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## Green-Eyed Remodelers

In Kensington, 3-Story Addition Takes Shape Based on a Pro-Environment Strategy

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Sandra Novotny and her husband, Thearin Wendel, are putting a green addition onto their 1960 Kensington split-level -- a three-story add-on that seeks to preserve their health, their wealth and the environment they live in.

It's almost finished now, but it has taken a lot of work to get there.

The couple have long been active in the environmental field; they met in 1989 while both were working at an environmental consulting firm. To start their new project, they spent hundreds of hours researching earth-sensitive products, materials and building techniques.

"We wanted an energy-efficient home to save money and to save nonrenewable resources," said Novotny, who now works as a consultant for the Environmental Protection Agency. "We wanted a healthy home for us and for our child. And we wanted to be environmentally responsible."

Helen English, executive director of the Sustainable Buildings Industry Council, a Washington trade association that promotes green building, said decisions about products, materials and construction techniques made by individual homeowners can have a definite effect on the environment.

"The energy we use in our buildings pollutes the country at a phenomenal rate," said English. "Energy is generated mostly from nonsustainable sources like coal, natural gas or nuclear. And energy generation is responsible for global warming, acid rain and a lot of smog and pollution. We need to minimize the amount of energy we use in our buildings."

Novotny and Wendel are adding 1,300 square feet on three levels, just about doubling the size of their home. On the lower level, they are adding a family room, mudroom, storage room, workroom and bathroom. The upper two floors will gain two bedrooms, a laundry room, a bathroom and a pair of home offices. Contractors cut the back of the split-level off to accommodate the addition.

From the home's ventilation system to the paving stones in the garden, the couple, who acted as their own general contractors, looked for building products that were energy-efficient, less toxic and made of recycled materials. They also made sure products were installed with an eye to energy conservation, even if that meant extra steps or a longer timetable.

A central goal was to seal the house as tightly as possible to limit the amount of air that seeps in -- cold in winter, hot in summer -- thus lowering the amount of energy required to maintain a comfortable indoor temperature. According to the EPA, a typical house built before 1990 exchanges its indoor air

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every 48 minutes through air leaks.

"What you want is to minimize air infiltration into the house," Wendel said.

They also made sure products were installed correctly, particularly the Tyvek covering used on the addition. Tyvek, a water-resistant, fibrous material made by DuPont, is widely used by builders and remodelers as a protective sheath on homes to limit both air and moisture infiltration. It is used as a sort of wrap around the house, placed directly underneath the exterior surface.

"If you don't install it right, Tyvek loses a lot of its efficiency," said Rick McDougal of RCM Enterprises LLC, a construction management firm supervising the couple's remodeling project. "And a lot of people don't install it right."

In this project, the Tyvek was overlapped and then taped down to prevent air or water getting in underneath it. At the bottom of the wall, the Tyvek was glued in place. McDougal said contractors rarely glue or tape Tyvek down.

The drywall used in the addition was also glued down at the top and at the bottom of the walls to prevent similar air seepage, another step often not taken.

Around the plugs and light switches, common sources of leaks, the couple installed airtight electrical boxes, which are sealed in the back and include side wing panels to prevent air from seeping in around them as happens with a standard box. The panels were then glued down and the drywall put up against it, creating an airtight seal.

In the basement, rigid Styrofoam insulation was placed against walls to prevent humidity getting through the below-grade walls, also not a typical technique. That was then glued down at the top and bottom as well.

Caulking was applied in the framing where the floor met the walls on each level, around the electrical boxes, the windows and doors, and at the top and bottom of the drywall panels. Insulating foam was also used around windows and doors to prevent air seepage. Any small crack or crevice was filled with either caulking or foam.

The ductwork for the heating and air-conditioning system was sealed at the seams with mastic, a gloppy sealant that is painted on and dries hard. The mastic, typically used only in commercial applications, prevents air from leaking out from the joins in the ducts, translating into higher efficiency for the HVAC system.

"I've never done a place like this," said Robert Smith of Studio One Architects in Kensington, the architect for the project. "Traditional building techniques usually produce a house that breathes everywhere."

Making a house airtight, however, means fresh air needs to be brought in from somewhere so a home doesn't become what is known as a sick house -- a clammy, stuffy building without enough fresh air circulating through it. "You have to be sure the ventilation is appropriate," said English. "You can't just seal up all the gaps and go home."

So Novotny and Wendel installed an energy recovery ventilation system, called an ERV -- a ventilating system that brings in fresh air from the outside and reduces energy consumption at the same time.

The ERV, an electrical air-exchanger, cools or warms the outside air by mixing it with the interior air in a device something like a waffle iron. After passing through the ERV, the outside air needs less heating in the winter and less cooling in the summer to achieve the desired temperature, which cuts down on energy used.

"We're expecting our energy bills to be 20 to 30 percent less than those of a comparable house," said Wendel.

Another problem with making a house airtight is the potential buildup of fumes, called off-gassing, from paints, glue, caulking, sealants, carpet, furnishings and cleaning products. To minimize this problem during construction, the couple opted for all low-VOC products, which have a low count of volatile organic compounds and thus release lower levels of toxic gasses.

Construction manager McDougal said finding low-VOC products was harder than expected. Although most retailers carry a selection of these products, they often don't have them in stock. Both the low-VOC paint and the low-VOC caulking had to be special ordered and cost more than the regular line.

"Most people selling these products don't even know that they're selling them," he said. "You have to special order everything."

Whenever possible, the couple used recycled materials, including cellulose insulation instead of the more widely used fiberglass insulation.

Cellulose insulation is made of recycled newspapers, treated with a fire-retardant, and is blown into place. The material is an effective insulator, said McDougal, because you can spray it into the voids around framing, wiring, plumbing and ducts and it adapts to the irregular spaces and forms a seal.

"Cellulose insulation is an almost 100 percent recycled product," said Bion Howard, principal of Building Environmental Science and Technology, an environmental building consultancy outside Annapolis. "Fiberglass is 20 to 25 percent recycled at best. And a considerable amount of energy is used to manufacture it."

Margo Thompson, research associate at the National Association of Home Builders Research Center in Upper Marlboro, said: "Its green feature is that it uses a material that would otherwise go into the landfill."

During the renovation project, the homeowners replaced the fiberglass insulation in the old part of their house with the recycled cellulose insulation.

In their new family room, the couple will lay a ceramic tile that is partly made of recycled material. For the yard, they bought steppingstones made of old tires.

Instead of hardwood flooring, the couple opted for bamboo, which is a renewable product.

For the exterior of the house, they used Hardiplank lap siding, which looks like cedar shingle but is made of fiber-cement panels that are mold-resistant and require less maintenance than wood.

Some of the couple's efforts to go green were unsuccessful. In their quest to preserve forests, they wanted framing lumber certified by the Forest Stewardship Council as sustainably harvested.

"We spent a lot of time trying to find it," Novotny said. "Home Depot buys it, but they mix it in with their other wood. We finally found a place outside of Montreal that had it, but it would've cost too much to bring it down by train. So unfortunately, we gave up."

Although the couple did not convert their house to a solar energy system, they did install three sun tubes, which look like light fixtures but are actually aluminum tubes that are open to the sky although hermetically sealed at the top. They also calculated the shading aspect of a balcony they installed as well as their roof overhangs.

Wendel said the three-story addition will cost about \$220,000. He estimates that making the project green will have added \$5,000 to it, with the big-ticket item being the ERV ventilation system, which cost about \$2,500 in material and labor.

"We didn't do anything that exotic," Wendel said. "And it wasn't that difficult, or expensive, to do." Wendel said that the ERV will pay for itself in lower energy bills within two to three years. He predicts that all the green elements in the house will pay for themselves sooner rather than later.

Architect Smith agrees. "This house is going to cost a lot less to run than other houses," he said.

McDougal said he was dubious when the couple first told him they wanted a green addition.

"I thought it was a bit out-there," he said. "I didn't think they'd do half the things they said they would. But when Sandra gave me a three-ring binder full of brochures, pamphlets and literature, I knew they were serious."

The project is scheduled to be completed in June. Both McDougal and Smith say they've learned a lot about green building and will take many of the practices, such as using blown-in recycled cellulose insulation and low-VOC caulking glue and paint, to subsequent jobs.

"This project turned the light bulb on for me," McDougal said. "Some things I'm going to just do automatically now."

Most remodeling projects are stressful to homeowners, and the Novotny-Wendel household has had its share of upheaval: The couple and their 9-year-old son, Alex, have been sleeping on mattresses on the floor in various rooms of the house during the 10 months of construction. Many of their belongings are in a storage shed on the front lawn.

But Novotny insists she has had the "most fun year of her life" working on her green addition, although she admits the project couldn't have happened if she weren't a consultant who works from home.

"We've been thinking about doing a green house for a long time," she said. "It's been like a giant arts and crafts project."

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