The Energy Biosciences Building brings together people from across the UC Berkeley campus to conduct interdisciplinary research in numerous aspects of renewable biofuels technology. Located just west of the central campus, the five-story, 113,000-square-foot building is designed to be both a premier research facility and a model for the sustainable revitalization of downtown Berkeley.

The university and the City of Berkeley worked closely to ensure that the building would integrate well within the existing urban fabric while enhancing the downtown experience for both building users and the public. For example, welcoming public spaces are located adjacent to the building, including a plaza just south of the lobby. A tree-lined pedestrian path running through the site improves walkability and connects the residential neighborhood to the north with the downtown commercial district. These spaces are outfitted with site furnishings that can be used by the public and building users alike.

The landscaping is designed to create pleasing outdoor spaces while also supporting the project’s sustainability goals. Nearly half of the plant species are native to California or adapted, including giant chain ferns, cape rush, and creeping raspberry. Low-water using vegetation is paired with a highly efficient irrigation system to produce significant water savings. The project uses just 58 percent of its maximum water allowance under AB 1881, California’s stringent landscape water conservation ordinance.

Like the project’s site design, people are the focus and the driving force behind the building’s interior design and space planning. Creating opportunities for collaboration was an important goal in the design of the interactive spaces incorporated into every floor. Abundant daylight and views, inviting seating, and numerous whiteboards characterize these collaboration-focused spaces.

Multiple strategies targeting energy efficiency reduce the project’s modeled energy use to 39% below ASHRAE Standard 90.1-2007. Energy efficiency was another major design emphasis at the Energy Biosciences Building. Mechanical systems in conventionally designed research facilities are typically sized for worst-case peak load projections experienced in a small number of lab spaces. This leads to oversized systems and poor energy performance. The biosciences design team performed right-sizing analysis to optimize the configuration of the HVAC system and improve efficiency. The project team also invested in...
high-efficiency chillers and boilers that use variable speed pumping to yield additional savings.

The wedge-shaped building is oriented on an east-west axis to maximize opportunities for passive heating and daylight harvesting. Thoughtfully planned interior spaces are designed to save energy by taking advantage of this orientation. Research labs are located on the northern exposure to reduce solar loads and allow daylight penetration through full-height windows. Office and administrative areas are grouped together, apart from labs to enable the use of operable windows and recirculated return air.

An innovative envelope design helps optimize daylight harvesting while controlling for unwanted glare. The southern exposure has a series of fixed horizontal sunshades made of translucent glass that simultaneously block direct sunlight and bring diffused light into the interior. A motorized shade system automatically deploys interior shades based on solar position to improve comfort for building users. The control system is programmed to fully close interior shades at night to reduce light pollution from the building.

The project team also paid close attention to fume hoods. According to the U.S. Department of Energy, a single fume hood can consume as much energy as three average homes. With nearly fifty fume hoods in the building, addressing them properly was a critical piece of the project’s overall energy strategy. All fume hoods are equipped with automatic sash closers, ensuring that energy is saved without relying on researchers remembering to shut sashes. Fume hoods in high density areas are equipped with variable air volume control, and all hoods have face shields to reduce airflow requirements.

**Energy simulations predict that the building’s efficient design will prevent the release of 2,500 tons of greenhouse gas emissions annually.**

Numerous lighting technologies reduce the lighting power density to 1.15 W/ft². Photosensors and progressive dimmers help optimize daylight harvesting, so that supplemental electric lighting is provided only when needed. Lab benches are equipped with LED task lighting and local occupant sensing controls that gradually dim lights to off when a vacancy is detected, thereby avoiding disruption to adjacent lab stations. Occupancy sensors are also installed in stairways and public corridors to enable after-hours dimming when fewer individuals are using the building.

Recognizing that operational energy performance depends greatly on occupant behavior, the project team proactively incorporated submetering into the building design. This infrastructure will allow campus staff to track energy usage and provide real-time data to building users via the campus-wide energy dashboard system. This program is part of the university’s larger Energy Management Initiative, which aims to inform and incentivize building users to conserve energy.
The Energy Biosciences Building is targeting LEED-NC Gold certification for its sustainable and energy-efficient design. The project team pursued a pilot credit for its ergonomic strategy as part of the LEED application. Pilot credits provide teams with an opportunity to test innovative new ideas for possible introduction into the balloted LEED rating system. The design team worked with an ergonomics specialist to ensure that the lab design and furniture support occupant health, performance, and satisfaction. The university will also provide occupants with training on the appropriate use of furnishings and equipment.

LESSONS LEARNED

The importance of understanding how facade design and lighting systems are interrelated — and how they must work together to provide visual comfort and energy savings — was a key lesson from this effort. Susan Ubbelohde, the lighting and daylighting consultant for the project, notes that the building’s success in this area results from approaching these components as integrated systems from the beginning of the design process.

Project Manager Sally McGarrahan recommends providing timely occupant education for design features related to energy performance, especially those that occupants may find new or confusing. She also notes that performing outreach immediately after occupancy is crucial to helping building users understand design choices and feel comfortable using new technologies and systems.

Clockwise from top left: Classroom/conference room, typical laboratory space, and markerboards common in collaboration zones. Images © 2012 Bruce Damonte.