WUSTL's Living Learning Center shares the world's first full 'Living Building' certification

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The Living Learning Center just became one of the first "living buildings" in the world, a title that requires net zero energy usage and net zero wastewater production over the course of a year. Credit: David Kilper/WUSTL

The call came in to Kevin G. Smith, PhD, associate director of the Tyson Research Center at Washington University in St. Louis, from Jason McLennan, CEO of the International Living Building Institute (ILBI).

McLennan was calling to tell him that Tyson's Living Learning Center had achieved the world's first full certification under the Living Building Challenge run by the ILBI.

The challenge is widely recognized as the world's most rigorous green

building performance standard.

Smith texted the good news to Deborah S. Howard, who had worked closely with Smith on the project. "I'm so happy," said Howard, special assistant to the executive vice chancellor of administration Henry S. Webber, repeatedly. Her jubilance outran her ability to put words to the news.

A second building, Omega Center for Sustainable Living in Rhinebeck, N.Y., simultaneously won full certification. A third building, Eco-Sense, a private residence in Victoria, British Columbia, was awarded partial certification.

More than 70 projects worldwide are actively pursuing Living Building certification, hoping to be the first to qualify.

Founded in 2009 by the Cascadia Green Building Council, the ILBI is a non-governmental organization dedicated to the creation of truly sustainable built environments around the world.

Launched in November 2006, the Living Building Challenge was developed by McLennan and the Cascadia Greeen Building Council and is now managed by ILBI.

To achieve certification, a project must:

- generate all of its own energy through clean, renewable resources;
- capture and treat its own water through ecologically sound techniques;

- incorporate only nontoxic, appropriately sourced materials; and
- operate efficiently and for maximum beauty.

To achieve 'Living' status, all program requirements must be met and proven through a full year of operation, culminating in a third-party audit.

The goal of the challenge, according to the institute's mission statement, is to provoke a fundamental, transformative shift in how we conceive of the built environment.

"These are quite simply the greenest projects in the world," said McLennan in the news release announcing the awards.

"If the building industry follows the example set by these pioneering teams," McLennan said, "we can begin healing our ecosystems and creating a future in which all life can thrive."

"We are honored to receive such a prestigious award, which will serve as a keystone for our continuing commitment to sustainability and the environment," Washington University's Chancellor Mark S. Wrighton said.

"The Living Learning Center is a symbol of our commitment to green building," Wrighton said. "The nine LEED-certified buildings Washington University has built in the last few years and the five others that are in the process of certification are testimony to our belief that the future must bring significant reductions in energy use. We have already announced that we intend to reduce greenhouse gas emissions to 1990 levels by 2020 without purchasing carbon offsets."

LEED is a nationally accepted set of benchmarks for the construction of

green buildings.

A chain of rainflowers guides rainwater from the lower roof to a rain barrel, which is tapped to water landscaping. Credit: Ralph Bicknese/Hellmuth + Bicknese

Tyson Research Center, located 20 miles southwest of WUSTL's Danforth Campus, contains 2,000 acres of woods, prairie, ponds and savannas for faculty and students to conduct environmental research.

The Living Learning Center is a 2,900-square-foot facility that houses a computer lab, classrooms and administrative offices for the research station.

How it all began

"When I took over directorship of the Tyson Research Center in 2007, I thought that if we're going to create a research center that is internationally recognized for its work in environmental sustainability,

we should also create facilities in harmony with our mission," said Jonathan M. Chase, PhD, professor of biology in Arts & Sciences and director of the Tyson Research Center.

"So I said we need to go beyond LEED and go beyond green and create something really out there. One other field station had done something similar — the Jasper Ridge Field Station at Stanford University and Stanford is a world leader in green building.

"That was the proposal I took to Ed Macias, who was then dean of Arts & Sciences," Chase said. "This was a long time ago, before we knew anything about the Living Building Challenge.

"But when we had a need for a building, we hired the architect Daniel F. Hellmuth, a principal at Hellmuth + Bicknese Architects, who have extensive experience in sustainable design. Hellmuth suggested we try for the Living Building Challenge. And then the whole university just got behind it and ran with it.

"But it was the university, the Tyson staff, the architects and engineers, and the contractors who took this big fluffy vision and made it real," Chase said.

A thing of beauty

The living building challenge requires that buildings be inspiring and beautiful as well as functional, and some parts of the project fell naturally and beautifully into place.

The eastern red cedar siding on the building came from trees harvested at Tyson — within two miles of the building — as part of a habitat restoration project.

"We were taking down the cedar trees," Chase said. "It's a native tree, but it is growing more densely than it used to because of fire suppression. And we just got a big grant to restore glades, so I'm quite proud of the fact that we're doing science in chopping down these trees and doing sustainable architecture using them to side the building."

The building itself is a restoration, as an article in the fall 2010 issue of High Performing Buildings that showcased the Living Learning Center pointed out. It was sited on an asphalt parking lot that was replaced with pervious concrete walkways, native landscaping and a rain garden.

The building's doors were salvaged and refinished. The hallway light fixtures came from an old St. Louis school. Door hardware was salvaged from the university.

A bat house built into the building's eaves will eventually be monitored by two "bat cams."

At one corner of the deck, which is also an outdoor classroom with bleacher seating, an elegant aluminum rainflower rain chain directs rainwater from the lower roof into a rain barrel. The water collected in this way can be used to water landscaping.

The hidden carbon accounting

"One of the things I liked about the challenge," Chase said, "was how it made us aware of everything — and I mean everything — that contributes to the carbon footprint of a building."

For example, construction activity itself releases carbon. The construction carbon footprint for the building was offset through the purchase of carbon credits from the Bonneville Environmental Foundation.

The habitat taken up by the building footprint was balanced by the purchase equivalent habitat through a program run by the Nature Conservancy. This land will remain untouched for the life of the building.

Not plug and play

The jubilation at Tyson was all the greater because the team had faced and overcome significant obstacles to achieve certification.

"I don't think any of us knew the challenges this would bring, including Washington University, our design team, the contractors or the folks at Tyson," Hellmuth said, "but throughout the process we have continually met them in a seemingly endless gauntlet."

One of the easier problems to solve was water purity. All water for building use is collected from the roof and stored in a 3,000-gallon underground tank where it is filtered and irradiated with ultraviolet light so that it is clean enough to be potable.

An initial failure of water quality tests was traced back to the tank, which hadn't been properly cleaned before filling. The water now consistently passes tests.

The biggest challenge, and the one that nearly defeated the team, however, was achieving net zero energy for the period of a year.

The Living Learning Center's main source of energy are photovoltaic panels mounted on the roof. Because Missouri has hot summers and cold winters, Tyson has a net metering agreement with the local utility company, Ameren UE, which allows it to pull energy from the grid when needed and pay back this debt with surplus energy at other times of the day and year.

For a variety of reasons — a value engineering review that cut solar panel acreage, a failure to model efficiency in sufficient detail and brutal weather — the electrical production lagged behind consumption during the winter of 2009.

To remedy the problem, insulation was added, the heating system was adjusted to be more efficient, additional solar panels were added to the roof and two visually captivating solar arrays that track the sun both vertically and horizontally were added to the front of the building.

Because of this lapse, however, the team felt that they would probably receive only partial certification. In his first communication after they received full certification, Smith said that "the International Living Building Institute was particularly impressed with how clear our dedication was to the spirit of the Living Building Challenge and that this is a major reason why we were given full certification."

"I think the fact that we attempted no shortcuts and were so quick to respond to performance issues played a big role in our successful certification bid," Smith said. "Washington University's support at all levels is what made this possible."

Provided by Washington University in St. Louis

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