BEST PRACTICES 2011

UC Riverside School of Medicine Research Building

The Research Building at UCR's new School of Medicine is the most sustainably-designed laboratory facility on the campus. With a focus on energy-efficiency and long-term usability, the project establishes a new environmental benchmark for future development at the university.

Award Category

Overall Sustainable Design

Green Features

Night flush reduces cooling load

Cooling with passive chilled beams

Reduced ventilation rates

Dynamic shade system optimizes daylighting

Occupancy sensor input for lighting and HVAC

Ceiling fans for occupant comfort

30% reduction in water consumption

Drought-tolerant landscaping

Annual Energy and Cost Savings

30% greater efficiency than Title 24 standards

675 MWh, 7000 therms

$51,000

Size

58,000 ft²

Cost

$25 million

Completion Date

February 2011

The School of Medicine at UC Riverside is the first new public medical school to be built in California in forty years. The school's inaugural facility, the Research Building, is designed to attract and retain senior faculty and support their advanced research. Envisioned as highly energy-efficient and sustainable from the beginning, the project will be UCR's first LEED-certified building and is expected to achieve LEED Gold.

Laboratories are highly energy intensive, typically using between five and ten times more energy per square foot than office buildings. With multiple design strategies targeting energy conservation, the Research Building's projected annual energy use intensity has been reduced to 128 kBTU/ft². This is less than half of the regional average for research labs per the national Commercial Buildings Energy Consumption Survey.

The building's laboratory spaces are cooled by passive chilled beams, the first application of this technology on the UCR campus. In this system, chilled water is circulated through heat exchangers suspended from the ceiling. As air nearby is cooled and falls into the occupied zone, warmer air in the space rises. Using chilled beams has enabled designers to reduce ventilation rates by half compared to typical laboratory design practice. The team used CFD analysis to optimize rates to just six air changes per hour, producing significant energy savings while still meeting health and safety requirements.

Taking advantage of the thermal mass of the structure is used as a key energy saving strategy in office spaces. The concrete structure is pre-cooled by a night flush ventilation cycle that circulates cool air through the building and out through motorized louvers. This approach stores "coolth" in the slab for the following day, reducing the daytime mechanical cooling load. The timing and duration of the night flush system is optimized by the building management system to conserve energy.

The night flush cycle reduces energy costs by taking advantage of off-peak utility rates and reducing peak hour penalties.

The north elevation (at left) provides daylight and solar control in offices. Photo: Lara Swimmer Photography.

The building's mass-cooling approach reverses the air flow of a typical night flush. The design team developed this solution in response to Riverside's poor air quality. Night flush ventilation usually pulls nighttime air through perimeter louvers and exhausts it at the roof level. At the Research Building, a rooftop supply air fan is used to filter and then push air through the office spaces to be exhausted through the perimeter louvers.

Overhead ceiling fans in office spaces are used to create a thermally comfortable indoor environment while delivering energy savings. Air movement created by the fans produces a cooling effect that helps occupants to remain comfortable even at higher than normal temperatures. This delays the need for mechanical cooling until the indoor tempera-

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Additional Awards

Anticipating LEED-NC Gold

Savings by Design Energy Efficiency Integration Awards, Award of Citation, 2011

AIA Portland Award of Merit, 2011

Contacts

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Project Team

Architect: SRG Partnership

Civil Engineer: TTG Corporation

Structural Engineer: Saiful/Bouquet, Inc.

MEP Engineer: Affiliated Engineers, Inc.

Landscape: Walker Macy

General Contractor: Barnhart Balfour Beatty

More Information

www.srgpartnership.com/projects/science-technology/uc-riverside-hssb

www.sbdawards.com/gallery/projDisplay.php?RECORD_KEY%28ProjectInfo%29=id&id%28ProjectInfo%29=104

www.labs21century.gov/pdf/bp_chilled-beam_508.pdf

www.architecture2030.org

ture exceeds 80°F, at which point supplemental cooling is provided by chilled beams.

Much of the building's lighting requirements are offset by daylighting. A dynamic shade control system adjusts blinds automatically to optimize daylight infiltration, control glare and reduce heat gain. Rather than relying on calculated solar position, the blinds are controlled by exterior sensors that read real-time sky and cloud conditions.

Laboratory interior shows upper daylight glazing and lower glazing with sliding louver panels. Photo: Lara Swimmer Photography.

While automated blinds cover the upper third of the glazing, manually operable sliding louver panels are installed on the lower portion to give occupants direct control over daylight and views. Interior light shelves are installed to provide a comfortable gradient of daylight from perimeter to interior zones. These strategies, in combination with occupant sensors, result in a design lighting power density of 1.0 W/ft^2 in offices and 1.35 W/ft^2 in lab spaces.

Laboratories are designed with a flexible layout that allows for a high degree of customization and optimization by research teams. A repetitive, modular utility infrastructure accommodates a wide range of equipment requirements and will enable the building to adapt to future technological advancements. The project team expects that these design choices will reduce both resource use and costs associated with churn while also extending the facility's long-term usability.

The Research Building is designed to exceed the 2030 Challenge's ambitious fossil fuel reduction target for 2010.

Reducing potable water consumption is important to UC Riverside given its dry Southern California location. The Research Building is equipped with efficient restroom fixtures, including waterfree urinals, which reduce in-building water use by 45 percent compared to a calculated LEED baseline. Laboratory water use is reduced by conservation features on sterilization equipment and by capturing process water from laboratory water systems. A carefully planned landscape design uses drought resistant plants and a high-efficiency irrigation system to cut water use by 78 percent per LEED calculations.

In addition to its achievements in environmental sustainability, the Research Building and the new School of Medicine directly support the development of a sustainable community. The school's mission to serve Inland Southern California and improve the health of medically underserved communities will support long term regional prosperity.

LESSONS LEARNED

The Research Building's innovative motorized shade system required careful coordination between the contractor, subcontractor, suppliers, and design team. The project architect, SRG Partnership, advises that procurement and commissioning of this novel system posed significant challenges that could have been better addressed through direct procurement, and by including the system in the commissioning plan.

Best Practices case studies are coordinated by the Green Building Research Center, at the University of California, Berkeley.

The Best Practices Competition showcases successful projects on UC and CSU campuses to assist campuses in achieving energy efficiency and sustainability goals. Funding for *Best Practices* is provided by the UC/CSU/IOU Energy Efficiency Partnership.