



**DUCTSOX**<sup>®</sup>  
Fabric Air Dispersion Products

## California LEED Gold Library is Green & Quiet Thanks to Engineer's HVAC Design

Custom-colored, streamlined fabric ductwork is seen, but not heard in \$15 million Highland, Calif. library and environmental learning ctr.

Highland, Calif. — Librarians typically don't pay much attention to HVAC ductwork, however the fabric air dispersion system specified for the \$15 million Highland Sam J. Racadio Library and Environmental Learning Center caught the eye and the ear of branch manager, Jessica Sutorus.

Aside from a sleek look and quiet sound, the fabric ductwork also helped accumulate Leadership in Energy & Environmental Design (LEED), credits for the 30,000-square-foot, San Bernardino County facility. Led by Farzad Tadayon, P.E., LEED AP, president of T-Squared Professional Engineers Inc., Vista, Calif., and Paul A. Frick, LEED AP, associate, STK Architecture, San Jacinto, Calif., the facility's design team used a variety of building techniques and materials such as recycled steel, foam insulation, an insulating rooftop landscape, extensive use of natural light, high efficiency water-source heat pumps, fluid coolers, gas-fired boilers, fabric air dispersion, and other green strategies to achieve an impressive LEED Gold

certification. The former abandoned building parcel now houses a community library (including a collection for an elementary school across the street from the library) and the Environmental Learning Center, all of which were partially paid for through funds from the city of Highland, Calif., and the California State Library Bond Act.

The fabric duct, manufactured by DuctSox Corp., Peosta, Iowa, offers a long list of LEED attributes, including increased HVAC equipment efficiencies due to better air dispersion, no jobsite trimming waste because fabric duct is custom-manufactured as per specification and lower shipping costs due to being 90-percent lighter weight than metal.

But it's the quietness in a library environment that surprises Sutorus, "There's a big difference in noise between the fabric duct throughout the building and a conference room, the only room using metal duct," said Sutorus, who worked with engineers and architects to achieve the most cost-efficient LEED benefits. "We also liked the ability to customize the fabric's color to complement the interior design."

Fabric duct is characteristically quieter, according to Tadayon, because the air is distributed through dozens of orifices spanning the length of a run versus just a few registers as with metal duct systems, which tend to promote turbulence and subsequently high levels of air noise. Furthermore, the softness of fabric duct doesn't reverberate noise from mechanical equipment housed in other building areas.



case studies

Sutorus, who suffers from allergies, claims the new building has reduced allergy symptoms for her and other staff members. The previous library building used conventional metal duct, which attracts condensation during humid days. When combined with dust and bacteria this causes perpetual allergenic reactions for occupants. Fabric duct not only reduces condensation, but also eliminates surface dust accumulations due to the fact that 15 percent of the air flows through the factory-engineered permeations in the fabric. Additionally, the more than 1,000 linear feet of DuctSox's Sedona-Xm model fabric averages 16-inch diameters and uses a built-in anti-microbial agent that resists bacteria harboring.

## Water Source Heat Pump Loop

Tadayon's project design of a water-source heat pump loop combined with solar and other alternative methodologies were instrumental in the LEED certification. The design surpassed the stringent 2001 California Energy Efficiency Standards for Non-Residential Buildings by 40 percent and features 30 high efficiency heat pumps ranging from 12.1 to 13.9 SEER. Also specified was one fluid cooler with an extra loop within the unit for better heat transfer and improved efficiency. A 750 Mwh high efficiency pulsing boiler provides hot water to the loop. "We looked at high efficiency packaged rooftop units, chilled water systems and other methods, but a water-source heat pump loop was the best design in terms of lifecycle and operational costs," said Tadayon.



**"Using fabric versus metal duct saved the project around 20-percent in labor, which required only two workers to install the suspension system and one worker to connect the fabric duct to the hangers."**

## Value Engineering & IAQ

While fabric duct also contributed to the project's LEED credits, it was one of the few alternative products that also contributed value engineering. "Using fabric versus metal duct saved the project around 20-percent in labor, which required only two workers to install the suspension system and one worker to connect the fabric duct to the hangers," said Glen Roberts, construction manager of the project's mechanical contractor West-Tech Mechanical Inc., Montclair, Calif., which had previously installed fabric duct in facilities such as the Los Angeles Country Fairgrounds.

Indoor air quality (IAQ) was also a consideration because the thousands of books stocked in a library environment, not to mention carpeting, paint, coatings and other building materials, generate significant levels of off-gassing. To continually remove volatile organic compounds (VOC), Tadayon's IAQ design included 30 percent more outdoor air than what ASHRAE 62.1 standards recommend, but with little effect on his energy-saving strategies.

Other energy saving specifications were variable frequency drives (VFD) for the two 10-hp circulating pumps. A direct digital control (DDC) system provides optimal energy use for both the HVAC and lighting systems.

Other LEED credits were accumulated with photovoltaic cells, which provide five percent of the facility's electric needs.

Additionally, the cooling towers have chemical-free water treatments with water sanitation equipment. This feature reduces air and water pollution while improving energy efficiency and eliminating potential operational hazards from handling chemicals.

To comply with the noise standards, all heat pumps and other equipment are installed with spring-type vibration and isolation mounts.

While there are noise and performance advantages to fabric air dispersion, Tadayon said the aesthetic upgrade versus spiral metal duct became evident during the design stages. Tadayon found it easy to design the many radiuses needed to follow the many visually interesting and asymmetrical contours and radiuses of walls that the architect incorporated into the interior architectural design. Manufacturer's representative, Toro Aire, Dominguez Hills, Calif., was instrumental in helping

facilitate the many radiuses needed for DuctSox's factory engineers to custom fabricate the duct and the aluminum H-Track hanging system to follow the interior design's many contours. West-Tech's Roberts praised both the engineer's design and the fabric duct fabrication that helped make a smooth and glitch-free installation of the project's dozens of fabric duct and H-track suspension radiuses. Particularly difficult were transitions from the standard 10-foot-high ceilings to vaulted ceilings, the latter which needed the H-track hung with cable 10-feet high to keep the fabric runs parallel with the floor.

"Our company had used fabric duct in industrial projects before, so we were surprised to see the industry's recent advancements and materials upgrades," said Tadayon. "We all agreed shaping the ductwork around all the building's contours wouldn't have been as visually effective with metal duct for the facility's overall interior design."

The LEED Gold building has already reached critical acclaim among its peers and may serve as a green role model for future library projects according to Sutorus. Several American Library Association (ALA) members and officials have visited the facility to review its successes.

**DUCTSOX**<sup>®</sup>  
Fabric Air Dispersion Products

9866 Kapp Court • Peosta, IA 52068  
Ph: 866-382-8769 • Fax: 563-588-5330

[www.ductsox.com](http://www.ductsox.com)