DUCTSOX®
Fabric Air Dispersion Products

Duct Sweating? No Sweat For Engineer Using HVAC Fabric Duct to save H.S. $380K.

21st Century design uses lower chilled water temps, less air handling equipment, fabric ductwork, steam absorbers & other innovations.

Oswego, Ill.— Saving $300,000 in ventilation air handling equipment costs by lowering chilled water loop design temperatures at the new Oswego East High School was no sweat for Kluber Skahan + Associates (KSA), the $65 million project's architect and engineering firm.

The real sweat came from eliminating metal ductwork sweating. Specifying 38°F chilled water and 45°F supply air temperatures instead of more conventional temperatures of 47°F and 55°F, raised the risk of ductwork sweating, which is a monumental consideration in lieu of the many recent school closings nationwide due to mold, bacteria and mildew infiltration.

KSA's John Kluber, P.E., vice president, and Donald Ware, P.E., chief engineer, searched for a solution to ductwork sweating because of the significant savings at stake. Averaged at $3/cfm, Kuber's 100,000-cfm air distribution reduction idea would save $300,000 in equipment costs, not to mention the additional savings from smaller ductwork and operating downsized equipment if only the duct sweating potential was resolved.

Instead of offsetting the savings with the added expense of ductwork insulation, fabric duct was specified because it doesn't need insulation and doesn't attract condensation. Kluber specified DuctSox, Dubuque, Iowa, fabric ductwork in the 430,000-square-foot high school's 20,000-square-foot cafeteria, the 38,000-square-foot field house, the 13,000-square-foot natatorium, and 3,800 square feet of open architecture administrative offices. DuctSox's Comfort-Flow® design, which incorporates a factory engineered porosity as per Kluber's specifications, disperses a small percentage of airflow through the fabric to eliminate condensation. The remainder of the airflow is dispersed evenly through linear vents that run the entire length of the duct, thus eliminating hot spots or air stratification.

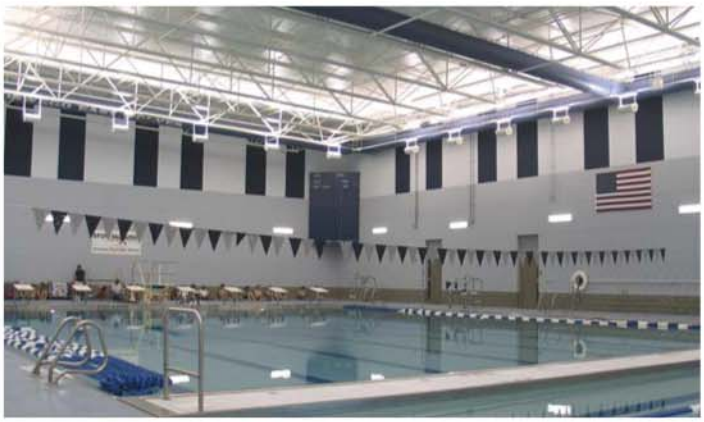
Using fabric duct had more benefits than just eliminating condensation concerns. Fabric duct, which is 90 percent lighter, thus considerably easier to handle and install than metal, saved an additional $80,000 in labor/installation costs, according to Bill Beukema, president of construction operations of the project's primary HVAC contractor, Amber Mechanical, Alsip, Ill. Because sheet metal material prices have skyrocketed over 40 percent in the last year versus more stable fabric costs, Beukema suspects more money was saved in material costs, but was undocumented.

"We saw labor generally cut in half on rooms requiring fabric duct, versus installing metal duct," Beukema said. "If metal duct requires a four-man crew, fabric duct required a two-man crew."

Case Study

The cafeteria's expansive 20,000-square-foot skylight design was possible partly due to the lightness and flexibility of the four 30-inch diameter, white fabric duct runs that hang arched and parallel to the room's barrel-shaped ceiling contour. Kluber designed a 70-inch-diameter fabric plenum visibly positioned in a corridor that supplies the four runs of duct in the adjacent cafeteria. This plenum was custom hung at the 9 o'clock and 3 o'clock positions since the cafeteria branch lines come from a 45-degree angle and meet the plenum at the typical hanging positions of 10 o'clock and 2 o'clock. The absence of protruding metal duct registers and the aesthetics of the material — DuctSox's high end polyester-blend Sedona fabric — also added to the futuristic appearance of the state-of-the-art cafeteria design. "I've worked on hundreds of projects," said Kluber, "and this is the first time I've seen architects get excited about ductwork."

Fabric duct also eliminated possible problems with natatorium air distribution as well, such as using expensive aluminum or galvanized metal with special paint, periodic maintenance, insulation, and all the other considerations associated with pool environment ductwork, according to Kluber. The natatorium



has a perimeter air distribution system of custom blue, 26-inch diameter fabric duct supplied by a 33,000-cfm Des Champs Laboratories, Natural Bridge Station, Va., combination dehumidifier and air-to-air heat exchanger. The duct is hung with corrosion-proof #316 stainless steel cable drops. Water Technologies, Milwaukee, Wis., was the natatorium consultant.

The field house was particularly challenging in air distribution because of its size, high ceiling, and a 20-foot-high, 25-foot-wide running track around its perimeter. Kluber designed a perimeter fabric duct distribution system above the running track's inner edge, however each 25-foot section has its own custom factory engineered orifices that vary in placement and diameter as to the needed air throw requirements.

While cost saving was the main impetus for fabric duct, the noticeable difference in airflow quality and aesthetics is a subliminal benefit. "Some people think fabric duct is that shiny, cheap-looking stuff you see in industrial applications, but today's technology gives it a high-end, sophisticated look and the sleek linear vents provide a much more even airflow than metal duct and registers," said Kluber.

Adds architect, Ed Skahan, vice president, KSA: "Finally, ductwork actually adds aesthetics to a space."

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Downsizing air handling equipment was just one of many strategic equipment cost reductions Kluber exercised through innovative design. For example, he specified two 600-ton steam absorbers by York, York, Penn., instead of conventional chillers and saved an additional $114,000 in equipment costs. "Many engineers perceive steam as an antiquated technology, however steam absorbers are about half the cost of refrigerant chillers," said Kluber. "It's a proven workhorse technology and there's no worry about refrigerants."

All air handlers by Ventrol Air Handling System, Ville d'Anjour, Quebec, included $125,000 worth of heat-recovery coils by Heat Pipe Technology, Gainesville, Fla. Heat recovery equipment will reduce future operational costs. The investment was offset by reducing the necessary boiler requirement by 300 hp., which equals approximately $150,000 resulting in an additional savings of $25,000. With school square footage costs averaging $150/s.f., the elimination of a boiler footprint also saved tens of thousands of dollars.

The temperatures are controlled by the building automation system, which is an integration of Tridium, Richmond, Va., front end graphics with Honeywell, Minneapolis, Minn., software and hardware by temperature control contractor, Control Solutions Inc., Lisle, Ill.

All of these innovative cost reductions were a result of value engineering by city planners to meet the school's strict budget. **Typical mechanical costs for schools average $18/s.f. nationally. After value engineering the design, KSA brought the mechanical costs down to an unheard of $10/s.f. without compromising indoor air quality and comfort.**