



Achilles Elementary School required HVAC replacement as part of a mechanical upgrade to the facility; one of nine operated by Virginia's Gloucester County Public School District.

## CASE STUDY

K - 12 Education

### Facility at a glance

#### Name

Achilles Elementary School

#### Location

Hayes, VA USA

#### Facility size

88,000 ft<sup>2</sup> total space

22,000 ft<sup>2</sup> served by new equipment

#### Issue

Replacement of classroom unit ventilators with lightweight, quiet, energy saving rooftop units

#### Solution

(19) 3-ton and (2) 4-ton Daikin Rebel™ commercial packaged rooftop units

## Retrofit Project at Virginia School is Elementary with Daikin Rebel Rooftop Solutions

### Issues

Students thrive in clean, quiet and comfortable learning environments. Daikin contributed to such a setting in an energy-saving HVAC upgrade at Achilles Elementary School in rural Hayes, VA, one of nine facilities operated by the Gloucester County Public School District. While a large wing was added to Achilles about a decade ago, classrooms in the original 1960s-built section were in need of a mechanical upgrade, including replacing the existing HVAC equipment.



Low roof and ceiling clearances necessitated rooftop units to replace exterior wall-mounted unit ventilators.

"In our market, we normally don't specify rooftops on a job like this, but low clearances between the roof and ceilings necessitated rooftop units to replace exterior wall-mounted unit ventilators," said Matthew Haltiner, LEED AP, senior associate with Thompson Consulting Engineers in Hampton, VA. "The owner is happy with Daikin equipment in its other schools and we designed this system for that brand continuity and owner satisfaction."

### Solution

After the engineering and school facility team determined that a single-zone rooftop solution was more cost effective than using larger-capacity units with support weight considerations, the district ultimately selected Daikin Rebel variable air volume (VAV), single-zone units featuring cooling and heat pump modes with an inverter compressor. "The single zone, VAV operation made the installation more appealing and efficient for energy savings being we could do the single-zone for each of the classrooms," Haltiner says. "The Rebel units are light and versatile enough to install on a roof with weight concerns. It's nice these units aren't terribly heavy and that the job required minimal structural considerations to an existing rooftop that didn't have any HVAC equipment."



21 Daikin Rebel VAV, single-zone units provided the indoor air quality and energy saving solutions the district required.

"This has been a time-sensitive project in that we only had approximately eight weeks to do a major renovation. We removed all the unit ventilators and rewired circuits to ensure the new rooftop units meet current standards," says David Simmons, C.E.M., energy manager with Gloucester County Public Schools in Gloucester, VA. The district is a longtime Daikin customer.



*Lightweight Rebel units and versatile installation required minimal structural considerations to the facility.*

The design of the new HVAC system allowed other mechanical and safety equipment to remain located in the tight ceiling areas. Ductwork underwent some re-design during the project. "Our main challenge was dealing with existing conditions of the tight ceiling spaces that contained piping, electrical, and communications lines," says Christopher Brown, vice president of CB Plumbing & Mechanical, Inc. in Camden, NC, the installing mechanical contractor. "For example, ductwork had to be made wider and thinner in certain areas and we connected ductwork to ceiling-mounted supply and return grills in some cases."

The rooftop units avoid overcooling or overheating spaces with a quiet inverter-driven variable speed compressor and modulating hot gas reheat to deliver the preferred air temperature while allowing the school to minimize use of its own propane fuel supply. "This allows the school to use Rebel's heat pump mode for energy-efficient heating until it's too cold outside for heat pump operation, and then the Rebel units switch over to propane gas," says Greg Prose, Daikin Applied representative and sales engineer with Hoffman & Hoffman, Inc. in Chesapeake, VA.

Prose says: "The Rebels are the only rooftop units in the district that can do this and additionally, it's an energy-saving feature. The units also have a zero to 100 percent economizer for economizer operation when possible."

For additional energy savings and to ensure optimum indoor air quality (IAQ), a self-cleaning, no maintenance air purification system that uses bi-polar ionization technology was installed on each Rebel rooftop. "We installed the bi-polar ionization to reduce the outside air to the space which reduces the total capacity from the system. It removes the need for an energy wheel and the exhaust fan associated with it," Haltiner explains, noting a formula of .06 cfm per square foot plus 10 cfm per student was specified to meet or exceed the ASHRAE standard.

Haltiner adds: "We are still required to have the same size compressor but it doesn't have to do as much work as when incorporating an energy wheel, so the customer receives the benefit of the reduced total capacity of the system, but not the total cooling capacity of the compressor."

Achilles Elementary looks forward to realizing energy savings from the Rebel rooftops while improving IAQ with bi-polar ionization. "Schools are a magnet for airborne pathogens," Simmons says. "If we can save a good percentage of those kids from spreading illness by reducing the outside air contaminants with the bi-polar ionization killing the pathogens that come into the building through the outside air, then we can do our job of providing an education for them."

## Outcome

The Daikin Rebel units serve about 22,000 ft<sup>2</sup> of space which includes 12 classrooms, two hallways and two computer labs. Start-up was completed in mid-August 2015 by the Daikin Service Group after some adjustment of the flashing on the curbs to accommodate the new rooftops, and units were commissioned by a third-party provider. "The new Rebels are all on the roof with sound isolation foundations so you don't hear them in the classroom unlike the loud motors of the unit ventilators that were in the classroom. This will be a much better learning environment for the kids," Simmons says.

Achilles Elementary uses a centralized building automation system (BAS) in use throughout the district and manages its energy carefully. Sensors in the rooftop units communicate with the set points in the BAS. "Our rooftops don't have local control though they have temperature read-outs in each classroom. We control the system through our BAS which cuts down complaints about occupant comfort and each classroom can be controlled individually," Simmons says.



*Rebel's EC fan motors, internal variable speed compressor, internal heat pump, and roofcurb foundation isolators create a quieter and more comfortable learning environment for students.*

Gloucester District takes a proactive stance on energy management, such as avoiding running equipment before 7 a.m. and programming HVAC in individual spaces to allow for after-school activities, as necessary. Other sustainable initiatives include LED lighting retrofits.

"The new Rebel units are easy to work with and user friendly," Simmons says. Of the Daikin Service Group that started up the system and is working with the controls integrator, he adds: "The technicians from Daikin Service Group have been outstanding and right on the money. We receive very helpful, responsive service from the Richmond office."

## Daikin throughout the district

Gloucester School District operates five elementary schools, two middle schools, a high school and an administrative center. Achilles Elementary is one of several facilities in the school district that has recently added new energy-saving Daikin equipment.

Last year, Petsworth Elementary School included Daikin Rebel and Daikin Maverick™ equipment in a major renovation. Botetourt Elementary added a large Maverick rooftop unit and 15 VAV boxes. Maverick rooftops with VAV boxes were also installed at TC Walker Administrative-Educational Center, and Daikin water source heat pumps (WSHPs) were used for the replacement of Page Middle School following a tornado. Simmons notes Gloucester District expects to add more Daikin WSHPs in years ahead as it plans to install a geothermal system to serve up to two more schools on the Page site.