

Case Study

Deep Energy Savings in Existing Buildings



Overview

Site Details

- Owner: The Christman Co.
- Location: Lansing, MI
- Building Type: Office
- Project Description: Major Renovation Historic
- Size SF: 64,200
- Stories: 5
- Project Completion: 2008
- Year Built: 1928

THE CHRISTMAN BUILDING

The Christman Building in Lansing, Michigan, is the national headquarters for The Christman Company, a construction management and real estate development firm. Originally built in 1928 and registered as a historic landmark, the former Mutual Building had fallen into a state of disrepair under previous ownership. Christman purchased the building and, using its own team specializing in historic preservation; sustainable design and construction; urban revitalization; real estate development and integrated project planning, “breathed new life into the grand old building.” The project consisted of 92% major renovation and 8% new construction. Rededicated in February 2008 as the Christman Building, it currently provides office space for Christman and two additional tenants.

The Christman is one of the few Triple LEED Platinum buildings designated by the U.S. Green Building Council’s Leadership in Energy and Environment (LEED) Program. This highest-level designation through the LEED programs for Existing Buildings Operation and Management (EBOM), Core and Shell (C&S) and Commercial Interiors (CI) is a testament to a full range of sustainable practices guided by LEED but accomplished by Christman.

The building is located in a climate zone comparable to Montana, northeast Washington and eastern Idaho¹, and its age and type are typical of many older buildings in small northwest cities. The measured energy use of this historic structure is now 29% better than comparable buildings in the U.S.,

¹ Climate Zone 6

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- GAVIN GARDI, SUSTAINABILITY MANAGER



and its Energy Star score of 81 out of 100 puts it in the top 20% in the U.S. for energy performance.

Motivations

Project Goals: Christman developed the following five design criteria to help it meet its project goals:

1. Represent the company’s core values, people, energy, expertise, accomplishments and history.
2. Encourage team collaboration internally, with branch offices and customers in both informal and formal settings.
3. Create an environment that shares successes and energy and provides for mental and physical breaks.
4. Maximize comfort with individual thermal and lighting controls, ergonomic workstations and daylighting.
5. Plan adaptively for growth, change and the space needs of short-term, on-site project personnel.

The Christman Company’s CEO and Sustainability Manager were both enthusiastic regarding their objectives and the desired outcomes.

“[Christman’s] quest is to provide the best possible tools and expertise to customers in achieving their own green building and operations goals. What better way to learn how to do that than by taking ourselves through the process, and experiencing it first-hand from an owner’s perspective?”

- STEVE ROZNOWSKI, CEO

Christman advocated strongly for the under-floor air distribution system as it improved energy efficiency and indoor air quality and resolved architectural issues.

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Rationale and economic criteria of selecting energy efficiency options:

Using an integrated approach, Christman was able to incorporate energy efficiency into the project and to prove it could be accomplished within a tight budget. The company engaged in extensive estimating and an HVAC life-cycle cost analysis to ensure the project would remain within budget. Christman advocated strongly for the under-floor air distribution system as it improved energy efficiency and indoor air quality and resolved architectural issues.

Barriers and resolutions to energy efficiency measures: Christman wanted to use a daylighting approach with controls and dimmable ballasts, but found the cost at the time was too high (it was estimated to increase the cost of the light fixtures by one-third).

Technologies and Design Practices

The project was a whole-building major renovation, allowing for consideration of many efficiency technologies and approaches. The building was not occupied during construction.

HVAC: Christman designed HVAC systems and selected equipment to minimize energy use while providing individually-controlled comfort conditions. It estimated the under-floor air distribution system to be more energy-efficient than conventional ducted systems. All cooling equipment uses refrigerants that cause minimal damage to the environment.

Envelope: Christman selected the white roof and 6” of added insulation to reduce the urban heat island effect and energy use. The original front façade window frames have been restored and fitted with double-glazed glass for comfort and energy efficiency. The building’s side and rear exterior windows have been replaced with high-efficiency aluminum windows.

Lighting: Additional background lighting is provided by high-efficiency fixtures and T-5 fluorescent lamps with a very high color-rendering index (CRI). All workstations have individually controlled multi-level task lighting. Time of use is controlled by occupancy sensors in private offices and stairways and by programmed control panels in common spaces. The lighting system energy savings are projected to be 27% lower than that observed with a standard system.

Daylighting: Large perimeter windows provide daylighting to 92% of occupied spaces building-wide, and outside views to 90% of the occupants. Daylighting controls were not incorporated into the project due to cost.

Controls: The web-based building management system (BMS) has several thousand control points which are used to operate the building systems for

Efficiency Measures

- High-efficiency HVAC units
- Under-floor air distribution system
- Increased insulation
- Reflective roof
- Insulated glazing
- T-5 fluorescent lighting
- Lighting program control panels
- Occupancy sensors
- Large windows providing daylighting
- BMS whole building controls
- Commissioning

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the value of comprehensive recommissioning. Christman also participated in USGBC's Building Performance Partnership program, a program to track actual performance. Its 2010 Performance Report indicated the building's energy use (after re-commissioning) of 66 kBtu/sf/yr is 29% less energy per square foot than the average for offices in the U.S.³ The U.S. average for all offices is a good basis for quickly comparing buildings of the same type.

A more specific comparison can be made through the Energy Star Portfolio Manager program, which determines the energy use of buildings of like type, size, hours of use and climate. In this example the Energy Star program calculated that comparable buildings would use more energy than the average U.S. office building (probably driven primarily by the cold Michigan climate). The Christman Building, however, uses less energy than either reference – and 35% less energy than the Energy Star estimate. The building earned an ENERGY STAR score of 81 (out of 100), placing it in the top 20% of office buildings in the U.S. The Christman Building provides an excellent example of achievable results when an owner pays continuous attention to energy use and ensures systems are operating as designed.

Monitoring systems: Mr. Gardi is a firm believer in the importance of metering: “You can't improve what you don't measure.” Christman meters the whole-building gas, electric and water and has electric sub-meters for each floor.

Financial

Total project cost: \$8,913,200, \$138/sf (after tax credits).

The overall project cost was reduced from \$187/sf by actively pursuing several tax credits:

- \$672,500 in Michigan Brownfield Single Business Tax (SBT) Credits
- \$2 million in Federal Historic Tax Credits and \$500,000 in State Historic Tax Credits
- \$8.5 million in Federal New Market Qualified Investment Funds
- \$1.2 million (\$100,000/year for 12 years) in Property Tax Relief through establishment of a Federal Obsolete Property Rehabilitation Act (OPRA) District

Funding: Project funding was based on a public/private partnership. Through a development agreement via the Brownfield Authority with the City of Lansing, the project qualified for the Michigan Single Business Tax Credits for eligible costs associated with the project. The City also provided key economic information that supported requests for the New Market Tax Credits. Due to its expertise in making projects affordable, Christman successfully used these programs to achieve financial feasibility for rehabilitation of the obsolete building.

³ CBECS – The Energy Information Agency's Commercial Buildings Energy Consumption Survey 2003.

Project Results

Competitive positioning in the market: Christman describes its headquarters as the world's first triple LEED-Platinum (CI, CS, EBOM) building. Sustainability manager Gavin Gardi believes the building differentiates his company from others:

“Tenants enjoy working here, the air feels fresh and is good for people with allergies; operating costs are low. People rave about the building.”

Staff education/user satisfaction: According to Gardi, Christman has conducted some staff education on energy use, but more is needed. Staff members are aware of the need to turn off lights when they leave. One of the goals of the company is to keep employees and tenants as comfortable as possible.

Innovation: Gardi describes the most innovative aspect of the project as “... taking a historic building and transforming it into a high-quality, high-performance building at no additional cost within a tight budget.”

Estimated annual cost savings: The energy efficiency upgrades incorporated into the project result in an estimated annual savings of \$45,659. Implementation costs for the energy efficiency upgrades were \$22,693, with a payback period of six months.

Acknowledgements and Sources

Project Team:

- Owner Representative: The Mutual Building, LLC
- Construction Manager: The Christman Company
- General Contractor: The Christman Company
- Architect: SmithGroup
- Commissioning Agent: The Christman Company
- M & E, Lighting designer: SmithGroup

Sources:

- The Christman Company: Gavin Gardi, Sustainability Manager
- Christman website:
http://www.christmanco.com/portfolio.asp?id=106&cat_id=25
- Building Green LEED case studies (membership required)
 - <http://www.buildinggreen.com/hpb/overview.cfm?projectID=1894>
 - <http://www.buildinggreen.com/hpb/overview.cfm?projectID=966>
- USGBC BPP Performance Report
- TCB Energy Savings Measures

Photos: Courtesy of The Christman Company and Gene Meadows

Research and Development:

- New Buildings Institute (NBI): Liz Whitmore, Cathy Higgins, Mark Lyles

Funding:

- The BetterBricks program of the Northwest Energy Efficiency Alliance (NEEA): Peter Wilcox, John Jennings, and Mark Rehley
- NBI's work is also supported by the Doris Duke Charitable Foundation and the Kresge Foundation

Existing Building Renewal Initiative

This work is part of NEEA's regional Existing Building Renewal initiative to accelerate the market's adoption of deep, integrated energy-efficient renovations. The initiative currently focuses on office buildings but will add other market sectors with large potential energy savings. This is one of the ways the region can rapidly revamp existing stock to achieve 30–60% energy savings — on the way to netzero-energy use by commercial buildings.

For more information on the Existing Building Renewal Initiative

contact: Peter Wilcox pwilcox@neea.org or www.betterbricks.com

For additional case studies highlighting high performance commercial buildings, visit NBI's Getting to 50 Database:

buildings.newbuildings.org/

For more information about NBI's efforts to improve the energy performance of existing buildings, visit:

newbuildings.org/advanced-design/existing-buildings

New Buildings Institute

New Buildings Institute (NBI) is a nonprofit organization working collaboratively with commercial building professionals and the energy industry to improve the energy performance of commercial buildings.