually started in 1986 with a complete rehab of the building,” explains Mark Bettin, vice president of engineering at Merchandise Mart Properties, Inc. (MMPI), referring to extensive renovation through the early 1990s that established the foundation for improved recycling and waste reduction.

Following further improvements, including a comprehensive washroom efficiency retrofit and the establishment of performance benchmarks in 2001, the Merchandise Mart sought and earned a Silver certification under LEED-EB in 2007. “The good news for this facility going into LEED was that we had a long history of running our facility efficiently,” says Myron Maurer, senior vice president at MMPI. “We never would have been able to achieve LEED if it wasn’t for those previous improvements.”

Ongoing Activities

Since the completion of the 2007 EB project, which included features both simple (such as eliminating water bottles and switching to recycled content trash can liners) and complex (real-time metering and CO₂ sensors and tenant education programs), Maurer and his team have continued the tradition of implementing ongoing improvements.

More recent initiatives include comprehensive lighting upgrades and the replacement of the previous water pumping system with a more efficient alternative after the original

stats

Project Financing

Capital Budget

Project Type

Retail/Office/Showroom

LEED Rating

LEED-EB Silver

Location

Chicago, IL (urban)

Project Start/End

Most Recent: June 2006/
November 2007

Players

Owner

Merchandise Mart Properties, Inc.

Consultant

Delta Institute

Third-Party Auditor

Enviser



The Merchandise Mart, Chicago, IL

© THE MERCHANDISE MART

CONTINUED

Merchandise Mart Building

CHICAGO, IL

was rendered oversized following efficiency improvements. Looking forward, the next component is a green retrofit of the Merchandise Mart's sister building, 350 West Mart Center.

Comprehensively, the years of continuous improvements have paid off in multiple ways. Benchmarking data demonstrates significant savings in operating costs, and the building itself enjoys a growing reputation as a historic building with

"We've found [our green retrofits] key not just to attract the right tenants...but also to help attract young talent."

a modern twist. The Mart is enjoying an increased flow of special interest groups seeking a green venue for industry events, as well as an increased interest and involvement from staff.

Attracting Talent

The changes are also resonating with the next generation. "With the age of our building, if we're not at the cutting edge and getting in the lead with energy conservation, we're going to have a tough time attracting talent," says Lloyd Davidson, vice president and general manager for MMPI. "We've found [our green retrofits] key not just to attract the right tenants and new companies but also to help us and our tenants attract young talent." ■

Size of Building

4,200,000 sq.ft.
(24 stories)

Date of Original Building

1930

Most Recent Project Results

Project Costs

\$440,000

Payback

Two years

Operating Cost Reductions

Baseline Year

2006

Audit

Internal and two third-party

Operating Cost Savings

Leading up to Certification

■ 10%

Operating Cost Savings 2007

Reduced Electricity

■ 3% usage reduction (actual)

Operating Cost Savings 2008

Added Focus on Pumping Systems and Lighting Retrofits

■ 10% usage reduction (actual)

Operating Cost Savings 2009

With Retrofits to Lighting Fans and Pumps

■ 20% usage reduction (expected)

Water Savings

Water Savings (actual, audit conducted)

- \$300,000 since 2001 (accumulation reduction of 45%)
- \$80,000 in 2008

Water Savings (actual)

Over 100,000,000 since 2001

Green Products & Technologies

Lighting & Controls

- Installed energy-efficient lamps for common area fixtures and exit lights
- Installed light switch enabled motion sensors in all restrooms
- Installed real-time meters on common area systems including gas, steam, chilled water, domestic water, compressed air and electricity
- Piloted then expanded use of carbon dioxide sensors on HVAC systems
- Rewrote graphic displays for HVAC systems to focus on energy efficiency and indoor air quality

Indoor Air Quality

- Used low-VOC paints and adhesives

Recycling

- Increased interior and exterior recycling centers
- Started recycling fluorescent tubes, cfl's, ballasts and batteries

- Switched to recycled content trash can liners
- Switched to paper products with recycled content

Other

- Replaced and extended permanent walkoff mats
- Eliminated dispensing of disposable water bottles
- Installed 5 gallon water coolers

Green Operations

Created a Green Operations Guide

Over 20 policies in the following areas:

- Exterior Maintenance, including policy on drought tolerant landscaping
- Energy Management
- Indoor Air Quality
- Water Efficiency (need to meter/sub-meter to baseline energy performance)
- Preventative Maintenance
- Green Cleaning
- Recycling, including creating a second shift supervisor position for the Recycling Center
- Equipment Maintenance
- Integrated Pest Management
- Event Planning
- Purchasing
- Construction Standards

results

Armstrong Headquarters Building

Walking the Talk with an Improved Headquarters

LANCASTER, PA

Walking the Talk

As a leader in the green building marketplace, Armstrong World Industries found itself without a suitable answer to questions arising from customers regarding whether Armstrong had any LEED buildings on its campus. In May of 2007, Armstrong was able to respond to customers' inquiries with the LEED for Existing Buildings (EB) Platinum certification of its company headquarters in Lancaster, PA. As Anita Snader, environmental sustainability manager for Armstrong, says, "We really wanted to show to the building industry our commitment to the LEED rating system and to sustainable principles. Having a living example of a sustainable building on our corporate campus accomplished that and much more."

Addressing Water

One of the biggest goals for the retrofit was to reduce the 126,000 sq.ft. building's use of water. In addition to installing water sensors on the faucets, waterless

urinals and dual-flush toilets, the project team was able to cut back on the building's water use by discovering a malfunction in the humidification process.

Snader recalls, "One of the big pieces we found during the commissioning phase was that fresh water was basically just going down the drain as part of the humidification process. We were able to identify that and save about 28,000 gallons a month just from that discovery."

The Ripple Effect

Attaining LEED certification created a ripple effect throughout Armstrong. The project team was able to use all of the documentation put into the certification process to create a series of policies and procedures for use on all of the buildings on the Armstrong campus and other locations as well. Snader says, "Now a facility person making a decision for carpet or for other materials is going to look at the criteria and make a more sustainable choice than they may have made before we did this project." ■

results

Size of Building Retrofit

126,000 sq.ft. (3 stories)

Project Cost

\$138,000

Expected Payback

3 years

Annual Purchased Energy

1,576,776 kWh/sq.ft.

(2,000,000 kWh purchased wind power)

Annual Water Use

420,000 gallons

Cost Reduction and Paybacks

Water Savings (actual)

380,000 gallons/year

Percent Water Use Savings (before versus after)

48%

Products and Processes

Green Products & Technologies

PPG insulated glass (tinted - argon filled - double paned); Optima 1" thick acoustical ceiling panels; Armstrong i-ceilings; Optima and Ultima ceiling panels; Systems controls using Johnson Controls software; HVAC system with energy-efficient motors and energy mgmt software zoned into small zones to maximize occupancy comfort; Integrated control systems interface with lighting systems using outdoor photocells and timers; Waterless urinals; Dual flush toilets; Low flow faucets; No irrigation landscaping; Interior and exterior light shelves; Energy-efficient lighting fixtures with T8 fluorescent lamps and electronic ballasts; Occupancy sensors; Armstrong WoodWorks Edos walls; Armstrong Translations flooring-green carpet

Green Process Improvements

- Sustainable procurement policy for IAQ compliant products
- Green cleaning
- Sustainable site maintenance
- Recycling program that exceeds USGBC recycling criteria

stats

Scope of Project

Minimal retrofit upgrade, review of systems, operational improvements

Project Type

Office

Original Building Age

1998

Project Financing

Donations, Grants, Bank Loan

LEED Rating

LEED-EB Platinum

Location

Lancaster, PA (suburban)

Project Start/End

2006/2007

Players

Owner

Armstrong World Industries

Contractor

Skanska USA Building

Designer/Architect

Gensler

Consultants

LEED/Green

Re:Vision Architecture

Engineer/MEP/Structural/Commissioning Agent

Bala Consulting Engineers, Inc.

Engineer/Civil

David Miller Associates

One Harvard Circle, Suffolk Construction

Staying on Budget While Making a Statement

WEST PALM BEACH, FL

Motivation to Green

Suffolk Construction made a corporate commitment to sustainability and green building for all building projects and office practices. Therefore, when they decided to buy an existing building in West Palm Beach and renovate it as their Southeast Headquarters, it was a natural decision to renovate the building to be green. For Suffolk to “talk the talk” about sustainability, they felt it was important that they also “walk the walk.” Their stated goal: achieve as green a building as possible while keeping within a tight budget for the renovation.

Determining the Practical Level of Green

After looking at their budget and at the restrictions created by working with an existing building, Suffolk decided to pursue LEED certification at the Silver level.

According to Matt Kiziah, the project manager at Suffolk, choices on appropriate strategies were made to maximize sustainability and results,

“In the end, it makes for a better workplace, and it’s rewarding knowing that it is environmentally-friendly as well.”

“It wasn’t just about accumulating LEED points.”

Suffolk’s strategy to maximize environmental results within an affordable budget is most easily demonstrated by the choices they made in the energy-efficiency aspects of their project. Kiziah points out that “the building is obviously fixed in a certain position so you can’t move it around” when doing energy modeling.

Therefore, Suffolk focused on what could be accomplished with available technologies and products. “We have an EIFS façade system that is 3 ½ inches thick ... [and] offers a lot of thermal insulation value.” In addition, by changing the original black plate glass windows on the exterior of the building to green low-E glass,

they were able to maximize daylight in the building while minimizing the thermal increase—a critical factor for increasing efficiency in Florida. “You pay a bit of a premium [for the low-E glass], but it definitely helps to reduce the sun’s impact on the building,” affirms Kirby.

The project proved results. As Kiziah points out, “In the end, it makes for a better workplace, and it’s rewarding knowing that it is environmentally-friendly as well.” ■

results

**Size of Building/
Size of Renovation**
45,000 sq.ft. (2 stories)/
23,000 sq.ft.

Project Cost
\$5,360,000

**Percentage of Project
Cost Attributed to Green**
5% (\$268,000)

Expected Payback
5 years

Annual Purchased Energy
45.5 kBtu per sq./ft.

Annual Water Use
96,000 gallons
(approximately 8,000/month)

Cost Reduction and Paybacks

Energy Savings (annual)
13-15% (based on commissioning)

Water Savings (annual)
■ 43% (actual)
■ \$4,150 (132,692 gallons)

Products and Processes

Green Products & Technologies

- Energy-efficient building envelope
- Energy-efficient VAV HVAC system with increased occupant controls
- Energy-efficient lighting
- Indirect daylighting
- Recycled content

Green Process Improvements

Implemented office-wide recycling program

stats

Scope of Project

Renovation—exterior facade and interior

Project Type

Office

Original Building Age

1987

Project Financing

Bank Loan

LEED Rating

LEED-NC Silver

Location

West Palm Beach, FL (suburban)

Project Start/End

January 2009/
November 2009 (near completion)

Players

Owner

1 Harvard Circle, LLC

Contractor

Suffolk Construction Company, Inc.

Designer/Architect

Hanson Professional Services, Inc.

Consultants

Energy Services Company (ESCO)

Renewable Choice Energy

LEED Consultant

Perkins + Will
Abney & Abney Green Solutions

Lighting

Sesco

National Life Office Building

Insuring Longevity in a Green Retrofit

MONTEPELIER, VT

The National Life Group headquarters in Montpelier, Vermont is the oldest and largest building in the state to receive a LEED certification. The National Life headquarters, constructed in the early 1960s, consists of three separate buildings retrofitted in 2008. "It started as trying to do the right thing in regards to the environment," says Tim Shea, Second Vice President for Facilities and Management at National Life, "but most of the things we started to look at made a lot of financial sense as well."

Implementing Strategy and Assessing Paybacks

National Life Group buildings now have solar thermal, solar photovoltaic and low-flow water fixtures. "We looked at the cost benefits and the environmental impacts of each installation, and the things that we picked were those that we recognized we needed to do with a 50-year-old building, regardless," says Shea, "so some of them aren't as aggressive or don't show as lucrative of paybacks. Then others, like the solar installation—due to some grants and the

tax benefits—there was a less than two year payback on that system." Post-retrofit, the National Life building has reduced water expenses and reduced electrical usage by over \$50,000 per year.

As part of their overall goals for reducing their ecological footprint, National Life also implemented an alternative transportation program that offers incentives for employees who carpool, use public transportation, walk, bike, or work from home. Well over 20% of the corporation takes advantage of this program.

Continuing Green Retrofits in the Future

Even after achieving LEED-EB Certification, Shea knows that there is more that National Life Group can do on an ongoing basis to constantly improve their footprint and collective environmental impact. "It's only going to get better from here," Shea says. "If technology becomes more acutely attuned to markets, and as incentives—whether it is the government's stimulus, tax credits, local grants, or utilities incentivizing—it's only going to get better." ■

results

Size of Project

543,992 sq.ft.
(3 separate buildings)

Project Cost

\$2,000,000

Annual Purchased Energy

62 kBtu per sq./ft.
(nearly 10,000 mWh)

Annual Water Use

3,000,000 gallons

Cost Reduction and Paybacks

Energy Savings (annual)
(actual, audit conducted)
\$50,000 (electricity)

Water Savings (annual)
(actual)
\$15,000 (1,700,000 gallons)

Percent Water Use Savings
(before versus after)
57%

Other Business Benefits

Building Value Increase
\$3,000,000 additional value from upgrades

Products and Processes

Green Products & Technologies

- Solar thermal installation
- Solar photovoltaic installation
- New low-flow water fixtures
- New HVAC pumps and motors
- New cooler with nontoxic freon

Green Process Improvements (new)

- Indoor air quality procedures
- Storm water management monitoring
- Commissioning procedures
- Energy Star monitoring
- Sustainable procurement requirements
- Waste management processes

stats

Scope of Project

Water and Lighting Retrofit

Project Type

Commercial office

Original Building Age

1960

Project Financing

Company profits

LEED Rating

LEED-EB Silver

Location

Montpelier, VT

(population 8,000, outside Montpelier)

Project Start/End

March 2008/
December 2008

Players

Owner

NL Group

Consultants

Electrical Contractor (Lighting)

Bates and Murray

Engineering Mechanical Contractor

Capital Engineering

Energy Services Company (ESCO)

Green Mountain Power and Efficiency Vermont

Commissioning Agent

Hallam-ICS

Mountain Gear Headquarters and Warehouse

An Early Leader Provides a Catalyst for Green Building

SPOKANE, WA

Motivation to Green

When Paul Fish, CEO at Mountain Gear, Inc., decided to move into a larger headquarters and warehouse space in 2006, his most important goal was a healthy workplace. However, as an advocate of green building, he also wanted to embrace environmental responsibility and, as a community leader in Spokane, provide a model of green building.

Abraham Kellogg, LEED consultant for this project, describes how the building has been “a catalyst in the area for a lot of people that want to do green building.” He states that, when they were retrofitting their building, green building “was just getting going in this area.”

Challenges of Being “First”

The fact that they were the first project in their area to engage in a green building retrofit made the project particularly challenging. A particular challenge they faced was finding locally manufactured products. Another challenge was working with contractors who were still new to the process.

A Catalyst for Change

However, in overcoming the challenge of working with contractors unfamiliar with green practices, Kellogg reports that many of the contractors embraced what they learned and it “has become their practice now.”

The Mountain Gear project also provided a great opportunity to promote the value of green retrofits for other building owners in that area. Kellogg reports that many people have toured the building because of its green reputation: “People are interested and want to see what has been done and how they could do it.”

Results Achieved

Mountain Gear’s leadership in green building is supported by their impressive results. Though the new building is five times the size of their previous one, their energy bills are less than double those of their former space. In addition, since their move, employee turnover is 30% lower, absenteeism is down and morale is up. According to Fish, “People are proud of the place they work and being part of a company that has gone above and beyond” to be sustainable. ■

results

Size of Building/ Size of Renovation

160,000 sq.ft. (1 story)/
111,526 sq.ft.

Project Cost

\$2,000,000

Annual Water Use

704,000 gallons
(58,656 gallons (\$377) per month)

Cost Reduction and Paybacks

Compared to Previous Space
(which was 80% smaller)

Energy Savings (actual)

\$22,000/year

Percent Energy Savings

50%+ /year

Water Savings (actual)

248,263 gallons

Other Business Benefits

Increased Rents

Higher rents charged after retrofit
(amount not specified)

Products and Processes

Green Products and Technologies

- Improved building envelope with high-performance glass;
- Motion and daylight sensors to reduce artificial lighting use;
- Carbon dioxide sensors that shut off the fan coil when the rooms are unoccupied;
- ENERGY STAR®-rated roofing system which reduces heat gain through the roof by 36 percent;
- Low-emitting adhesives, sealants and paints;
- Low-flush toilets, waterless urinals and low flow fixtures

Green Process Improvements

- Active Recycling Program (all paper, cardboard, metals, plastics, glass, wood)
- Reuse opportunities (e.g., using received product boxes and packing materials for shipping)
- Comprehensive green cleaning program affecting cleaning solutions, practices and equipment as well as staff training and custodial commitments to environmentally-conscious procedures.

stats

Scope of Project

Renovate existing building to convert to sustainable office/warehouse

Project Type

Warehouse with office/administration

Original Building Age

1960s

Project Financing

Bank Loan, Utility Rebates

LEED Rating

LEED-NC Gold

Location

Spokane Valley, WA (suburban)

Project Start/End

March 2006/
November 2007

Players

Owner

Paul Fish

Contractor

Steverding Construction

Designer/Architect

Environomic Design

Consultants

Airefco, Inc.

Electrical, Lighting

Thorton and Sons Electric

Loyola Elementary School

Making Seismic Improvements through Green Modernization

LOS ALTOS, CA

Loyola Elementary School, built in 1948, had some serious seismic problems and was on track for demolition. While solving the building's structural challenges, Lisa Gelfand, of Gelfand Partners Architects, recognized that the school provided an opportunity for retrofit.

Cost-Benefit Analysis

In the end, the decision to retrofit came as a result of a simple cost-benefit analysis. Gelfand found that new construction would be more expensive. The school was originally built with steel construction, high ceilings and large window walls, which allowed for larger classrooms and excellent north light. "When we did our conditions assessment," says Gelfand, "we found that its structure, in terms of condition, was completely sound. If we were to demolish it, we would be demolishing something that was 20% of the value of a full building. We could make these into wonderful classrooms, and it would be less money than building a new school."

Gelfand acknowledges that the cost-benefit argument is crucial.

"The sustainable thing to do is to reuse buildings. But absent the cost-benefits analysis, we would have lost the argument. We were basically making the best school for the money."

Seismic Improvements

In order to make seismic improvements, Gelfand Partners filled in some of the school's wall-to-wall windows with wood framing and plywood. Daylight harvesting light controls, EMS operated clerestory windows and stack ventilation were added to give the building evenly-lit classrooms and an energy-efficient ventilation system.

Prior to renovation, 60% of the electrical use of the school went towards lighting. By installing a new lighting system, that electrical use was lowered by at least half.

Gelfand points out the advantages of working with older buildings, "Most older buildings [constructed] are set up for ventilation and daylight because there was no other choice. So when you go back to retrofit, you look at how to make it work again the way it was meant to originally." ■

"The sustainable thing to do is reuse buildings. But absent the cost-benefit analysis, we would have lost the argument. We were basically making the best school for the money."

stats

Scope of Projects

System replacement, structural improvements, site infrastructure replacement and new administrative wing

Project Type

School

Original Building Age

1948

Project Financing

Local school bond, California state school bond, Utility rebates

Location

Los Altos, CA (suburban)

Project Start/End

2002/2006

Players

Owner

Los Altos School District

Contractor

Blach Construction

Designer/Architect

Gelfand Partners Architects

Consultants

Electrical, Lighting

Alice Prussin

results

Size of Retrofit

29,629 sq.ft.

Project Cost

\$8,000,000

Percentage of Project Cost Attributed to Green

2%

Expected Payback

4 years

Cost Reduction and Paybacks

Electricity Savings

(compared to average Title 24 school)
\$45,500/year

Percent Electricity Savings for Lighting (before versus after)

50%+ lower energy use going toward lighting

Products and Processes

Green Products & Technologies

- Daylight harvesting light controls
- EMS operated clerestory windows
- Stack ventilation

Green Process Improvements

- Recycling

200 Market Office Building

Continuously Improving & Yielding Better Occupancy

PORTLAND, OR

Originally built in 1973, the 200 Market Building has undergone a number of transformations—from an initial reconstruction in 1988 under the Russell Development Company to the various other sustainable projects throughout the years. Achieving certification under LEED for Existing Buildings (EB) was pursued to quantify and qualify their green building efforts.

Continuous Improvement

As part of their continuing process improvement system, they plan to surpass the building's LEED-EB Gold status and achieve LEED-EB Platinum under the new 2009 rating system.

They also improved their Energy Star score. Originally having a 79 after the first renovation, their score has since gone up to 96.

When asked about the ongoing improvements, Elaine Aye, principal at Green Building Services, comments, "Once it's understood how the building performs under existing conditions . . . there's sufficient value in terms of continuing to make improvements to the building to reduced operating costs."

"The average Class A building [in Portland] has about a 10–12% occupancy vacancy rate. We have less than 2%."

Strategies

Strategies implemented include water-efficient plumbing fixtures, implementation of a solid waste audit to document the building's waste stream and installation of a gas-fired microturbine generator.

Improving Occupancy & Other Benefits

In addition to the improved building performance, the green renovation also helped foster increased occupancy. Traci Wall, property manager for Cushman & Wakefield, states, "We can definitely say that our occupancy level is beating the market for Class A office buildings in Portland. The average Class A building here

has about a 10–12% occupancy vacancy rate. We have less than 2%."

Other benefits include increased notoriety. Wall comments, "Tenants are asking us about our LEED practices, and the brokerage community is asking us about our sustainability practices. So, we've developed a green building checklist that we provide to prospective tenants." ■

stats

Scope of Project

Operational retrofit, making efforts continuous and ongoing

Project Type

Office

Original Building Age

1973

LEED Rating

- LEED-EB Gold
- For continuous efforts, going for LEED-EB Platinum under LEED 2009

Location

Portland, OR (urban)

Project Start/End

1988/1991

Players

Owner

Russell Development Company

Consultants

LEED Consultant

Green Building Services, Inc.



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results

**Size of Building/
Size of Renovation**
384,000 sq.ft. (19 stories)

Project Cost
\$30,200,000

Annual Purchased Energy
5,604,000 kWh

Annual Water Use
6,000,000 gallons

Cost Reduction and Paybacks

Energy Savings (actual, audit conducted)

- 2,536,406 kWh/year
- 69%

Water Savings (actual from 2005 to 2006, audit conducted)

- Financial: \$16,290
- Quantity: 1,634,656 gallons
- Percentage: 79%

Products and Processes

Green Products & Technologies

- Waste heat from microturbine used to preheat water
- Installed new energy-efficient elevators
- Water-efficient fixtures and toilets
- Dual redundant hot water boilers
- Self-contained cooling and ventilating unit on each floor
- Converted all T12 lights to T8's
- Recycled 95% of construction waste diverted from landfills

Green Process Improvements

- Green cleaning system
- Recycling center
- Building operations manual (overall building)

PepsiCo Headquarters Building

The Power of Volunteers—Mobilizing Change with a Green Team

CHICAGO, IL

After PepsiCo officially released its corporate-wide environmental policy in 2007, the company engaged in LEED certification for its headquarters building. Their motivation was not only to become more efficient, but also to engage their employees.

According to Tim Carey, director of sustainability at PepsiCo Americas Beverages, “Perhaps the even more important goal was [to create] a building that employees are psyched to work in, that they’re energized about and that they can enjoy and be proud of.”

Influence of the Green Team

The employees formed an all-volunteer “Green Team” to encourage employee involvement in the sustainability process and to help achieve the necessary energy savings, waste reduction, recycling and air quality improvement initiatives for the building.

In 2008, the Chicago Green Team took PepsiCo’s sustainability goals to the next level and initiated the creation of a Sustainability Center on

“Probably the biggest success is having people change behaviors... without feeling like they were giving anything up.”

the ground floor of the office building, which gained LEED-CI Platinum. According to Peter Skirbst, vice president and A/E project principal at The Haskell Company, the LEED consultant on the project, “The Sustainability Center exemplifies how [PepsiCo] and their employees are changing their business practices to achieve greater sustainability.”

The extensive paperwork and documentation required for LEED posed a significant challenge. “I think having the Green Team—this all-volunteer army—building the video systems that went into the Sustainability Center, creating competitions between floors and recording floor energy use and recycling [rates]... just made it so much easier,” says Carey.

Changes in Employee Behavior

One of the greatest successes resulting from these projects was the change in employees’ practices. Carey comments, “Probably the biggest success is having people change behaviors...without feeling like they were giving anything up.” These changes included activities both big and small, such as “going to double-sided printing, eliminating energy-hogging printers [and] changing all of the cafeteria materials [to renewable ones].” ■

stats

Scope of Project

Retrofit of building; renovation of ground floor for Sustainability Center

Project Type

Office; Learning Center

Project Financing

Corporate Budget

LEED Rating

- Building: LEED-EB Silver
- Sustainability Center: LEED-CI Platinum

Location

Chicago, IL (urban)

Project Start/End

- Building: 2007/2008
- Sustainability Center: 2008/2009

Players

Owner

- Building: CBRE
- Sustainability Center: PepsiCo

Contractor

Pepper Construction

Designer/Architect

PARACHIN design studios, ltd.

Consultants

LEED

Haskell Co.

Lighting

Anne Kustner Lighting Design, Ltd.

ESCO

Continental Electric

results

Size of Retrofit

- Building: 425,000 sq.ft (17 stories)
- Sustainability Center: 3,000 sq. ft.

Project Cost

- Building: \$1,100,000
- Sustainability Center: \$1,950,000

Annual Purchased Energy

57.82 kBtu per sq./ft.

Annual Water Use

530,000 gallons

Cost Reduction and Paybacks

Operating Cost Savings (actual)

- Building: \$220,000/year in Energy Savings
- Sustainability Center: \$700,000/year in elimination of off-site meeting needs

Energy Savings

(actual, audit conducted)

2.2 million Kwhr/year

Green Products & Technologies

Building

VFD drive, lighting, light sensors, faucet switches, recycle bins, PLA-based utensils, etc.

Sustainability Center

Tile, insulation, carpeting, bamboo, wall coverings, seating, solar panels, wind turbines, toilets, lighting, solar and wind power, LED lighting

Resources

Organizations, websites and publications that can help you get smarter about green retrofit, renovation and new building

McGraw Hill CONSTRUCTION

Main Website: construction.com

GreenSource: greensourcemag.com

Research & Analytics:
construction.com/market_research

Architectural Record: archrecord.com

Engineering News-Record: enr.com

Sweets: sweets.com

Green Reports:
[greensource.construction.com/
resources/SmartMarket.asp](http://greensource.construction.com/resources/SmartMarket.asp)

Autodesk®

- autodesk.com
- autodesk.com/sustainabledesignguide

UL Environment™ YOUR PARTNER IN SUSTAINABILITY

- ulenvironment.com
- ul.com



- usgbc.org
- Green Building Certification Institute: gbc.org

SIEMENS

- usa.siemens.com/industry

CBRE CB RICHARD ELLIS

- cbre.com

Federal Government

U.S. Department of Energy

Main website: energy.gov

Office of Energy Efficiency and Renewable Energy (EERE): eere.energy.gov

National Renewable Energy Laboratory: nrel.gov

U.S. Environmental Protection Agency

Main website: epa.gov

Energy Star: energystar.gov

WaterSense: epa.gov/WaterSense

U.S. General Services Administration: gsa.gov

National Institute of Standards and Technology: nist.gov

American Recovery and Reinvestment Act 2009: recovery.gov

Academia and Nonprofit Organizations

Alliance to Save Energy: ase.org

American Council for an Energy-Efficient Economy: aceee.org

The American Institute of Architects (AIA): aia.org

Associated Builders and Contractors, inc. (ABC): abc.org

Associated General Contractors of America (AGC): agc.org

Building Owners and Managers Association International (BOMA): boma.org

Carnegie Mellon University,

Center for the Building Performance and Diagnostics: arc.cmu.edu/cbpd

Database for State Incentives for Renewable Energy (DSIRE): dsireusa.org

Green Building Initiative: thegbi.org

National Association of Counties (NACo): naco.org

Sustainable Buildings Industry Council (SBIC): sbicouncil.org

University of California, Berkeley,

Center for the Built Environment: cbe.berkeley.edu

U.S. Conference of Mayors: mayors.org

U.S. Green Building Council: usgbc.org

Other

Building Green, LLC: buildinggreen.com

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■ Design and Construction Intelligence

SmartMarket Report

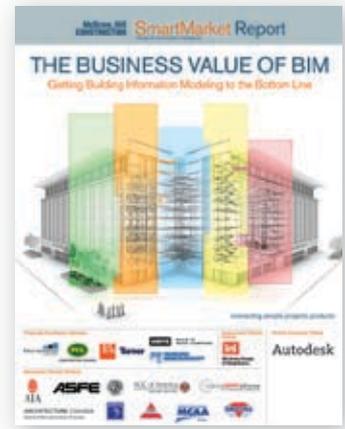
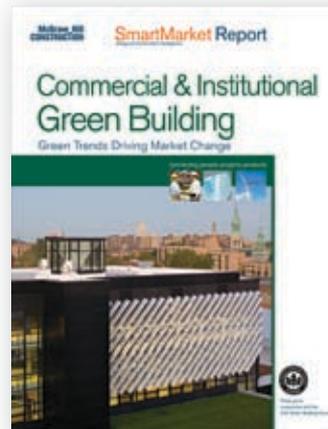
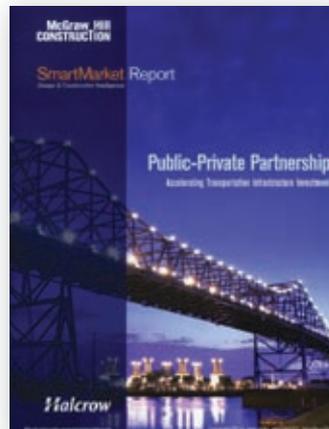
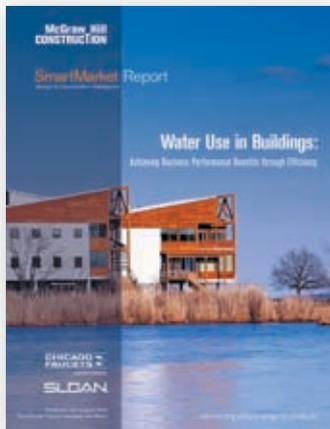
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