University of California, San Diego
Price Center Expansion

The Price Center expansion uses an innovative HVAC system to transfer 100% outside air cooled for the offices to a variety of spaces in the building. Using complementary airstreams in spaces with progressively higher operating temperatures avoids unnecessary air conditioning and saves energy.

The Price Center is a vibrant hub of student activity at UC San Diego. Located at the center of the campus, it contains the school’s bookstore, a movie theater, a post office, several restaurants, conference rooms, a billiard room, and a ballroom. However, with 20,000 students, faculty, and staff visiting the building each day, the Price Center is straining to adequately serve the needs of the community.

To accommodate the university’s swelling student population and prepare for future growth, a $63 million expansion project is underway on the building’s east side. The expansion will provide a wider variety of amenities for its patrons and enhance the lively college-town atmosphere at the campus’s center.

Creating an area on campus that provides both an array of services and places for students to socialize is important to UCSD because the campus is not bordered by a typical downtown setting. Without a commercial shopping district available nearby, UCSD envisions bringing an urban environment directly to students at the heart of campus.

Students played an active role in the development of the building design, and comprise two thirds of the Building Advisory Committee.

The 174,000 ft² addition nearly doubles the size of the existing Price Center building. A large atrium surrounded by four stories of restaurants, retail and office space forms the primary interactive area within the building. The expansion will include another ballroom, an alumni center, a cross-cultural center, a 5000 ft² grocery store, late-night dining, additional lounge and study areas, and a musical venue. Both high-profile social spaces and quiet areas are incorporated into the building to provide students with a variety of activities and services in a single location.

The diversity of spaces within the Price Center requires a robust HVAC system to efficiently and effectively ventilate and condition areas with a variety of mechanical demands. The air conditioning systems are specifically designed to avoid addressing each area’s ventilation requirements in isolation. Instead, complementary airstreams are used to condition adjacent spaces. Air is transferred from space to space with increasingly higher operating temperatures to maximize the use of air that has already been filtered and cooled. In this strategy, a single airstream serves up to three different spaces or functions before it is vented from the building.

The office area requires the coolest air in the Price Center, making it the starting point of the building’s primary airstream. Outside air is filtered and cooled to 65°F by the air handling unit (AHU), and delivered to the offices through a displacement ventilation system. The system supplies air directly into the occupied zone via low sidewall diffusers. Occupants can regulate the airflow by adjusting local dampers on the supply grille. Displacement ventilation uses less energy than a conventional overhead HVAC system, which must supply cool air at a higher velocity to distribute it down to the occupant level.

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Relief air from the offices is then either sent to the enclosed loading dock or transferred to the atrium. Air destined for the atrium is filtered and cooled again, if needed, before being delivered below seating benches situated throughout the space.

Air in the atrium then becomes make-up air for the restaurant grease hoods, which can require up to 31,000 CFM. Alternately, air in the atrium can rise up to the fourth floor to be discharged out of the exhaust air plenum.

In a separate airstream, outside air is cooled and delivered to the electrical room located in the basement of the building. Water droplets, airborne salt, and other particles are removed from the air by mist eliminators in the AHU. All outside air entering the building is filtered in this manner to minimize damage from airborne salt traveling from the adjacent Pacific Ocean. The air is then sent to the enclosed loading dock to satisfy the ventilation requirement for that space. Relief air from the offices supplements the airstream as it travels to the loading dock when the atrium AHU is in the economizer mode.

UCSD will install airflow measuring stations in the Price Center to regulate the multiple airstreams passing through the building. The stations will send a continuous data feed to the building management system, enabling facilities staff to adjust the airflow when necessary.

Bench diffusers introduce cool air into the atrium. Air either rises to the exhaust plenum or becomes make up air for the restaurant grease hoods. Image: IBE Consulting Engineers.

LESSONS LEARNED

The facade design for the Price Center was approved prior to calculating its heating and cooling loads. When the calculations were conducted it became clear that the expansive use of glass would result in significant loads on the mechanical systems. To mitigate the heat gains, the selection and placement of glass had to be reworked. UCSD found that trying to add items like tinted glass, exterior shades, and glazing size reductions after the building’s appearance was approved posed substantial challenges. The campus suggests generating load calculations during schematic design so the facade can incorporate all necessary energy-efficiency elements.