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HVAC Design-Build Contractor's Value Engineering Helps College Reduce Budget.

Cost-cutting fabric duct helps former 1996 Olympics outdoor pool's transition to year-round use for $45 million Georgia Tech Campus Recreation Center.

ATLANTA — Providing HVAC for one of the nation's largest natatoriums is a tough task in itself, however engineers and architects for the new Georgia Tech Campus Recreation Center had a tight budget and many pre-existing structural hurdles to negotiate.

The 13,300-square-foot pool, which is the former outdoor pool built for the 1996 Summer Olympics held in Atlanta, serves as the anchor for Georgia Tech's ambitious $45 million, 289,000-square-foot Campus Recreation Center that surrounds it. The 100,000-square-foot Aquatic Center that encloses this mammoth competition pool presented a host of HVAC design challenges for engineer, Michael Saunders, senior engineer and business development at design/build mechanical contractor, Lee Company, Franklin, Tenn., and architect, Hastings + Chivetta Architects, St. Louis.

The original 1.5-million-gallon swimming/diving pools' free-standing, towering 115-foot-high rain/sun shelter and rooftop photo-voltaic cells were to remain as part of a 25-year research study grant conducted by the university, Georgia Power, and the U.S. Department of Energy. The solar system now provides 30-percent of the building's power. It was Hastings + Chivetta's difficult task to not only design walls and enclose the structure, but to cost-effectively add 50,000-square-feet of athletic activity spaces in the void between the canopy and pool was created by removing 13,000 of the 15,000 spectator seats temporarily installed for the Olympics. While many architect firms declined, Hastings + Chivetta's design uniquely uses post tension concrete—a standard in bridge building—for ten 58-foot-high arches that create the largest, column-less indoor span in the country. The arches serve both as a natatorium ceiling and floor for upper level athletic areas.

Although ingenious, the initial design surpassed Georgia Tech's budget, therefore many contractors for all trades were required to value engineer the project.

case study

The 60-year-old Lee Company, which is recognized by Engineering News Record Magazine as a Top 50 mechanical contractor, did its share of value engineering and cut the project's HVAC/plumbing budget by several hundred thousand dollars, according to Saunders. The redesign switched out the originally specified double-wall round aluminum metal duct with fabric air dispersion duct and saved over $100,000. In the building's fourth floor gyms, fabric duct was also threaded through bow trusses and branched out for complete floor coverage.

Sedona fabric duct with Comfort-Flow air dispersion and linear vents manufactured by DuctSox, Dubuque, Iowa, helped cut both material and installation costs. Gray 56-inch-diameter fabric duct distributes dry, conditioned air along a wall of exterior windows and three 36-inch-diameter ceiling-hung branches span the entire width of the pool surface. A separate duct run supplies the spectator seating. The duct lengths hanging 50-feet over the pool feature DuctSox's Sonic Vent technology at three custom manufactured positions of 1, 5 and 11 o'clock to evenly distribute air while avoiding deflection against the 13-foot-deep ceiling joists they run between. "The trick was to get high enough velocity from the fabric duct, but not so much that unnecessary evaporation is caused at the pool surface level," Saunders noted. "In the case of Georgia Tech, we like the balance we've achieved."

In addition to saving material and labor costs, fabric duct doesn't require interior insulation and exterior epoxy coatings to prevent condensation and corrosion respectively, that's inherent in natatorium environments. "Fabric duct offers a bonus over metal in natatorium environments, because pool chemicals do not degrade polyester fabric material," said Saunders.

The natatorium's HVAC design also saved equipment costs because portions tap into the university steam loop instead of relying on expensive dehumidification equipment options that provide heating and cooling. For example, cooling and dehumidifying the 2,000-seat spectator area is handled with a conventional chilled water air-handling unit, consisting of one model MCC-100's by Trane Co., Tyler, Texas. The chilled water is supplied by the building's 950-ton York International, York, Pa., chiller and accompanying Evapco Inc., Westminster, Md., 2,850-gpm cooling tower.

For the larger dehumidification loads of the pool, windows, and diving areas, Saunders used three Desert Aire Corp., Milwaukee, Wis., dehumidifiers with a combined capacity of 1,000/lbs./hr. of moisture removal. The two SA-60's and one ND-60 each provide 26,000 cfm of dehumidified air for the windows, pool, and diving areas along with a 50,000-cfm unit to serve the spectator area in the dehumidification process. Nearly 20 percent of outdoor air makes up the total cfm as calculated by the natatorium standard of .15-cfm/sq.ft.

To eliminate chloromine-laden air that tends to linger above pool surfaces—a long-standing swimmer complaint at many competition pools — Saunders specified seven 3,500-cfm and two 16,000-cfm deck level Loren Cook Co. exhaust fans. "Transforming this large pool to a facility it wasn't originally intended for and staying within budget was very challenging," said Saunders, who has designed several past natatorium projects. To prevent air stratification within the voids between the 56-foot-high cast-concrete joists' voids not occupied by ducts, Saunders specified eight 22,000-cfm cross ventilation fans that are controlled by variable speed drives in the event a televised swimming meet requires quieter ambient conditions.

While heating is rarely needed in Atlanta's warm climate, the natatorium can be heated on cold winter days via a 12,000,000-BTU Taco Inc., Cranston, R.I., heat exchanger that converts campus steam to hot water to supply the air handlers. Additional distribution of heating is mixed through the dehumidifiers' systems and accompanying fabric duct as monitored by the campus-wide Johnson Controls Metasys system.

Fabric air dispersion duct saved over $100,000.

In addition to saving money in labor and materials, Georgia Tech's maintenance department has a cost-effective option of retracting the DuctSox on its H-Track suspension system and laundering it, which is less costly than conventional metal duct cleaning services.

Thanks to value engineering, Georgia Tech is an example of a world class facility that doesn't sacrifice indoor air quality.

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4343 Chavenelle Road ■ Dubuque, IA 52002-2654
866-382-8769 ■ www.ductsox.com
563-589-2754/FAX