

REPLACEMENT ROOFTOP UNITS PAY BIG DIVIDENDS FOR SOUTH HIGH COMMUNITY SCHOOL



Background

After numerous water leaks, compressor failures and damper control problems, it was time for South High Community School in Worcester, MA to replace the 30 year old HVAC rooftop units. Not only had the units outlasted their expected mechanical life, but the ability to deliver fresh outdoor air and maintain comfortable heating and cooling conditions became increasingly difficult and expensive. To specify a state-of-the-art replacement HVAC rooftop system, the energy and environmentally conscious school district enlisted the services of a local engineering firm.

Design Challenge

Director of Facilities Jeff Lassey met with engineer Mike Lescarbeau of Lindgren & Sharples, P.C. to establish new system design requirements. Electric heat would need to be replaced with a lower cost energy source. To avoid altering the recently installed rubber roof, the new replacement units would need to utilize existing roof curbs and ductwork.



"We wanted the most energy efficient rooftop HVAC system available to minimize operating cost, protect against future energy prices and reduce CO2 emissions."

Jeff Lassey

Director of Facilities

Worcester Public Schools

Because the replacement units would also be supplying outdoor air to meet the schools IAQ requirements, Lassey wanted to include energy recovery ventilation (ERV) technology to minimize this energy load. Lassey had utilized the technology on a neighboring high school three years earlier to successfully lower operating costs.

ERV Technology Specified

To meet the new design challenge, Lescarbeau specified a total of (19) gas/electric rooftop units with energy recovery wheels to replace the all electric units.

Without energy recovery ventilation, HVAC systems waste energy contained in building exhaust air while consuming



*Rooftop unit with integrated
Energy Recovery Wheel*

new energy to precondition code driven fresh air requirements. By contrast, systems utilizing energy recovery wheels re-use (recycle) up to 80% of the energy in exhaust air to heat, cool, dehumidify or humidify a like amount of incoming fresh air. This recycling of energy can reduce HVAC design loads and annual energy use by as much as 50%.

As a result, Lescarbeau was able to specify smaller, lower cost heating and cooling units to easily fit within the existing roof curb profile. Adaptor curbs were designed and fabricated by a local curb supplier to fit the new rooftop units to the existing curbs. Direct Digital Controls and modulating dampers were added for individual zone control by an existing building automation system.

We've also received positive comments about the improved indoor comfort and air quality".

*Mike Lescarbeau
Lindgren and Sharples*

Energy and Economic Payback

The energy recovery ventilators were calculated to save South Community High School approximately \$60,000 annually or \$1.2 million in today's dollars over the average life of the new rooftop units. When asked about the upfront investment in wheel based energy recovery rooftop units, equipment representative Craig Campbell said the choice is simple:

"For roughly the same price as a larger more energy intensive rooftop unit, we can provide the same amount of work with a smaller, wheel based unit that performs with up to 40% greater efficiency. This translates to significant energy savings over the life of the equipment."

*Craig Campbell
Trumbull and Campbell Associates*

The initial added investment in wheel based rooftop units is expected to be recouped during the first year of operation based on savings from the energy recovery ventilators alone. Had the school not converted their heating energy source from electric to gas, the wheels would have provided an additional \$100,000 annually in outdoor air energy savings.



Custodian Tim Fournier comments there is no added maintenance for the energy recovery wheels.

Green Award for "Going the Extra Mile"

The replacement HVAC rooftop system earned South High Community School a Central Mass Green Award for energy efficiency. The award was created by the Worcester Business Journal (WBJ) to recognize organizations "going the extra mile" to make green choices. According to the WBJ,

"We all know being in business is about making money. But thanks to technological advancement, and a realization that our global resources are finite, making sustainable choices can both ease the conscience and help the bottom line."

South High's energy recovery wheels are estimated to reduce CO2 emissions by 265 tons annually which translates to approximately 353 lbs per student.

Impact of Energy Recovery Wheels

Heating Capacity Saved (Btu/hr)	4,727,000
Cooling Capacity Saved (tons)	115
Net Capital Expenditure (Wheel based rooftop units)	\$55,000
Annual Outdoor Air Energy Saving	\$60,000

Based on \$1.10/therm gas, \$0.115/kwh, 67,449 cfm outdoor air, 12/5 operation, 10 months/yr.



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