Expanding Scientific Discovery at Bowie State University

The Benefits of Chilled Beam Technology

VCU School of Allied Health Professions Underway
Bowie State University Opens Center for Natural Sciences, Mathematics, and Nursing

With chilled beam technology and fully automated dynamic glazing among its many state-of-the-art building features, the new Center for Natural Sciences, Mathematics, and Nursing at Bowie State University in Maryland is a showcase for sustainable design and construction. The 149,000-square-foot building was designed by Perkins+Will with Mueller Associates providing HVAC and electrical engineering.

The center was designed to support interdisciplinary, interactive, and experiential learning within a number of undergraduate and graduate programs. Spaces include classrooms, laboratories, nursing simulation suites, offices, a lecture hall, informal learning and study spaces, and a greenhouse. The “Beacon,” a three-story elliptical multipurpose space, anchors the building’s south elevation and provides a distinctive focal point for the university’s endeavors in scientific studies and research.

Chilled Beam Technology: A First on Campus

The LEED Gold® building features an active chilled beam system, which is still relatively new in the U.S. and a first for the Bowie State University campus. The use of the chilled beam system provided another key benefit in design: the ability to reduce the overall building height. As a result of the smaller ducts required for the system, the design team was able to reduce the height of the second and third floors by one foot each, netting an approximate savings of more than $300,000. This savings offset the higher first cost of the chilled beam system and lowered the overall life cycle cost for the building as a whole.

Mueller’s team designed a Multiparameter Demand Controlled Ventilation System that samples the air in the laboratories, and only increases the airflow based on the direct measurement of the carbon dioxide, carbon monoxide, total volatile organic compounds, and airborne particulates. If the parameters are below the maximum levels, the airflow remains at the minimum safe quantity, realizing increased energy savings.

Chilled Beam Technology has been used extensively in Europe and Australia but is less common in the U.S. Depending on the local climate and the use of the building, the technology may present the best option for system performance and long-term life cycle costs. In an active chilled beam system, the beams receive both air ducted from a central air handling unit and water piped from a central chilled water system. The amount of air delivered to each space is reduced to a minimum—typically only the amount required for ventilation.

The amount of chilled water used by each beam is varied to maintain a comfortable temperature. Ducted air passing through each chilled beam induces room air to flow through its heat exchanger, cooling the room air as it circulates. As water can carry more energy than air, it is more efficient to use the water in the chilled beam heat exchanger to remove heat instead of using conditioned air.

While chilled beam systems may be more expensive than air-only systems with traditional air diffusers, the chilled beam systems typically require smaller ductwork and air-handler size. Mechanical room size and ceiling space may then be reduced, offsetting some of the chilled beam system costs.

Chilled Beam Systems: Cost Benefits and Increased Flexibility

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A new School of Allied Health Professions building is now under construction on the Virginia Commonwealth University campus in Richmond. EYP, Inc., is the architect for the project, supported by Mueller Associates for mechanical, electrical, and plumbing engineering. The Whiting Turner Contracting Company is serving as construction manager.

The 154,000-square-foot building will house 13 university departments, including Gerontology, Health Administration, Nurse Anesthesia, Occupational Therapy, Physical Therapy, and Radiation Sciences, as well as the Virginia Center on Aging. Spaces include classrooms, conference rooms, laboratories, simulation suites, imaging suites, a state-of-the-art smart home apartment, a biomechanics research lab, and several maker labs. Targeted for LEED Gold, the building is scheduled for completion in 2018.