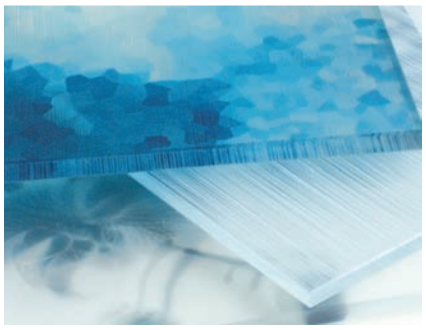
# PRODUCT
## SPEC GUIDE FALL 2007

# ARCHITECT

hanley wood

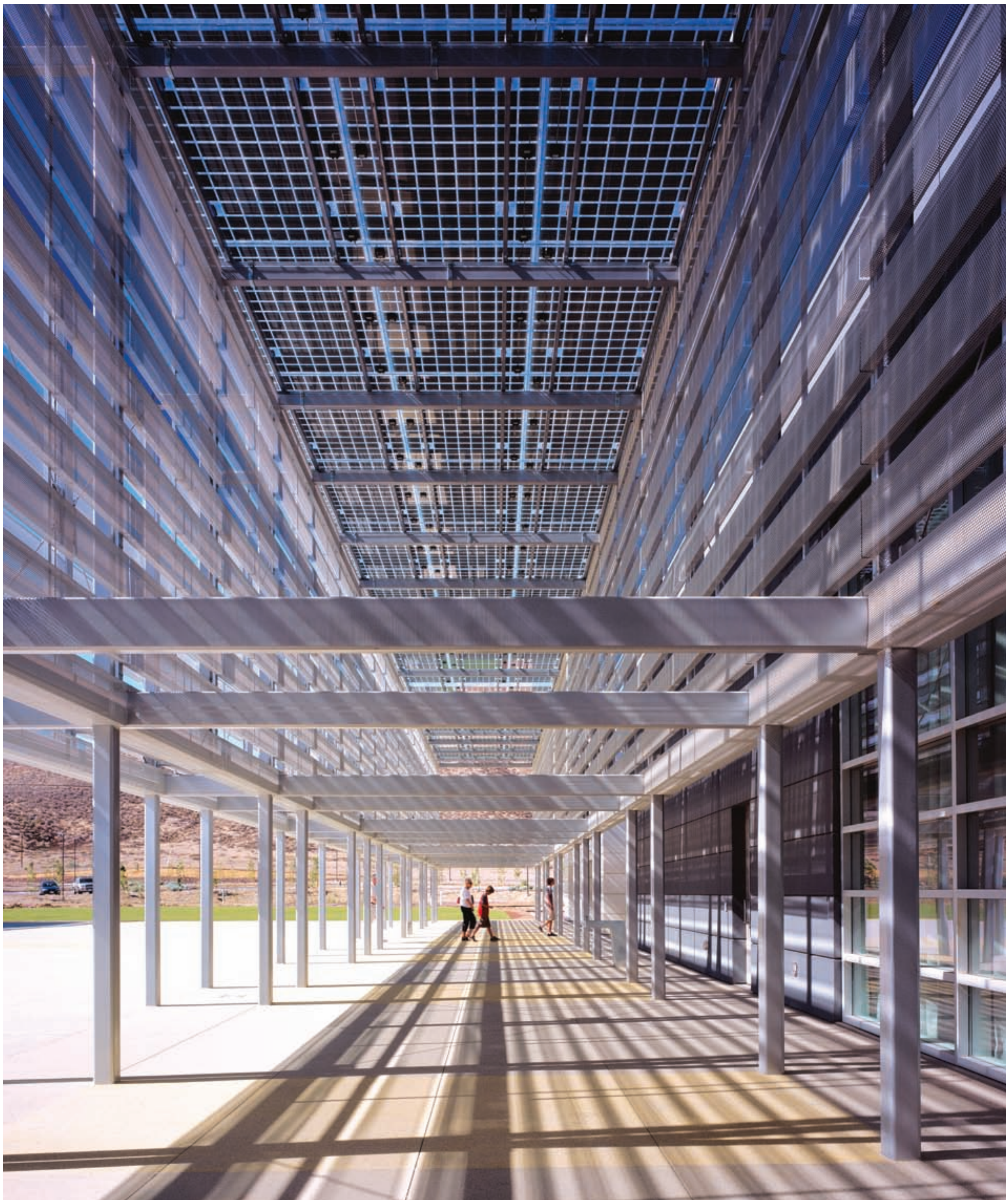
**Lighting** 50



**Surfaces** 60

**Systems** 58

**Flooring** 56



# Green Building

**Entering New Territory at the Water + Life Campus in California** 41 **USGBC's D.C. Corporate Headquarters** 25 **The University of Ontario Institute of Technology** 31

**Fall 2007** www.architectmagazine.com

**A deceptively simple**-looking device called an enthalpy wheel (above right) can save significant money and energy as part of a building's HVAC system. The key component in energy recovery ventilators (above left) manufactured by Greenheck, the wheel spins between two air streams—one half through a building's exhaust air and the other half through its supply stream—recovering energy within the mechanical system and maintaining both temperature and humidity at a comfortable level.

ERVs save energy from going off into thin air. **Text** Edward Keegan

# Thinking in Circles

**Moving air through spinning parts** has been a core capability for Schofield, Wis.–based Greenheck since the company's founding in 1947. Some of its earliest products included rotary turbines built with the knowledge of airflow that Bob Greenheck gained while working on aircraft during an internship at Boeing. Today, in a complex prosaically named Facility One, the 2,600-employee company manufactures an extensive line of commercial and industrial air movement control products, including energy recovery ventilators (ERVs). Available in some form since the 1970s, the ERV is an overlooked technology that offers big energy and cost savings—and LEED credits.

**Greenheck founders** Bernie Greenheck (left) and Bob Greenheck with a roof ventilator, 1956.

## ENERGY RECOVERY VENTILATORS: A SHORT PRIMER

All mechanical ventilation systems involve the intake of a certain quantity of fresh outdoor air, balanced with the recirculation of a corresponding percentage of redistributed, preconditioned indoor air. In everyday application, this outdoor air (cold and dry in winter, hot and moist in summer, depending on specific climatic conditions) must be tempered before it can be distributed throughout a building. In a 100 percent fresh-air circumstance, all the energy used to temper this air would be lost when the air is exhausted. An ERV recaptures some portion of the energy previously used to heat or cool the exhaust air and applies it to incoming fresh air to maintain desired indoor temperatures.

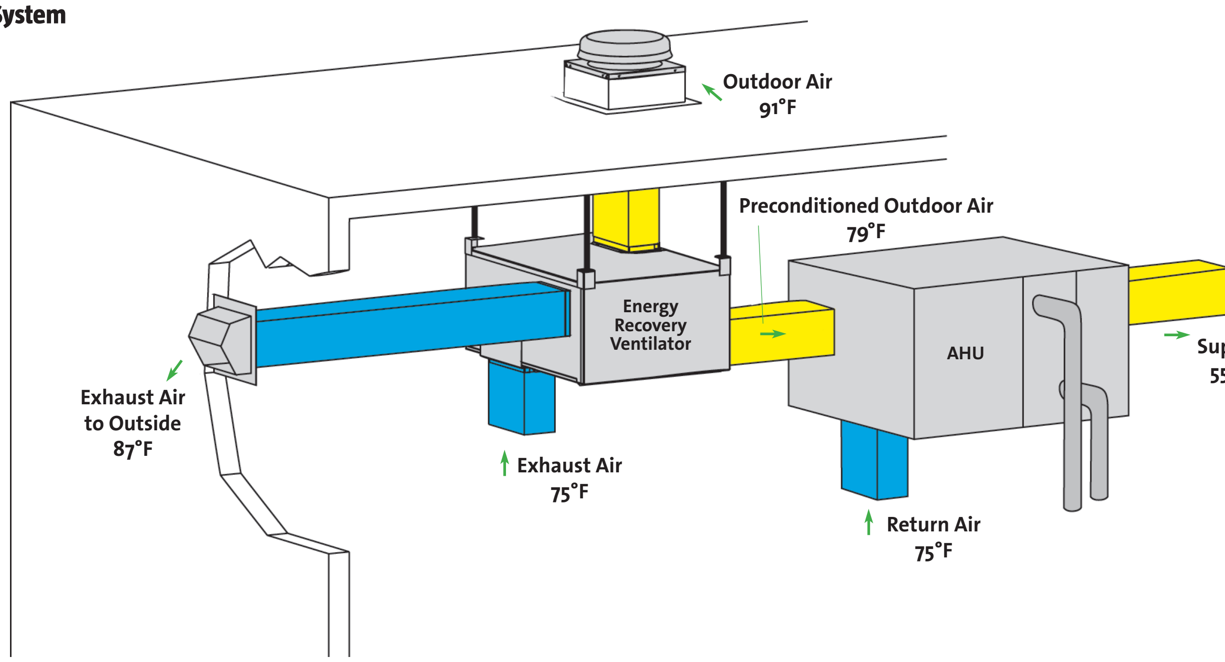
## HOW THE WHEEL WORKS

Two different methods are commonly used for recovering energy within ventilating systems. Many manufacturers use plates that transfer heat between the exhaust and fresh air streams. Greenheck uses the preferred method: an enthalpy wheel that spins between the two air streams, one half through the exhaust air and the other half through the supply stream. "It transfers sensible and latent energy," explains Dan Jore, Greenheck's sales and marketing manager for energy recovery products. "A lot of devices out there—[those with] just plates—get heat, but not the moisture transfer." Since maintaining comfortable humidity levels is just as important as maintaining temperature, the wheel method is much more efficient in recovering energy that's already been created within the mechanical system.

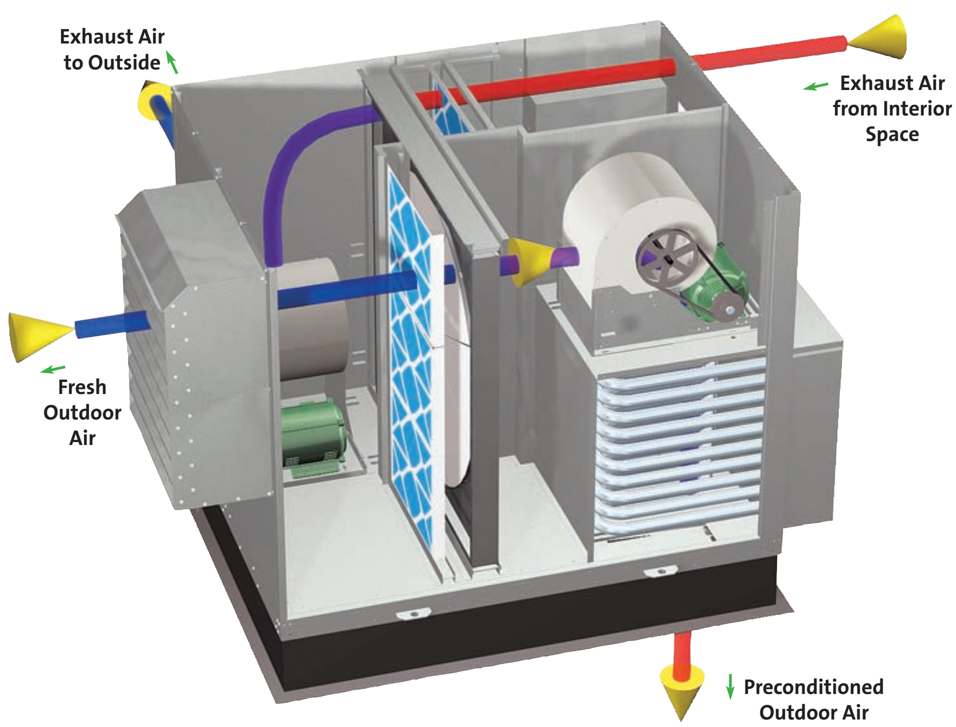
The enthalpy wheel typically rotates at a velocity of between 50 and 60 rpm—just a little faster than the old vinyl 45 single recordings. But these platters are considerably larger, ranging in diameter from 25 to 74 inches. Regardless of size, each wheel is configured in six to eight segments that can be individually demounted for easy cleaning. Energy is recovered via plastic polymer infill strips—each paper-thin—packed within each wedge. A desiccant is permanently bonded to each of the literally thousands of strips in each wheel. While the stacks of polymer are relatively tight, it's easy enough to poke a finger between them and even simpler to clean with a stream of water from an ordinary hose. With proper care, the wheel doesn't need to be replaced during the life of the unit. "We weren't the first to use the wheel," explains Jore, noting, "We got to cherry-pick from the best ideas on how to do energy recovery." Another advantage is the lightweight nature of the plastic polymer wheel. It doesn't take a lot of energy to rotate it.

# AIRFLOW THROUGH THE ERV

**ERV in Integrated HVAC System**
**Typical Summer Operation**




**Inside the ERV**




**The challenge:** All mechanical ventilation systems take in fresh outdoor air while recirculating indoor air. Usually, the outdoor air (cold and dry in winter, hot and moist in summer) must be tempered before it can be distributed throughout a building. Energy used to temper outdoor air is lost when the air is exhausted.

**The value:** An energy recovery ventilator (ERV) recaptures some of the energy used to heat or cool the exhaust air and applies it to subsequent incoming fresh air to maintain desired indoor temperatures.

## THE MANUFACTURING PROCESS

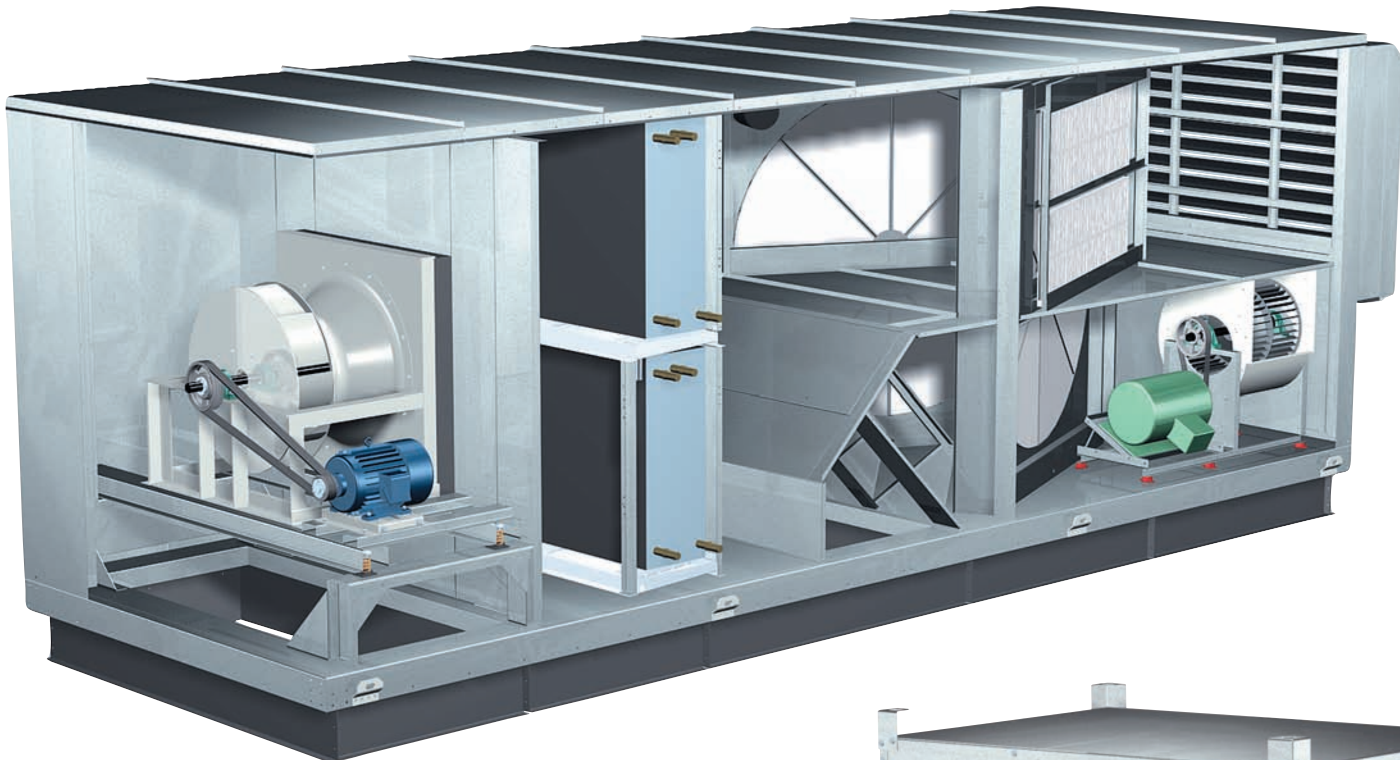
Welcome to Facility One. The first two steps in the assembly line are relatively compact and low-key—the raw material staging and controls assembly. Large-scale action begins when the packages of sheet steel are opened. Individual sheets—all galvanized and some powder coated, depending on the particular specification—weigh approximately 88 pounds each. They are individually fed into one of two computerized punch presses that meticulously cut and punch each sheet to size. Every screw hole that will eventually allow the ERVs to be hand-assembled is mechanically punched while the metal is still in sheet form. The next stop, just steps away, is a matching pair of computer-controlled panel benders. These machines shape the sheets into what finally begin to resemble actual parts.

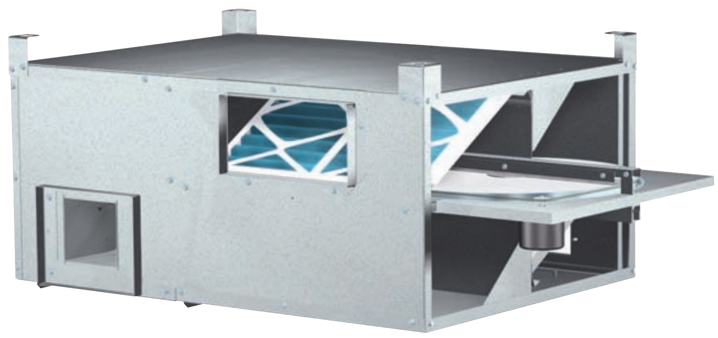
Movement between each step of the assembly line is surprisingly low-tech. Simple metal carts like those used to reshelve library books litter the floor. Each is identifiable across the vast factory via brightly colored "lollipop" sign tags that protrude above the stacks of parts. Every cart represents another ERV on its way to completion.

The final assembly is the last step of the process and the one involving the most handcrafting, as the parts are screwed and the electronics wired together. It's only here that the enthalpy wheels are inserted and a sophisticated energy recovery ventilator suddenly emerges from what was previously just a stack of seemingly spare parts.

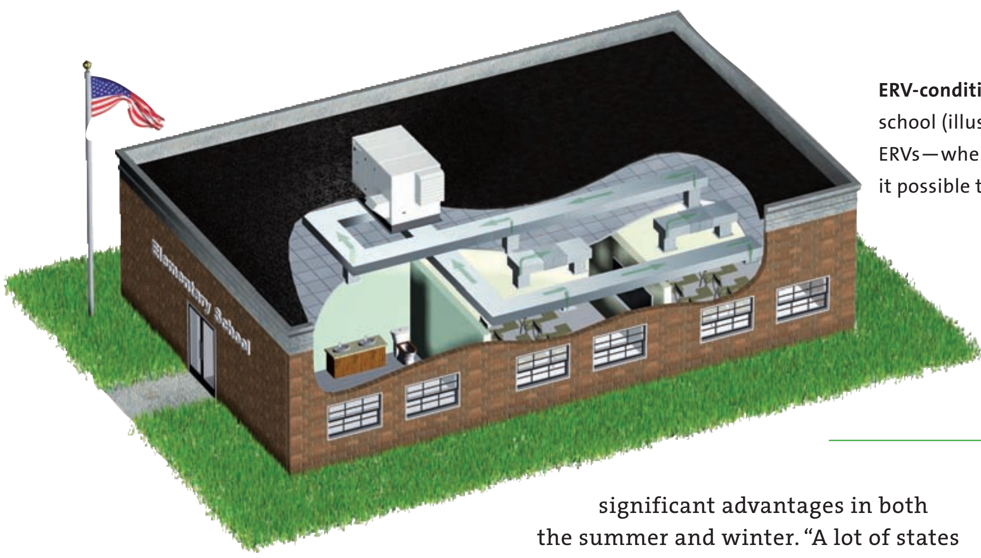
## LEED IMPLICATIONS

The extent to which energy recovery can benefit building designers, engineers, and owners is dependent on location, with the entire eastern and central United States showing





**Greenheck's smallest** MiniVent package (at right) can easily fit above a closet or similarly small interior space. It's less than 3½ feet long, 29 inches wide by 20 inches high, and it weighs about 150 pounds. At the opposite end of the spectrum, the largest APEX unit (above) could house a New York City studio apartment. It tips the scales at 6 tons, is more than 8 feet wide and just as high, and stretches more than 24 feet. Units vary from having an airflow volume of a mere 300 cubic feet per minute (CFM) to 20,000 CFM, and they can be installed either as part of an existing HVAC system or with integral heating and/or cooling in a new installation.



**ERV-conditioned air** travels through ducts in a building—such as a school (illustrated at left), a common installation site for Greenheck's ERVs—when combined with other parts of the HVAC system. ERVs make it possible to add square footage without replacing an older HVAC unit.

significant advantages in both the summer and winter. "A lot of states require energy recovery now," states Jore, citing ASHRAE 90.1-2004 as the most commonly adopted standard for many buildings that receive public funding. "It strongly suggests what kind of energy recovery to use," he says.

Greenheck has identified three prerequisites and five credits from the LEED-NC requirements that their ERVs can help achieve. Greenheck's ERVs are already ahead of the curve. Jore notes that ASHRAE 189 is in public review and requires even higher performance that will necessitate energy recovery devices. "Our product is already there in terms of what they're asking for in efficiencies," he says.

## DIFFERENT KINDS OF PAYBACK

The earliest energy recovery units were developed by other manufacturers during the early 1970s, primarily for industrial environments. Interest waned when energy costs went down following the energy crisis of that decade. Greenheck eschewed the industrial market for ERVs, since contaminant-laden air streams posed problems with the mixing of indoor and outdoor air streams. The company entered the ERV market just over a decade ago with its own system for institutional and commercial applications. "Schools are a very big market for us," explains marketing communications manager Cheryl Aderhold.

Many regular Greenheck customers are constantly expanding their facilities. Since implementing energy recovery reduces total energy loads, it's often possible to add square footage while retaining older HVAC units. "It's a significant amount of cooling you can reduce," says Jore, citing a savings of 3 to 4 tons per 1,000 CFM. By adding an ERV, old systems can often meet the heating and cooling requirements of larger areas.

While operating bills will always be a factor, today's increased demand for ERVs is based on costs of a different magnitude. More temperate climates—California and parts of Arizona, for example—don't necessarily require air conditioning. "California is not a great place for us in terms of financial payback, but now there's a whole other element," says Jore. "It's not a cost thing. It's saving the environment."