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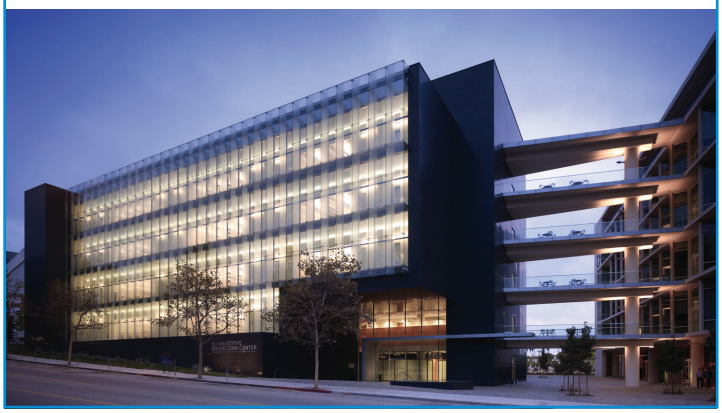
# A Complete Design Package

Careful integration of architectural and engineering elements demonstrates that the whole of a design can be greater than the sum of its parts.

For some research facilities, a single architectural or engineering feature is a mark of success in laboratory design. The true design test is to incorporate multiple innovative features that are energy efficient, architecturally pleasing, and facilitate scientific goals.

The **Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research** at the **University of Southern California** (USC) met this challenge and was recognized with High Honors in *R&D Magazine*'s 2011 Laboratory of the Year (LOY) competition.

## 2011 Laboratory of the Year High Honors



The Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research at USC. Photo: Nick Merrick, Hedrich Blessing

The LOY judges were impressed with how engineering systems were incorporated into the architecture to produce an overall effective building. The five-story, 91,485 square foot structure, located on the university's health sciences campus, is connected to the adjacent Zilkha Neurogenetic Institute via bridges on each floor and a basement tunnel. The buildings also share support services including steam, soft water, liquid nitrogen, and carbon dioxide.

The structural connections grew from the facility's goal of creating an environment that fosters collaboration, discoveries, and expansion. The building is home to stem cell research and regenerative medicine laboratories, housing 15 faculty members and more than 100 staff and students. The researchers collaborate with colleagues at other organizations to translate basic discoveries into new treatments for cancer, neurosciences, cardiovascular disease, obesity, diabetes, metabolic diseases, and immunology/infectious diseases.

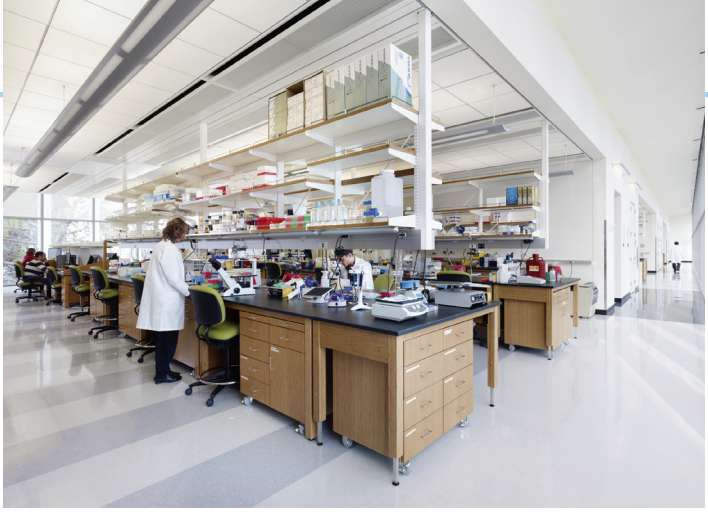
The building is set on a slope from the south to north elevation. To bring as much natural light into the laboratories as possible, the site architect and interior designer, **ZGF Architects LLP**, Los Angeles, placed the mechanical systems on the semi-subterranean ground floor. The first floor is dedicated to public functions and includes a lobby and a large seminar room. The upper floors house laboratories and offices.

### Twice the light

A key feature of the interior—the lighting—starts on the exterior. The east and west sides of the building have glass façades running the full length to maximize natural lighting in the labs and offices. The west façade features Low-E glass with a frit pattern to reduce heat gain. Angled glass fins reduce glare from the afternoon sun without blocking exterior views.

The east façade features a unique, ventilated double-glass wall that acts as a buffer to moderate temperatures to the interior, while allowing daylight to pass through. In cooler temperatures, the wall acts as an insulating barrier, retaining air inside the cavity. Alternating patterns of transparent and translucent glass create oblique exterior views, while maintaining an air of privacy in the labs. The outside glass curtain, supported by steel cables and cable mesh, meets California's stringent seismic requirements.

"This is the first double exterior wall I have seen that actually seems to work. It provides a full wall of natural light for the users,



**The flexible laboratories allow research group sizes to expand into adjacent neighborhoods. Chilled beams, located about the benches, reduce heat gains from instruments and equipment on the benchtops. Photo: Eric Staudenmaier**

but protects the lab benches and instrumentation from direct sunlight," says Richard R. Rietz, independent lab design planner and 2011 LOY judge.

Transparency continues inside the laboratories. There are no obstructions across the building or between the laboratory bench zone and desk/dry zone. The open labs, called neighborhoods, are flanked by support spaces for fume hoods and tissue/cell culture rooms. Circulation paths direct traffic along the exterior walls.

## VITAL STATS

**Project:** The Eli & Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research at the University of Southern California, Los Angeles

**Size:** 91,485 square feet

**Cost:** $65 million

**Architect/ Interior Designer:** ZGF Architects LLP, Los Angeles

**Lab Planner:** Jacobs Consultancy, Solana Beach, Calif.

**MEP Engineer:** Affiliated Engineers, Inc., Madison, Wis.

**Structural/Civil Engineer:** KPFF Consulting Engineers, Los Angeles

**General Contractor:** Morley Construction, Santa Monica, Calif.

The second floor is occupied by core laboratories and the Stem Cell Collaborative and Training Core, part of the **California Institute for Regenerative Medicine** (CIRM). These facilities, which include lab benches, fume hoods, an environmental room, and a sterilizer facility, are used to teach and disseminate knowledge about stem cell research to the USC community and other research organizations. The third, fourth, and fifth floors, used by USC's principal investigators, have similar layouts and feature meeting areas, kitchens, and balconies for informal meetings and interaction between researchers.

The designers also built flexibility into the labs. As research needs change, wet benches and dry benches/desks can be reconfigured and intermingled. Benches, desks, and environmental rooms can be moved; only sinks, fume hoods, and sterilizers are fixed in place. Overhead service carriers are movable, and the main service distribution lines run over aisles and hallways.

### Cool solution

One of the most impressive features of the Broad facility identified by the judges was not only behind the scenes, it was overhead: one-way throw chilled beams are located over laboratory workbenches where heat gain occurs.

Chilled beams have been used in Europe for many years, but this was the first large-scale installation in a California laboratory. Chilled beams can provide a solution to equipment-driven cooling loads without paying the energy penalty of conditioning and moving additional outside air.

Using chilled water rather than chilled air to remove thermal loads reduces ductwork requirements, air handling unit sizes, fan energy, and floor-to-floor heights. The designers estimate that annual energy consumption will be reduced 10 to 15%, and that by using the chilled beams, approximately 35% less ductwork was required to maintain appropriate comfort levels in the labs.

To supplement the natural light, linear luminaires are suspended between the benches to provide artificial light. The light is reflected off the ceiling to provide a uniform, shadow-less work area. Photocells monitor daylight from the windows and luminaries and reduce the electric lighting levels when adequate daylight is available. Lab workers turn on lights when they enter the space. Pre-programmed daytime and nighttime settings further reduce energy use. LED task lights are connected to a low voltage lighting control system and shut off automatically.

"This building is a nice example of integrating architecture with the needs of the building. It's a working building, and it should be a very productive building," says Dave Withee, manager, sales and marketing, **Diversified Woodcrafts**, Suring, Wis., a 2011 LOY judge.

**—Rita C. Peters**

Affiliated Engineers®

Peter Strupp
608-236-1131
pstrupp@aeieng.com

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