



BETTERBRICKS
Bottom line thinking on energy.

BANNER BANK BUILDING



PROJECT OVERVIEW AND TEAM

OWNER: The Christensen Corp.

LOCATION: Boise, Idaho

BUILDING TYPE:

Speculative Office Building

SIZE: 180,000 square feet

COMPLETION DATE: March 2006

UTILITIES: Idaho Power,
Boise City Geothermal

ARCHITECT: HDR Architecture, Inc.

STRUCTURAL ENGINEERS:

KPFF Consulting Engineer

MECHANICAL ENGINEERS:

Musgrove Engineering, P.A.

ELECTRICAL ENGINEERS:

Romar Electric

COMMISSIONING AGENT:

Solarc Architecture & Engineering

GENERAL CONTRACTOR:

The Russell Corporation

INTRODUCTION

The Banner Bank Building is a model for high performance buildings in the US. Energy efficiency strategies were considered from the whole building scale, such as under floor air distribution (UFAD) with evaporative pre-cooling, to the finest details, such as eliminating light switches in favor of individual computer controls.

With a total of 180,000 square feet, made up of eleven floors, this building added a significant amount of class-A office space to the Boise area and is delivering a high quality environment that uses almost half the energy at typical rental market rates. Due to its enhanced interior environment and competitive lease rates, the building has leased up faster than its competitors.

“We created a beautiful, high-performance building that’s good for the environment. And it didn’t cost us any more to do it.”

Gary Christensen, Owner Christensen Corp.

The art-deco inspired building is the first LEED Platinum building in Idaho, earning 49 out of 62 possible LEED credits in the Core & Shell category. Worldwide, Banner Bank was the 16th Platinum building but the first speculative office building to achieve this level. It earned all ten of the “Optimizing Energy Performance” credits under the Energy and Atmosphere section of the LEED checklist, showing Core & Shell modeled energy savings of over 50%. The building’s Energy Use Index (EUI) is 37 kBtu / FT²·YR as compared to an average office building in Idaho which uses 89 kBtu / FT²·YR. The reduction in energy use offsets approximately 721 tons of CO₂ per year—the equivalent of removing 139 cars from the road per year.

Energy efficient strategies of Banner Bank provide additional benefits. The raised floor system that expedited data and power runs during construction, provides tenants with optimum outlet and supply air placement, and is also easy to reconfigure. Modular walls and clear span spaces in combination with the raised floor system minimizes owner churn costs and provides both the owner and tenants tremendous space flexibility.

Banner Bank Exterior



Photo Credit: Christensen Corp.

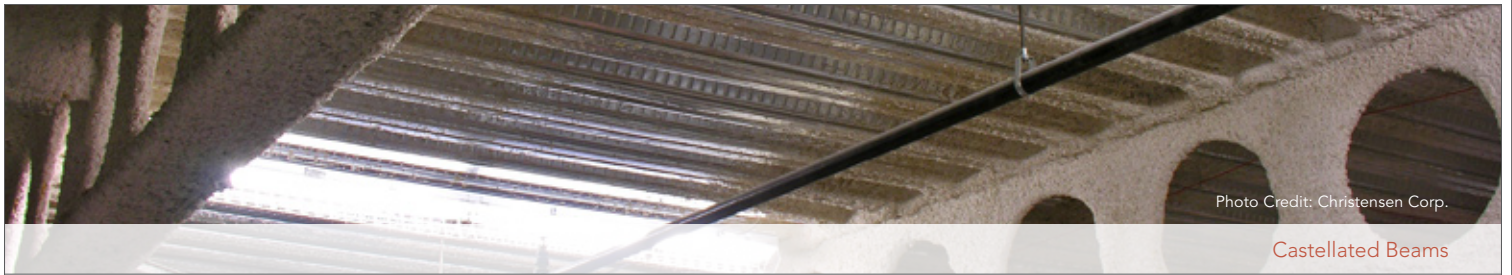


Photo Credit: Christensen Corp.

Castellated Beams

STRATEGIES AND FEATURES

Profitability

- Minimize energy use
- Reduce material consumption
 - Castellated beams optimized steel use
 - Modular wall systems
- Minimize churn costs
 - Clear span spaces
 - Modular wall system
 - “Plug-n-play” electrical outlets

Visual Comfort & Preference

- Use daylight as primary light source
 - 2-inch white aluminum blinds as shades and reflectors
 - Spectrally selective high visible light transmission glazing
 - Glazing all the way to ceiling & narrow floor plates
- Supplement daylight with quality electric lighting & controls
 - Indirect-direct electric lighting
 - “Plug-n-play” fixture & controls
 - Digitally addressable fixtures & controls
 - Photo-controlled dimming with desktop user control
 - Occupancy sensors

Thermal Comfort & Air Quality

- Reduce first and lifecycle cost of cooling systems
 - Demand controlled ventilation
 - Evaporative pre-cooling
 - UFAD allows for higher temperature cool air
- Reduce heating system energy use
 - In-floor geothermal closed water loop

Water

- Minimize water consumption
 - Use drought tolerant vegetation
 - Use moisture sensors
 - Treat and reuse graywater
 - Touchless low-flow fixtures

Other “Green” Features

- Provide healthy interior air
 - Use low-VOC paints and adhesives
- Reduce & recycle materials
 - 42% of building is recycled material
 - 90% of construction waste recycled

ENERGY AND FINANCIAL ANALYSIS

- Project Budget: \$23,000,000
- Price/Square Feet: \$128 / SF
- Utility Incentive: \$100,000 from Idaho Power

Operating Expenses

- Energy: Modeled Annual Savings \$48,387. As compared to base (ASHRAE 90.1).
- Churn: \$8/SF for major turnover. As compared to \$20-25/SF typically.
- Triple Net: \$4.90 / SF. As compared to \$6-8/SF typically.

Energy Analysis

- Energy Cost: \$99,438 (Baseline) \$51,051 annually (49% savings)
- Lighting: 1,085,000 kWh (Baseline) 435,000 kWh (60% better)
- Ventilation: 338,000 kWh (Baseline) 150,000 kWh (56% better)
- Space Cooling: 240,000 kWh (Baseline) 150,000 kWh (38% better)
- Pumps: 98,000 kWh (Baseline) 43,000 kWh (56% better)
- Energy Use Index: 89.30 kBtu / ft²· yr (typical Idaho)**, 59.72 kBtu / ft²· yr (code baseline), 37 kBtu / ft²· yr (as designed)
- Carbon Offset: 721 tons of CO₂ / year (energy savings)**

Base Building vs. Banner Bank Energy Savings

	BASE BUILDING	BANNER BANK	BASE BUILDING	BANNER BANK	BASE BUILDING	BANNER BANK	
	kBTU	kBTU	kWh	kWh	Energy Expense	Energy Expense	
LIGHTING	3,703,105	1,484,655	1,085,273	435,109	\$43,400	\$17,400 (60% better)	
VENTING	1,153,594	511,950	338,085	150,038	\$13,520	\$6,000 (56% better)	
PUMPING	334,474	146,759	98,025	43,011	\$3,920	\$1,720 (56% better)	
COOLING	819,120	511,950	240,060	150,038	\$9,600	\$6,000 (38% better)	
HEATING	4,382,100	2,974,800	–	–	\$29,000	\$20,300 (30% better)	
					\$99,440	\$51,420 (48% better)	TOTAL

LESSONS LEARNED

Load Reduction Measures

- **Under Floor Air Distribution.** The building is equipped with an underflow air system with a pressurized plenum space for ventilation supply air, thus delivering air closer to the occupants with less fan power and minimizing the air change requirement. Vents and outlets can easily be placed at each individual's workstation, providing excellent access to fresh air and individual temperature control. The raised floor system allows the building to use outside air for cooling for more than 200 extra hours per year because the air is delivered at approximately 62-67° F, while a typical overhead system supplies air at 55-59° F. This system also improves indoor air quality because it takes advantage of stratification and a ceiling return plenum to remove stale air without mixing it with the supply air.
- **Cooling.** Since the underfloor air is delivered close to the users, it can be delivered at a higher temperature requiring less cooling energy. On the roof top unit, evaporative cooling cassettes pre-cool the air before it passes through the chiller reducing energy use because the chiller does not have to work as hard. Further, this technology helped to reduce total first cost in two ways. First, these technologies allowed for a smaller, less expensive and more lightweight chiller. Second, the smaller chiller allowed for smaller less expensive structural members.

- **Heating.** Geothermal heating is integrated with the under-floor air distribution system. Heat from the 170° F geothermal water supply is transferred to a closed water loop that runs through the building. The geothermal water is then recharged into the ground.
- **Envelope.** Spectrally selective high performance glazing was used throughout. This glass is effective at keeping the heat outside in the summer and inside during the winter while allowing a large amount of visible light to penetrate the building for further electric lighting savings and increased user preference.
- **Daylight Harvesting.** The open floor plan allows daylight to penetrate deeper into the space, uninterrupted by columns or permanent hard walls. The windows are all fitted with 2-inch aluminum louver blinds which act as mini light shelves to help redirect light toward the ceiling to increase perceived brightness while also eliminating users' line of sight to the sun and minimizing glare.



Saving Money

- Through the Banner Bank Building, the Christensen Corporation has proven that 'building green' increases profitability for owners right out of the chute, and suggests that higher profitability will be enjoyed over the life of the building due to energy cost reductions and lower churn rates. Several current tenants at the Banner Bank Building have indicated that the "green building features" were an important factor in their decision to move their business into the building. When it comes time, a higher sale price is expected for the building (net asset value) due to lower operating costs, higher tenant satisfaction, and higher occupancy rates.
- **Up Front Capital Savings.** Open floor plans, good envelope design, and load reductions in heating, cooling and ventilating allowed designers to downsize the mechanical systems, reducing equipment cost, installation cost, and structural cost. These savings were reinvested into the UFAD system, lighting control system, and evaporative precooling systems that further improved building performance.

The core and shell building has large open floor plates, uninterrupted by structural components. Large 27-inch deep castellated beams were used to clear span from the core to the perimeter. These beams span longer distances than normal wide flange beams while using 12% (234,000 pounds) less steel. The decision to use the castellated beams also cut the cost for columns because fewer were required. The open floor plates allow tenants to easily modify their interior spaces with minimal expense.

- **Leasing Benefits.** The building leased up quickly, achieving nearly 90% occupancy in the first 12 months of operation while other buildings in downtown Boise are experiencing 24-48 month periods to achieve the same occupancy. Further, the building is enjoying a 70% realization ratio for prospective tenants. This is largely due to the enhanced interior environment, flexible space layout options, and lower triple net and tenant improvement costs. Operating expenses are more than \$1.00/SF lower at the Banner Bank Building than other typical Class A office space in Boise.

Other Green Features

- **Recycled Content.** More than 90% of the debris from demolition (pre-existing parking garage) and construction was separated, recycled and documented. The building is constructed of over 42% recycled materials.
- **Water Reduction.** The building is equipped with a 20,000 gallon cistern (water storage tank). Storm-water is directed from a 7-block diameter to the graywater treatment center in the building. The water then fills the storage tank and is used for on-site irrigation and toilets. The building uses 80% less water than a similar office building of comparable size.
- **Transportation:** The building is located less than 200 yards away from a bus stop and includes indoor bike parking and shower stalls to provide alternate transportation opportunities for all the occupants of the building.

OTHER LESSONS LEARNED

- **Owner Pushes Design Team.** Gary Christensen, CEO of Christensen Corporation, challenged the design team to think outside the box and to not approach the project as business as usual. All the players came together, and at Gary's urging, made daylighting and lighting controls a top priority while engaging in a design process that considered the full impact of their decisions and did not accept seemingly high first costs as a deal breaker. Christensen also promotes the use of a building rating system such as LEED because it helps designer/owner teams set higher goals and gives some guidance for the realization of those goals. For Banner Bank, achieving LEED Platinum has also brought international attention to Christensen Corporation, their design team and the community of Boise. This success story has extended Christensen Corporation's business model to client groups and development opportunities that were not available previously.
- **Importance of Commissioning:** Christensen also indicated that the 0.05% of the project budget spent for 3rd party commissioning was well worth the investment. Specifically, systems were balanced, controls and operating sequences were tweaked, extra ceiling return diffusers were recommended and additional training on operating the lighting system helped to realize the energy savings potential in the design.
- **Things that Could Be Improved:** Christensen indicated that the storm water reclaim system was not yet performing satisfactorily and he may think twice before attempting a system like it again. Further, it has taken careful planning to balance the HVAC equipment in conjunction with an UFAD system, as tenants are moving in to various spaces. The UFAD system pressurization changes as spaces are fitted with carpet tile as tenant improvements are completed.

PAGE NOTES

* Energy Model for LEED certification performed by design team

** Based upon USEPA© Target Finder for Idaho

*** Based upon USEPA© @ 5.2 tons of CO₂/car-year

CONTACTS AND RESOURCES

BOISE INTEGRATED DESIGN LAB:

www.uidaho.edu/idl

THE CHRISTENSEN CORPORATION:

www.c-squaredboise.com

IDAHO POWER:

www.idahopower.com

HDR ARCHITECTS, INC.:

www.hdrgreen.com

BETTERBRICKS:

www.betterbricks.com/design

BANNER BANK DVD:

The Color of Money

www.deepgreen.tv



Photo Credit: Boise IDL

Banner Bank Exterior

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Boise; University of Idaho;
College of Art & Architecture