NYC Church Blesses the Comfort, Environmentalism of VRF

The Convent of St. Dominic finds energy savings, extended comfort in VRF technology

Founded in 1878, the Dominican Sisters of Blauvelt is a religious congregation based in Blauvelt, New York, a northern suburb of New York City. The more than 150 professed Sisters and associate members serve throughout six states and are actively involved in education at all levels.

Their ministries include social service programs for the developmentally disabled, services for children in foster care, shelters for the homeless, housing for persons with HIV/AIDS, programs for the mentally ill and chemically addicted, and health care services for the poor.

Sisters' housing administrative offices, a convalescent wing, and large chapel in Blauvelt. The 100,000-square-foot, five-story brick building was being heated with an archaic steam system. In addition to operating expense, the lack of control over the facility's heating system was a problem, especially in the hospital and living quarters. Only 40 percent of the facility was air conditioned via window units.

"We needed to make a change," said Sister Catherine Howard. "There was a lot of potential to better serve the community, increase comfort, and become better stewards of the planet."

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>
> — *Sister Catherine Howard*

ANTIQUATED APPROACH: The 100-year-old Convent of St. Dominic was previously heated with a steam system and used window units for cooling.

To achieve so much, the Sisters run every element of the organization like a well-oiled machine. Waste not, want not, conserve resources, and apply their efforts and funding where it will best serve the Lord.

While their 100-year-old convent is absolutely pivotal to the congregation's existence and operation, its energy consumption had been a concern for a number of years. The congregation knew that maintaining and fueling the existing heating and cooling systems were draining them of funds that could and should be applied elsewhere.

The Convent of St. Dominic is the headquarters for the

SEEKING IMPROVEMENT

In early 2015, with a charge to make major building improvements, the convent's director of property management, David Reeves, approached Steven Winter Associates Inc. (SWA), a building performance consulting firm with offices in New York City; Norwalk, Connecticut; and Washington, District of Columbia.

Michael Flatley, senior engineer and director of commercial projects at SWA, completed the New York State Energy Research and Development Authority (NYSERDA) Flexible Technical Assistance Program (FlexTech). FlexTech provides objective, site-specific technical assistance and analysis to inform the implementation of clean energy technologies. This helped determine what kind of energy conservation measures could be taken to reduce energy bills and minimize the carbon footprint of the convent.

Flatley also referred Brookfield, Connecticut-based Green Star Energy Solutions LLC to complete the building improve-

FIELD SOLUTIONS

ments and HVAC retrofit at the convent. Green Star's work, which is often performed in NYC, is aimed at providing holistic efficiency.

"We combine Fujitsu General America Inc.'s Airstage VRF [variable refrigerant flow] heating and cooling technology with drastic building envelope improvements," said Joe Novella, founder, Green Star. "Windows, doors, weatherization, and insulation are often integral parts of our turnkey solution. This allows us to increase building performance, comfort, and longevity while also lowering the upfront and operating costs of the new HVAC system."

"NYSERDA looks for 10-15 percent energy savings," said Tom Esposito, director of business development at Green Star. "We strive for 40-70 percent and routinely achieve it."

After lengthy discussions with Reeves and the Sisters' Leadership Team, the project was broken into three phases: insulation, engineering and permitting, and installation.

SHELL IMPROVEMENTS

Aside from the obvious shortfalls of an old steam system and irregular window a/c units, Green Star's assessment of the building made the need for envelope improvements painfully clear. Other than small amounts of fiberglass batt stuffed ineffectively around several skylights, the entire building was uninsulated.

During the summer of 2015, Green Star thoroughly insulated the building. Nearly 1,200 bags of Owens Corning L77 loose fill insulation was blown into attic spaces and exterior wall cavities and densely packed in other areas. Insulation board was installed wherever possible, window and skylight penetrations were sealed, and Roxul mineral wool was used to fill gaps of various sizes.

"Exterior walls were brought up to R30, and the attics are now R60," said Esposito. "Immediately, the air conditioning units started cycling instead of running nonstop all day. It was a night-and-day difference, especially in the building's upper levels."

When insulation work was nearing completion, Green Star entered the engineering and permitting phase. Novella and Esposito were busy determining how to avoid or navigate the challenges that would soon come with the installation of state-of the-art HVAC equipment in an occupied historical building.

They learned that the building would require 120 total ton (1.44 MMBtu) of heating and cooling capacity.

"The convalescent floor and residence areas are always occupied," said Novella. "The beautiful, sacred chapel is used daily. To avoid problems with the building's molding, gold leaf, paintings, and stained glass, we had to be very specific about where and how the system's evaporators would be installed."

The outside of the massive brick building was no different; the large VRF condensing units had to be hidden from view.

Before the installation phase began, Valentine Electric Inc. of Blauvelt, New York, designed the service upgrade that would be needed when the building switched from natural gas-fired steam to an electrically driven heat pump system.

FLEXIBILITY AND VARIETY

A contract for the installation phase was signed in February 2016 and work began immediately. Using the elevator, Green Star technicians Josh Nettleton, Hector Pancheo, Mike Grier, Jorge Parra, and Sergio Molina took all 14 Fujitsu General Airstage VRF condensing units to the fourth floor. The systems were installed on an access roof between the main building and the chapel.

Because the small, flat rooftop is sandwiched behind and between two taller portions of the convent, it's difficult to spot from the ground. The electric service upgrade was also simplified because all the outdoor units were concentrated to one easily-accessible area.

The system includes a variety of 8- and 10-ton condensing units, which are paired

BIRD'S EYE VIEW: Technicians with Brookfield, Connecticut-based Green Star Energy Solutions LLC check the 14 variable refrigerant flow (VRF) condensers mounted on a small roof atop the Convent of St. Dominic in Blauvelt, New York. The facility is the headquarters for the Dominican Sisters of Blauvelt's housing administrative offices.

CONGREGATING IN THE CHAPEL: Green Star Energy Solutions LLC's Tom Esposito (left), director of business development, and Joe Novella (right), founder and CEO, meet inside the convent's chapel.

TONS OF COMFORT: In all, 120 ton of VRF heating and cooling capacity is installed to serve the 100,000-square-foot building.

NEW AND IMPROVED: The new VRF system uses a wide variety of indoor units to serve different spaces.

ALL SYSTEMS GO: Hector Pacheo (left) and Sergio Molina (right) close up Airstage VRF units after servicing the units for the first time.

into seven refrigeration circuits between 16 and 20 ton each. Inside the building, 144 units serve spaces large and small.

Throughout the chapel, steam radiators were removed from the oak casework and replaced by 18,000-Btu slim duct units. The vertically mounted evaporators are completely concealed and provide heating and cooling to the sacred space. Other smaller slim-ducts are installed in bedrooms and hallways.

Conference areas, offices, and bedroom cells are served by wall-hung units of various sizes. Ceiling units are also used in several hallways. On the fourth floor — the only area with existing ductwork — high-static air handlers were used to replace the existing ducted air handlers.

"Flexibility, ease of installation, and silent operation were critical on this project," said Novella. "A number of years ago, we found all this, along with outstanding design and technical support, with Fujitsu General. It's now the only brand we specify for VRF or mini-split applications."

But installing units in every area of a building whose nature is commercial, residential, institutional, and religious was easier said than done. Much care was needed to minimize disturbance throughout the entire project.

LIVE, WORK, AND WORSHIP

"The respect that Green Star had for us is absolutely second to none," said Sister Bridget Mary Troy. "They worked around us at all times and did nothing to mar this sacred space."

Green Star worked around worship services in the chapel. In the residences and convalescent wing, work was isolated to very small areas to allow everyday life to continue as usual. Work areas were kept very small and isolated with ZipWall dust barrier systems. As rooms were completed, units were powered up to provide conditioning immediately.

"One advantage of VRF equipment is the ability to install and commission systems incrementally," explained Novella. "Some of the units on the residential floor were up and running while we were still installing others right down the hall."

The convent presented as many logistical challenges as any retrofit Green Star has completed. But all fell to the wayside because of the understanding and cooperation on the part of the Sisters. Green Star estimates that the project will yield 60 percent savings while also providing a/c to portions of the building that weren't cooled before.

"This project not only allows us to better serve our ministries but also increases our sustainability," said Sister Howard. "By bringing cost-effective and conservation-minded equipment to our building, we're keeping with Pope Francis' call to care for the Earth and all that has been given to us."

Information courtesy of Rachel Ruhl, an account manager and writer for Common Ground. Ruhl writes about HVAC, hydronic, plumbing, mechanical, radiant heat, geothermal, solar, and broad building systems industries. For more information, call 717-664-0535 or email cground3@ptd.net.