



New Award-Winning, LEED Platinum Palo Alto Library's HVAC Design Earns Rave IAQ Reviews

Underfloor air distribution and dispersion combined with solar, pinpoint BMS monitoring/control and building envelope design help facility to LEED platinum.

Palo Alto, Calif.--The new \$47 million Mitchell Park Library & Community Center opened with rave reviews for its indoor air quality (IAQ) and controllable air comfort designed and installed by the HVAC engineers and contractors.

The 40,000-square-foot, Palo Alto, Calif.-based library and its accompanying 16,000-square-foot community center ranks first in air comfort among the city's nearly 100 facilities, according to Debra Jacobs, P.E., LEED AP, PMP, project engineer, Public Works Dept., Palo Alto. "This is by far the best air comfort of any city-owned building we have," said Jacobs, who reports first-hand experiences since relocating her office into the facility during the final six month start-up and commissioning.

The library is one of California's most sustainable and is illustrated by the project's Leadership in Energy and Environmental Design (LEED[®]) Platinum certification. The center also won last year's Center of Excellence in the "Facility Design--Community Center/Mixed Use" category awarded by the California Parks and Recreation Society (CPRS).

Jacobs led a design team featuring Tunde Munz, P.E., LEED AP, principal at consulting engineering firm Guttman & Blaevoet (G&B), San Francisco; Jonathan Hartman, associate, Group 4 Architecture, South San Francisco, Calif.; Tony Guminsky, project manager at mechanical contractor Intech Mechanical, Roseville, Calif. The design includes many cutting edge technologies including solar electric panels providing 25-percent of the library's electricity,

solar hot water panels, night sky radiant cooling with cold water storage, water reclamation, green living roofs, and raised floors with underfloor air distribution (UFAD) fabric ductwork for uniform air dispersion.

One of the two-story library's most innovative and sustainable HVAC designs is the UFAD. It provides energy savings, because the HVAC supply systems use less energy to maintain set point temperatures. UFAD also provides a more even temperature control in the three to six-feet-high occupied zone versus the impractical and less efficient cooling methodology of conventional overhead ductwork, especially with Mitchell Park's high ceilings, according to Munz.

UFAD offers advantages of positioning floor diffusers where the air is most needed. The raised floor also provides a space to conceal, add or reroute electronic cables, piping and other utilities for any future data equipment upgrades or room reconfigurations. "Compared to UFAD, recessed or hung ceiling ductwork would be more difficult to maintain," said Jacobs. "Cooling air from above the occupied zone is less efficient and the ductwork would also reduce the aesthetic floor-to-ceiling window views of the adjacent park and sports fields."

UFAD has disadvantages, but G&B's design solved them. Supply air temperature differentials of as much as 4°F are common in UFAD designs, especially in buildings with window-dominated walls, such as Mitchell Park. The thermal swings are due to low set point operating discharge temperatures required to meet the perimeter

high solar loads, which in turn can create excessively cool interior area temperatures.

Slab and floor temperatures tend to increase the supply air temperature when it travels more than 50 feet, especially during early morning ramp-up periods, according to Munz, whose G&B San Francisco office pioneered UFAD specification more than 20 years ago and has since used the design in hundreds of applications.

Guttman & Blaevoet is a UFAD proponent with the enhanced specification of UnderFloorSox, a textile air distribution system developed by fabric duct manufacturer DuctSox Corp., Peosta, Iowa, specifically for distributing airflow within the UFAD plenum. Engineers can design the system to get the air dispersed within areas prone to temperature rise. Instead of air highways or conventional metal duct and diffusers, the flexible 18-inch-diameter fabric duct uses laser-cut, linear vents that can be factory engineered and modeled to address any perimeter thermal decay and safeguard against overcooling interior zones. It can also easily be reconfigured and routed around the inherent myriad of cabling, piping, vertical floor supports and other concealed UFAD obstacles. In Mitchell Park's design, G&B's solution delivered the air strategically through the custom linear vents to facilitate a better distribution via textile duct with an adjustable air releasing end cap, according to Munz.

Reducing solar gain helps minimize UFAD perimeter thermal decay. Therefore the design team specified highly-insulated Solarban 70XL glazing. The glass has a U-factor of 0.439 and a shading coefficient of 0.359. The building also employs sun shades custom-designed and manufactured for each exposure. The walls and roof have a U-value of 0.05.

Supplying the UFAD system, constructed of flooring panels, are two 91-ton chillers and two 1,250-MBh boilers, that provide tempered water to air handlers and mixed into the plenum using the fabric. Supply airflow is dispersed into the occupied space through floor mounted adjustable diffusers or through floor mounted displacement diffusers (interior) or linear diffusers (perimeter). Fan-powered variable air volume (VAV) reheat boxes draw airflow from the plenum and connect to the perimeter linear grills ensuring quick adjustment for additional perimeter load for cooling or heat. All equipment is the highest efficiency models of its respective product line using electronically commutated (EC) motors, direct drives and other energy-saving components.

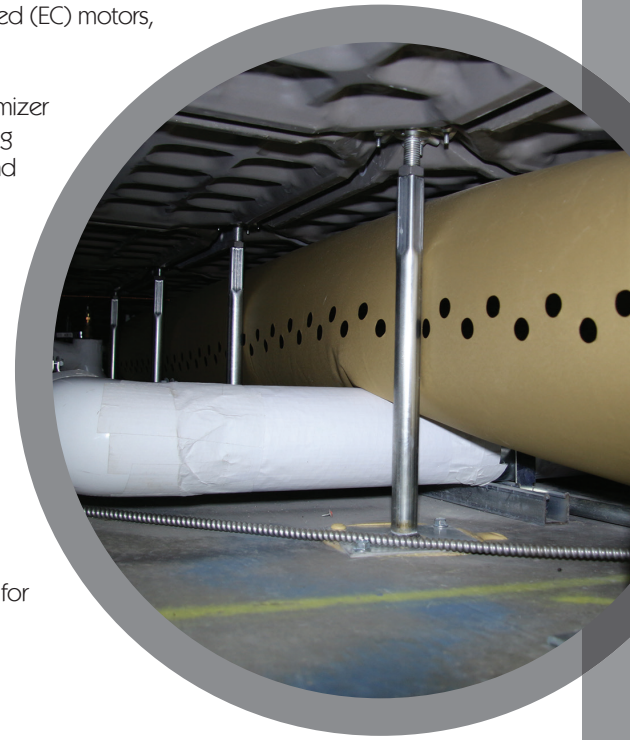
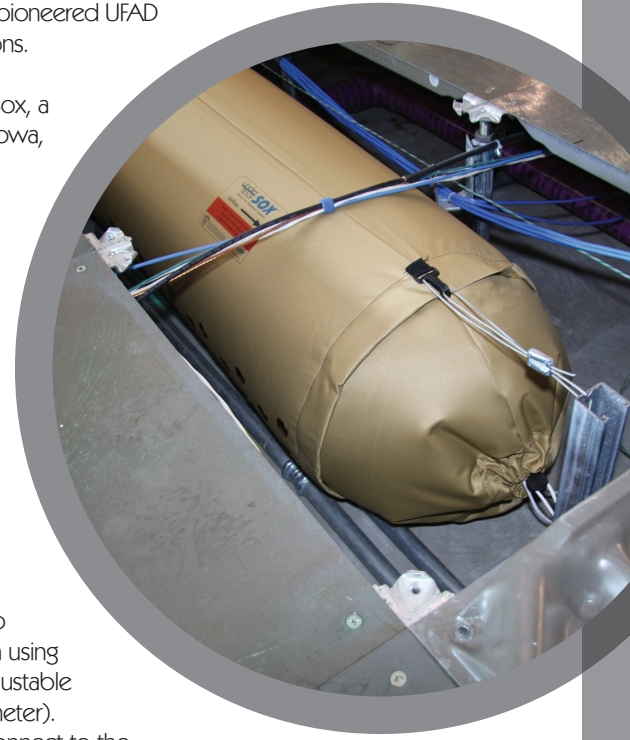
The library's cutting-edge IAQ monitor and control includes air handlers that supply economizer air when outside conditions are optimal. Additional house exhaust fans are used for cooling with mechanical ventilation. CO₂ detectors also sense contaminants from large gatherings and activate natural ventilation.

The building management system (BMS), monitors and controls the indoor environments. "This project has more than 350 points (measurement and control) compared to the 50 points at our City Hall, which is an older building with similar space volume and the same BMS network," said Jacobs.

Besides IAQ, Jacobs attributes the air conditioning system's low decibel operational sound to the UFAD, fabric duct distribution and its linear dispersion which all contribute to airflow noise suppression that's critical in library environments.

In addition to LEED Platinum, the facility is recognized by the Santa Clara Valley Urban Runoff Pollution Prevention Program for "Site Design and Low Impact Development," and by the California Library Association "Public Relations Excellence Award." It was also a film location for a video depicting the environmental award the city won from Acterra.

In previous buildings on the site, occupants walked through zones and experienced noticeable temperature differentials. The Mitchell Park Library & Community Center has very even temperatures throughout, which is a credit to the efficient building envelope, pinpoint BMS monitoring/control, the UFAD and the underfloor air dispersion and appropriate temperature zoning. "As I walk through the building the temperature is amazingly consistent, even when comparing the west and east portions of the building in the late afternoon's setting sun," said Jacobs.



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