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Capitalaire

The National Capital Chapter of ASHRAE

Monthly Newsletter

Adapt Today to Shape Tomorrow

ASHRAE National Capital Chapter

biomass thermal as a mainstream renewable energy source. To find out more about BTEC, visit www.biomassthermal.org.

ASHRAE Society Technology Awards

Frostburg State University Center for Communications and Information Technology

Public Assembly-New Construction

Mechanical Engineering: Patrick Murphy, Jerry Goyanko
Electrical Engineering: Brian Charles (Vanderweil) and JVP Engineers (lighting)
Plumbing Engineering: JVP Engineers
Principal-in-Charge: Sam Bohsali and Don Posson

From left to right: Patrick Murphy, Omar Hawit & Patti Gunderson

Project Summary

The Gira Communications and Information Technology Center at Frostburg State University is a new $52 million, 127,000 classroom/laboratory designed for math, computer science, graphic design, and mass communications that achieved LEED®NC v2.2 Gold certification. The building includes broadcast studios for the University radio station and television and multi-media broadcast studios along with support spaces for these production areas. Video production and video editing classrooms, along with graphic design studios, are provided to support the production studios used by the mass communications department. The center also has 24-hour academic computing and computer science research laboratories. Additionally, there is a planetarium used as a multi-media learning center by the entire College of Liberal Arts and Sciences, a rooftop observatory and terrace, and an event space and commercial kitchen for banquets and fund-raising events.

The facility was designed starting in 2011 and evolved over a one year design period, followed by a two-year construction process. Occupancy began in the Fall of 2014. The final installed MEP systems include two (2) 230-ton rooftop air-cooled chillers; a 12,000 MBH dual fuel boiler plant; chilled beams; hydronic radiant heating and cooling lobby floor; total energy recovery ventilation; a daylight dimming system; demand controlled ventilation; hydronic snow melting system; displacement ventilation in the planetarium; a data center with underfloor air distribution; a green roof; and an evacuated tube solar domestic hot water system. The MEP/FP design for the building utilized Revit MEP Building Information Modeling (BIM) software as well as Navisworks for coordination and clash detection.

Energy Efficiency

The overall project design is projected to reduce energy cost relative to the ASHRAE Std. 90.1-2004 baseline by 30.3 percent and achieves an Energy Star Score of 91. A number of complementary design features reduce energy consumption and produce renewable energy on site. Variable speed rooftop screw air cooled chillers produce 42 deg F chilled water and are provided with waterside economizer. Chilled water is blended to supply 57 deg F water to the sensible cooling coils in chilled beams throughout the facility and minimize the risk of condensation. Air handling units are zoned to limit the operation time, heating/cooling energy consumption, and fan energy consumption for spaces that do not require 24/7 ventilation. These air handling units dehumidify the spaces and maintain a 55 deg F dewpoint to prevent condensation on the chilled beams. The building envelope includes a green roof, R-14 wall assemblies, and 0.38 U-value/0.28 SHGC glazing. Corridors and transition spaces are located along building facades to allow greater temperature fluctuations and save energy. Daylighting control limits wasted lighting energy consumption. Domestic hot water is produced using rooftop evacuated solar thermal tubes.

Indoor Air Quality & Thermal Comfort

The Frostburg State Gira Center HVAC system is designed to maintain a comfortable and healthy work and learning environment for occupants and to comply with ASHRAE Std. 62.1 and ASHRAE Std. 55. All primary ventilation air is filtered through MERV-8 prefilters and MERV-13 final filters. All recirculating fan powered VAV terminal units are also provided with MERV-8 filters. Materials and adhesives used during construction were selected for low VOC content.

Spaces used for storage of chemicals such as janitor closets, as well as spaces used for copying and printing are exhausted and isolated from adjacent spaces. Building entryways are provided with permanent walkoff mats to capture dirt brought in by occupants. The planetarium is provided with displacement ventilation for optimal ventilation effectiveness, acoustics, and thermal comfort. All conference rooms and densely occupied spaces are provided with CO_2 sensors. Humidity is controlled with local and AHU-mounted humidifiers serving the TV

studio. Occupant comfort is optimized through the installation of dedicated thermostats in all classrooms, all conference rooms, and 50 percent of enclosed offices. The owner has committed to conduct a post-occupancy thermal comfort survey and to make corrective actions to address complaints, and has already reported receiving significantly fewer thermal comfort complaints in this facility than elsewhere on campus.

Innovation

The unique building program and cold climate necessitated an equally unique combination of HVAC systems. With the television and radio studios and associated support spaces, special attention was paid to provide optimal acoustics through the use of vibration isolation, sound attenuators, strategic equipment placement, architectural treatments, and low velocity ductwork. In classrooms and offices, chilled beams were used to provide dedicated outside air for high ventilation effectiveness and thermal comfort, and to reduce fan energy and equipment noise. Rooftop air cooled chillers were provided with waterside economizer to serve interior zone chilled beams, and rooftop air handling units were provided with airside economizer since the outdoor air temperature is below 55 deg F for the majority of the academic year. The heating hot water boiler plant is provided with redundancy for both capacity and fuel type, and has hot water temperature reset controls to utilize the high efficiency condensing boiler for reheat during off-peak periods.

The project design in 2011 was an early adopter of Revit MEP Building Information Modeling (BIM) software as well as Navisworks for coordination and clash detection. This allowed the design team to coordinate closely and minimize conflicts during construction.

Operation & Maintenance

Redundancy for heating was needed for this facility in Frostburg, MD. This redundancy and reliability was balanced with energy efficiency and maintenance effort, and resulted in a unique boiler configuration for the heating hot water plant. A high efficiency dual fuel boiler operates throughout the year for heating and reheat, with two dual fuel boilers available to provide the full system heating capacity using either natural gas or diesel. This dual fuel operation allows the owner to maintain full system capacity during periods of natural gas curtailment by the utility. The heating plant also serves a snowmelt system for the sidewalks and stairs surrounding the site to eliminate the need for frequently clearing the sidewalks of snowfall and reduce the damage of salt and freeze/thaw to the concrete. The system is controlled by both temperature and moisture sensors to prevent energy waste.

The chilled beam system is designed for minimal maintenance with no moving parts, dry coils, no filters, and temperature and humidity control to prevent condensation. The owner has reported that this system has resulted in fewer occupant and maintenance complaints than other traditional HVAC systems on campus.

Most central HVAC equipment is located either on the roof or in a basement mechanical room to consolidate maintenance access. Rooftop equipment on dunnage is provided with access platforms for ease of access and safety. All exposed piping serving rooftop equipment is provided with heat trace, and all rooftop air handling units are provided with access vestibules to reduce the amount of heat trace and to provide all-weather access to maintain the RTUs. The roof is provided with elevator access to ease maintenance and equipment repair/replacement. This elevator is located within 20 feet of the basement mechanical room and roof access.

Cost Effectiveness

Both achieving LEED Gold certification and designing to a budget were high priorities for the owner. During design, over 50 architectural and MEP design elements were listed as design alternates to be accepted only if the budget allowed. The facility is expected to realize approximately $75,200 in energy cost savings per year.

Environmental Impact

The owner and design team shared a project vision for an innovative sustainable facility that minimized its impact on the environment. This resulted in the project earning LEED
NC v2.2 Gold certification.

The energy efficiency of the HVAC, lighting, and building envelope systems results in a projected reduction of CO_2 emissions of 1,276 metric tons of CO_2, a savings of nearly
47 percent compared to the median property in the Energy Star Target Finder. In addition, the project uses no CFC-based refrigerants.

Water use is reduced by over 41 percent through the use of low flow plumbing fixtures and rainwater reuse. A green roof also limits stormwater runoff and heating and cooling energy consumption.