BEST PRACTICES

2008

UC-Davis Tahoe Center of Environmental Sciences

The Tahoe Center is only the second building in the UC system to achieve LEED [illegible]

The Tahoe Environmental Research Center of the University of California at Davis is a fitting emblem of education and sustainability, as a leading environmental science research and education center, housed in an energy efficient building. The project has received high honors, in achieving the LEED Platinum certification from the U.S Green Building Council. As such, the center is only the second building in the UC system, and the ninth in the state of California, to be awarded LEED's highest level of certification.

View of Tahoe Center. Photo: Vance Fox

From the exterior, the three-story Tahoe Environmental Research Center (TCES) blends in with its surroundings in Incline Valley, Nevada, clad in stained fiber cement board with a mountain-chalet aesthetic. The 45,000 square-foot facility houses research laboratories for UC Davis, as well as labs, classrooms, offices, public museums and education centers for Sierra Nevada College. The center hosts a variety of activities for multiple audiences—children utilize science curricula, while college students take classes or conduct research. The center also holds public outreach events on topics related to current ecological challenges.

Energy use at the Tahoe Environmental Research Center has been verified to be 60% less than ASHRAE Standard 90.1. Water use in the building has been 65% less than traditional systems. To create an energy-efficient facility, TERC's project team incorporated several innovative systems, including radiant floor heating, evaporative cooling, chilled beams, and underground chilled water storage tanks. In developing this system, the design team faced many challenges during the design process. As UCD senior project manager Bill Starr explains, "Issues emerged in dealing with regulatory limits, using new technology, and building a lab in the Tahoe basin—a setting uncommon to lab buildings."

The project uses "active" chilled beams, a unique technological feature that offers both low investment costs and high efficiency cooling benefits. Active chilled beams move ventilation air through ceiling-mounted diffuser boxes. This in turn induces room air to flow through the coils.

The HVAC system utilizes "free cooling" from chilled water generated at night by a cooling tower. The tower uses 10% of the power consumption of a typical chiller.

The project has been noted as the first lab to use "active" chilled beams, also known as induction diffusers.

This strategy made it possible to eliminate reheat while reducing the HVAC energy for the building by 57%. In addition, other strategies were an integral part of the success of the chilled beam. This includes storing cooled water from the cooling tower in underground tanks, which is then circulated through the chilled beam system when needed.

Award Category

Best Overall Sustainable Design

Green Features

Active chilled beams

875 photovoltaic shingles on rooftop

Carbon dioxide sensors

Heat-recovery system

High-recycled-content materials

Paints and adhesives with low or no VOCs

Radiant floor heating

Cooling tower and cold water storage

Exterior light shelves

Annual Energy Savings

60% less than ASHRAE Standard 90.1

65% less water use than traditional systems

Size

45,000 ft^2

Cost

$24 million

Completion Date

August 2006

2008

BEST PRACTICES

Additional Awards

LEED-NC Platinum

Contacts

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Team

Architect: Lundahl and Associates

Contractor: Turner Construction Company

Mechanical Engineer: Rumsey Engineers

Electrical Engineer: Integrated Design Associates (IDeAs)

Structural Engineer: John A. Martin & Associates of Nevada

Lighting Designer: David Nelson & Associates

Acoustical Consultant: McKay Conant Brook

Laboratory Consultant: Research Facilities Design

LEED Consultant: Architectural Energy Corporation

More Information

johnmuir.ucdavis.edu/featurettes/tces-platinum.html

www.news.ucdavis.edu/search/news_detail.lasso?id=8309

cms.ashrae.biz/files/20081016_rumsey.pdf

In addition, the project boasts excellent water efficiency. Waterless urinals and low flush toilets use 50% less water than normal fixtures. A snowmelt and rainwater catchment system captures water for toilet flushing use. After filtration and UV treatment of the water, it is used once to flush toilets, thus conserving onsite water. However, an unexpected issue arose with the rainwater used in toilets. When the pine trees around the building release their yellow pollen, some of the color remains in the roof water after filtration, causing visitors to repeatedly flush the toilets. Signage has been added to inform visitors that the color poses no sanitary problem.

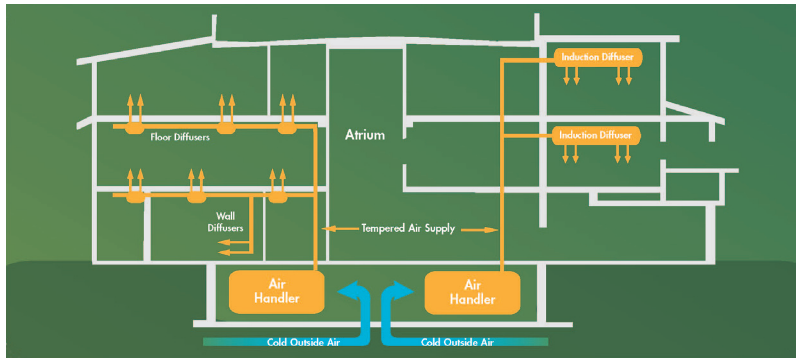

Diagram showing air supply, including the use induction diffusers. Image: UC Davis.

The central atrium is an area where sunlight potential is maximized through architectural strategies. Private areas within the center, including offices, are connected to a central, open sky-lit atrium, so that the spaces are visually comfortable even with minimal electric lighting. Exterior light shelves bring daylight into rooms and corridors surrounding the central atrium. On the roof top, 875 photovoltaic shingles generate approximately 10 percent of the electricity used in the building. Rooms also contain carbon dioxide sensors that can automatically increase the ventilation of outside air. Heat recovery was also implemented to reclaim the heat of the exhaust stream to pre-heat the outside air going to the laboratory air handler unit.

The project team also included several materials and products containing recycled industrial by-products. For example, wall insulation by Soft Touch includes pre-consumer fabric scraps. The structural concrete contains 25% fly ash, a by-product of coal combustion in power plants. The center's sound-absorbing panels are made of recycled newspapers, while both steel and carpet contain a high-recycled content and low emission rate. The project team also specified paints and adhesive with low or no VOCs. In addition, over 85% of construction debris was recycled.

LESSONS LEARNED

Bill Starr, senior project manager of the UC Davis Architects & Engineers, recommends that selecting the right team is essential to doing innovative work. In this project, with the amount of technology and strategies implemented, he emphasizes the importance of right-sizing the equipment to provide good energy and cost-outcomes. Joe Wenisch of Rumsey Engineers remarks that the early stages of the project were challenging, as the team was developing ideas while working with a large team of consultants and contractors. Mr. Starr mentions the importance of aiming beyond the minimum goal by targeting everything that can be done within the budget, pushing the team to become creative. He also learned that focusing on a few key technologies allowed for a more cost-effective and functional design.

- Mangala Gopal

Best Practices is written and produced by the Green Building Research Center, at the University of California, Berkeley.

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