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NATURAL INTERIOR DAYLIGHT BRINGS LIGHT AND JOY TO BERKELEY WEST LIBRARY

ENEREF INSTITUTE EXAMINES HOW THE NUMBER OF PATRONS
USING THE LIBRARY INCREASES WITH THE INSTALLATION OF SKYLIGHTS.

“Having beautiful spaces was really important,” explains librarian Sarah Denton, “and a large part of that was having daylight available at the branch.” Denton, is the Manager for Branch and Children’s Services for City of Berkeley, Berkeley Public Library,

West Branch Library.

“But also feeling connected to the outside,” Denton said, expressing how brightening the space with natural interior daylight was an improvement over the darker interiors of the

IT ABSOLUTELY IS ONE OF THE HIGHLIGHTS WHERE WE HAVE SIGNIFICANT NATURAL LIGHT

A NOVEL LIBRARY DESIGN: NOT JUST FOR BOOKS

Librarian Sarah Denton reports that the “amount of time people spend” increased.

previous buildings.

The West Branch Library is a completely new building, designed to comply with the City of Berkeley's 2009 Climate Action Plan. According to Neal DeSnoo, with Berkeley's Energy Program Management team, the Climate Action Plan “sets the ambitious goal of reducing local greenhouse gas emissions by 80% by 2050 and envisions a city where new and existing buildings achieve Zero Net Energy consumption through energy efficiency and renewable energy sources.”

To achieve the goal set by the Climate Action Plan, every new building Berkeley constructs needs to be a Zero Net Energy building, according to Gerard Lee, an architect with Harley Ellis Devereaux, whose firm won the bid for the new West Branch Library because of their attention to energy reduction methods. Harley Ellis Devereaux's Green Studio also provides energy consulting to a number of other

architectural firms.

The building design is a substantial improvement over what was there before, says Denton.

In no small part, Lee credits the quality of the space to the natural interior daylight the design team created—including windows and skylights. “You give somebody a choice between being in a room that has daylight, as opposed to a windowless room with LED lights, they are going to pick the room with daylight,” Lee insists.

While the previous library building had floor-to-ceiling windows, the challenges inherent to natural interior daylight design were not considered. Eventually the tall windows in the older building were covered with book shelves, blocking out all the natural light (and fading the books).

“So it's totally different from what it was like before,” says Denton.

The high-traffic urban setting on University Avenue in Berkeley, California, where the West Berkeley Public Library sits, offers no space for parking cars, but has plenty of space for bikes to dock. The 24 ft tall, 9,500 sf library was completed at the end of 2013, well under the \$7.5 million budgeted for the project. The skylights, which bring in the majority of the natural interior daylight, were installed in just two days.

“It's absolutely one of the highlights,” exclaimed Denton as she referred to the significant natural light flooding the interior of the library.

Designing a building with natural interior daylight, as opposed to artificial electric lighting, required the Harley Ellis Devereaux (HED) architecture team to account for the changing path of the sun as it sweeps across the sky from dawn to dusk. HED's Building Simulation studio used a number of sophisticated modeling software products to position VELUX skylights “throughout the building to ensure a very even illumination,” he said. The software also predicted the sun's motion year round to avoid shade on the rooftop solar thermal



VENTING SKYLIGHTS

Venting skylights bring in natural interior daylight and also fresh air.

collectors (which generate heat) and solar photovoltaic panels (which generate electricity). Poorly designed daylight systems can add unwanted heat or glare, something Lee was careful to avoid in the design.

Despite the added complexities, Lee insists natural interior daylight is worth the extra effort. “In all the buildings I’ve ever designed, they always have had a daylight component, because it just makes sense,” says Lee.

The building uses numerous other sustainable design technologies. Instead of a large air-handling unit on the roof, the building uses

natural ventilation. The breezes that blow in from the Bay create a Venturi effect. Storm water runs into special low flow planters that filters and cleans the water before it enters the ground.

BRINGING IN NATURAL INTERIOR DAYLIGHT

However, natural interior daylight is unique as a component to achieve Net Zero Energy buildings.

“Few other sustainable technologies so enhance the building’s interior space for occupants, while lowering the building’s carbon emissions for the environment, as effectively

as natural interior daylight,” contends Seth Warren Rose, founding director of Eneref Institute.

And interviews with the Berkeley Library staff attest to the visual comfort daylight brings to the space interior.

“I think patrons enjoy spending time here,” observed Amanda Myers, the branch librarian. “I think it’s a beautiful building. I think that we all enjoy it.”

Librarian Sarah Denton agrees. “I know that they have all mentioned that being able to have that light is a huge thing.”

THERE IS A VALID AND PREDICTABLE EFFECT OF DAYLIGHTING ON STUDENT PERFORMANCE.

A compelling statistical correlation exists between the amount of daylighting in elementary school classrooms and the positive performance of students on standardized math and reading tests according to a report by Daylighting expert, Heschong Mahone Group, Inc.

The HED design team positioned the majority of windows on the north side of the building to minimize heat gained from the sun. Shades also help to minimize any heat gain through the window. Both the north and south side of the main library space offer large window views. On the sunny south side of the building Lee specified deep recessed trellis windows, which avoid glare by bringing indirect light into the building.

On the roof of the building are nearly thirty VELUX skylights that give the building a feeling of “lightness and airiness,” according to Sarah Denton. To minimize glare, the skylights are tilted 20 degrees to the north.

VENTING SKYLIGHTS OFFER FRESH AIR

Fifteen of the skylights open, allowing fresh air into the building. The VELUX fresh air venting skylights also allow heat to escape during summer months. The air exchange also can rid the building of volatile organic compounds, or VOCs.

“Skylights can come in many

different kinds of configurations. The best skylights, in my mind, are those that can be vented,” insisted Lee.

Skylights tend to be at the very top of a building. Hot air rises. “The best way to eliminate hot air is right through your skylights,” explained Lee, who sees venting skylights as a way of “reducing the need for [traditional] heating and cooling.”

And while the passive ventilation cools the air during the summer, the skylights and south-facing windows provide passive heating during winter months. Research backs up Lee’s claim. A recent report by Group14 Engineering found that “venting skylights will result in energy cost savings” and “indoor air quality is significantly improved when the venting skylights are used, leading to a very quick dilution of predictable indoor contaminant concentrations.”

Naturalight Solar, a California installation company, installed the VELUX skylights. They coordinated the install with the building control company to assure that the automatic

blind controls would properly communicate with the building’s computer controls. The skylights have built-in augmenting shades and a sensor that detect when to lower shades. Shades can keep the heat out while still letting the right amount of light needed into the building.

Fourteen of the skylights are non-venting. Both venting and non-venting VELUX skylights employ a recently developed Cardinal LoÉ³ glass, which reflects most of the infrared light (IR), while letting in almost all of the visible light. Therefore, the LoÉ³ substantially reduces the amount of solar radiation that would otherwise enter the building as heat. The glass is also designed to reduce the potential of fading of interior furnishings. As an added bonus, the LoÉ³ glass prevents more heat loss during winter months than more common window glass with clear glass or with older low-E coatings.

On top of the book stacks, traditional artificial light was employed, focusing all of their light on the book bindings for ease of locating.



A WELCOMING SPACE

Along with skylights, natural light from a two-story wall of glass signals a welcoming and open space.

Photo credit: Mark Luthringer.

A ROOM WITH A VIEW

The new building achieved the Net Zero Energy that Berkeley's Climate Action Plan was seeking. The combined energy generated from the rooftop photovoltaic panels and solar thermal collectors is 17.4 kBtu/sf/year. The same amount of energy is needed by the relatively small load of the building, including the electrical task lighting, heating, cooling pumps, electrical outlets, hot water and ventilation fans.

"The West Berkeley Library is now the model for sustainable building, merging innovation and beauty," says Neal DeSnoo

of Berkeley's Energy Program Management team.

And the community agrees: Compared to the older library building the number of patrons has increased. "We definitely are seeing our usage numbers going up," claims Ms. Denton. She added that the library has also seen an increase in the amount of time people spend there.

"Whereas previously people would sort of come in and grab stuff and go, they are much more likely to spend some time reading or browsing or chatting with people, or just sitting and enjoying the space," explained Denton.

"It's very busy, continuously from when we open until when we close. Patrons want to be inside of a beautiful interior." Amanda Myers agrees with Sarah Denton, and takes it one step further. "It's easy to come to work because it's a beautiful building."

Research and reporting compiled and provided by Eneref Institute. (www.eneref.org)