

TRADITIONAL GOES GREEN

A Mount Joy Township home, built largely by students, brings sustainability into the mainstream.



STORY BY M. DIANE MCCORMICK

IT'S POSSIBLE THAT JOHN L. FELIX JR. ONCE SAT on the Conestoga Valley High School bleachers that have now been recycled into his bathroom cabinets.

"The irony of ironies is, that's where I began my teaching career," says Felix, now principal of Donegal High School and first owner of a Lancaster County Career & Technology Center (LCCTC) "Apprentice Green" home, a four-bedroom house in Mount Joy Township.

Apprentice Green is a planned development of four homes — one completed and another under way — built largely by

LCCTC students. With help from the U.S. Department of Housing and Urban Development, the National Association of Home Builders (NAHB), the state Department of Environmental Protection and Central PA manufacturers and contractors, the project is pointing the way toward the future of homebuilding. Apprentice Green's goal is bringing sustainability into the mainstream

— educating the next generation of builders in green techniques, blending design and green technologies, creating comfortable, marketable houses.



"We didn't want to do anything too off the wall," says Michael Dodson Sr., LCCTC project supervisor, who oversees construction-technologies students who are doing everything from plumbing to drywall. "We didn't want to build some Taj Mahal where people would say, 'I'll never do this.' We wanted to build a traditional home with green aspects to it."

Felix, wife Maureen and their 17-year-old daughter left a nearby 1920s house to enjoy the new home's green aspects, easy maintenance, educational history and proximity to two parks and a bow club that John belongs to.

"About 400 different students worked on some part," says Felix, a 30-year education veteran. "Some of those students would have been my kids from Donegal."

Even the chimney was educational, Felix notes. The gas fireplace didn't need one, but students got hands-on lessons in building a chimney anyway. The home features a steady, comfortable climate through hot August days and winter cold snaps, Felix says. "We really haven't noticed a lot of fluctuations, the house is insulated so well."

That's no accident. Felix's house began with plans for a traditional home, donated by Lancaster County Energy Star builder Norman L. Graham, Inc. Then, working with the NAHB and local HVAC, plumbing and other companies, Graham and project leaders adapted the plan to accommodate a long list of green technologies and maximize their efficiency.

The list begins with advanced framing techniques that use fewer studs, spaced farther apart than lumber in traditional framing. Insulation then fills the broader spaces, with fewer gaps. "We filled the cavity with cellulose, which is recycled newspaper," says Dodson. "It's 75 percent reclaimed material. It really gives you a nice wall."

That tight wall defends against climatic assault so well that Mike Newman, renewable energy manager for Worley & Obetz, Lancaster County, observes that the completed shell felt comfortable even on a hot day.

A tight home envelope can also save building and heating costs by allowing installation of a smaller heat pump, says Newman, whose firm has helped with the geothermal systems in both houses and is installing a new feature — solar electricity — in the second house. Conventional thinking once

"WE DIDN'T WANT TO BUILD SOME TAJ MAHAL WHERE PEOPLE WOULD SAY, 'I'LL NEVER DO THIS.' WE WANTED TO BUILD A TRADITIONAL HOME WITH GREEN ASPECTS TO IT."

— Michael Dodson Sr.

called for erring on the high side when choosing the heating unit's size, he says. But with new technology and the better construction techniques that students and builders are learning, smaller is better. Oversized units would just "end up wasting electricity."

The Apprentice Green home's ductwork also contributes to the comfort level, says Newman. "With any forced air heating and cooling system, you need to make sure that the distribution of air is proper," he points out. "If it isn't, you'll have drafty spots and not-drafty spots."

The home's solar hot water and rainwater collection systems heighten its green qualities. Two 1,300-gallon rainwater tanks buried in the yard have provided every drop of water for laundry, yard and dual-flush toilets.

The solar hot water system features 24 evacuated tubes, whose rounded surfaces collect more energy from the moving sun than flat panels in the fall and winter, says Randy Reinard, Lancaster branch manager for plumbing distributor Thos. Somerville. The heated water collects in a tank, and a central manifold, or "maniblock," sends water in individual lines to each plumbed item, preserving heat energy and preventing corrosion by eliminating the need for fittings and connections that shuttle water through the house from the main line.

Tankless water heaters — one for the master bathroom, and one for the rest of the house — heat the water as needed. Every solar system needs redundancy, Reinard notes. "It can't do everything. You have to have a backup source."



Of course, the true measure of a green home is actual performance. Does it use less

energy, less water? John Felix knew, going into his home, that monitors and sensors would detect usage patterns, climate and air quality. "It's not like they have a camera in my living room," he says. Like everyone else, he is curious whether the home will "work the way everybody says it's going to."

Jeannie Leggett Sikora is analyzing the data for the NAHB Research Center. True to the home's educational purpose, the data is being collected for the U.S. Department of Energy's Building America program, which promotes more efficient home construction and remodeling techniques.

Sikora, based in Millersville, is monitoring "real-world performance" of the solar water heating, rainwater collection and ground source, or geothermal, heat pump. Since data collection began in October, the rainwater tanks have saved 7,000 gallons that would have been drawn from the public water system, Sikora says. And the ground source heat pump, which heats or cools air from the basis of the earth's constant 55°F, is twice as efficient as an air-source heat pump that works harder to condition Central PA's air temperature extremes.

Only the solar hot water system has fallen short in early findings, she says. The system has supplied a little more than one-third of the family's hot water — less than the expected half. "I'm hoping to see that [go] a little bit higher," Sikora states. Still, as electricity rates climb, the family has used more than 700 kilowatt-hours' worth of hot water but only had to buy enough electricity for almost 500.

Most of the home's green technologies are hidden from view, but other green elements are in plain sight — in cabinets recycled from those bleachers or renewable eucalyptus, carpets and flooring made from recycled material, and concrete countertops.

Enter the mud room off the breezeway, and the floor is actually commercial-grade ECOSurfaces, made from recycled tires by Lancaster-based ECORE International. Interlocking mats in the basement, suitable for putting under exercise equipment, are also ECORE's Training Ground brand, available for home use at some sporting-goods stores.

"IT'S A WAY OF BUILDING THIS WELL-ROUNDED WORKFORCE THAT'LL BENEFIT EVERYBODY. WE'LL HAVE QUALIFIED PEOPLE AND A NEW WORKFORCE FOR OUR COUNTRY."

— Mike Newman

Susan Dyson, of Dyson Interior Design, helped select the home's design elements, keeping an eye on cost, function and aesthetics. "The choices are always difficult because you may choose a green material like bamboo, but it has to be shipped from China," she says. "The carbon trade-off is something you have to consider."

Finding green materials locally "is not too bad, actually," she says. "We have a lot of stuff right here in the Susquehanna Valley."

Still, going green continues to have its challenges, such as finding broad color choices in low-volatility paints, Dyson says. In the end, she feels, the Apprentice Green home demonstrates the best of green living — a smaller space that retains the open floor plan popular among homeowners today.

"Most people like an open kitchen to the family room," she says. "That house would be, for me, a very livable place. People really don't use living rooms anymore. You might as well have a velvet rope across."



Among the many people interested in the Apprentice Green home — featured in last year's Lancaster and Lebanon County Parade of Homes — are the students who helped build the home and who, in the end, embody the whole point of the exercise.

Dodson "couldn't be more proud" of his LCCTC students, who enthusiastically apply their classroom lessons in real-world settings. "They actually love coming to school," he says. "And they're very proud when they come back during Parade of Homes and other events. They just show up on weekends. Some of them show their parents. You just see the pride in their eyes." One visiting plumbing graduate recently shared the fact that he's installing solar panels.

In the future, Worley & Obetz will want HVAC installers with some knowledge of solar and geothermal technologies, says Newman. "It's a way of building this well-rounded workforce of the future that'll benefit everybody. We'll have qualified people and a new workforce for our country."

Student involvement might not "equate to dollars and cents," but it added to the home's value in the eyes of Felix and his wife — both of them educators.

"How often," marvels John Felix, "are you going to get a chance to buy a house built by kids who are learning to build a house?" *

To learn more about the "Apprentice Green" home and its systems, visit:
<http://tinyurl.com/ya9d8p3>

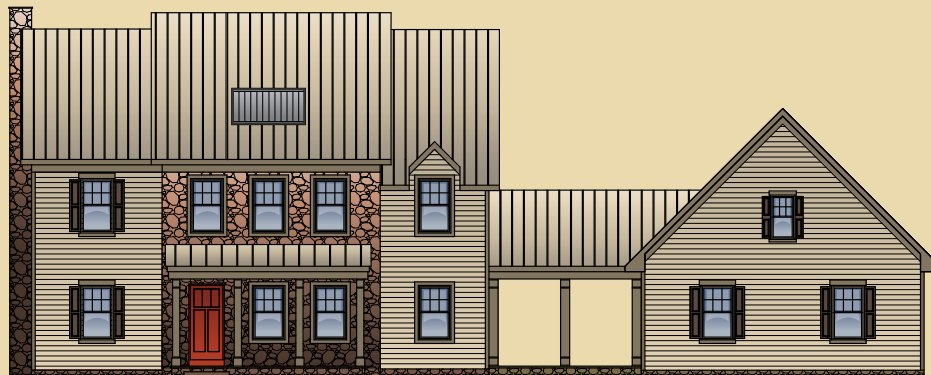
ENERGY CONSERVATION

Workers drill a well to accommodate a closed-loop anti-freeze-solution-filled tube for the ground-source ("geothermal") heat pump system, which is twice as efficient as an air-source heat pump because it heats and cools based on the constant 55°F temperature of the earth.

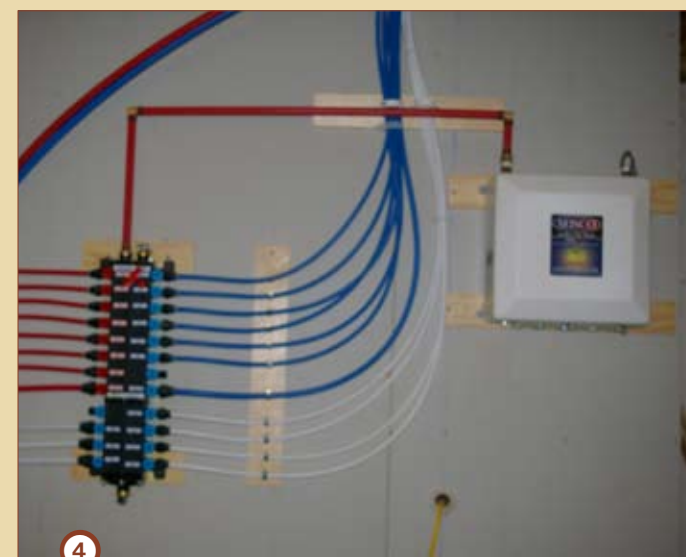
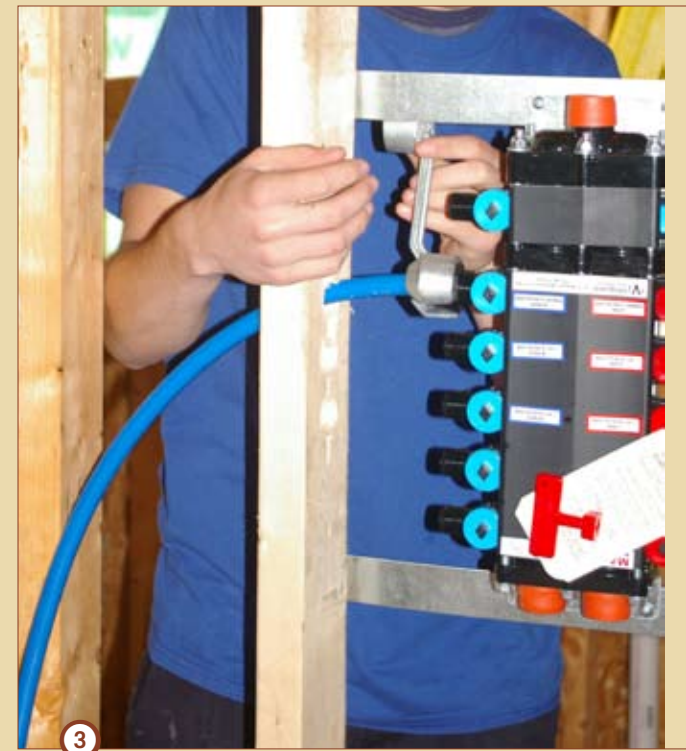


Cellulose insulation (made from recycled newspaper) in the wall cavity, combined with spray foam at the rim joists, provides a well-insulated wall with good air sealing. Studs are farther apart than in traditional framing, making for fewer gaps.

The lenses and highly reflective materials used in **tubular skylights** provide bright, constant lighting throughout the day, reducing energy use.



WATER SYSTEMS



- 1 The **solar hot water** system features 24 evacuated tubes, whose rounded surfaces collect more energy from the moving sun than flat panels in the winter and fall.
- 2 **Rainwater** stored in two **1,300-gallon tanks** buried in the yard provides every drop of water for the family's laundry, yard and dual-flush toilets.
- 3 A student uses a simple tool to connect supply lines to a central manifold, which **takes water from the solar and rainwater tanks** and distributes it throughout the house.
- 4 Lines connected to the plumbing manifold (blue for cold, red for hot and clear for a secondary cold-water inlet from the rainwater tanks for the toilets only) are flexible and can be bundled together to run neatly through the house's framing and joists. One of two **tankless water heaters**, at right, serves as a backup for times when solar heating water is insufficient.