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Super green: Taking the energy-efficient home one step further

By Lori McFerran
THE MORNING CALL

In November, the U.S. Department of Energy launched a program that can help people rate the energy efficiency of their homes, as well as provide recommendations on reducing its energy costs. Called the Home Energy Score, the program uses certified contractors and a standardized rating system to evaluate a home's energy performance.

The program is being tested in about 10 states and then nationally next year. If it works as well as its supporters are hoping, it's speculated that the Home Energy Score could be used by people buying or selling a home, as well as real estate agents and builders who want to market properties based on their efficiency ratings.

This latest development in the continuing pursuit of more energy-efficient structures is an indication of just how serious prospective homeowners are about reducing their use of fuel and electricity. The same objective is being illustrated by those who already own homes.

For example, one Lehigh Valley couple decided to upgrade the energy efficiency of their current house to Gold- or Platinum-level LEED standards, those stipulated under Leadership in Energy & Environmental Design, a green building certification system. Most commonly associated with commercial, industrial and institutional buildings, a LEED certification for a residence was something builder Brian Baker already had experience with, so he embraced his new project.

"It helps us to be a better

builder," says Baker, who, along with his brother and father, owns and operates studio26 homes in Orefield, as well as his newest company, Renu Building & Energy Solutions. "Usually the building process is two-sided with just the builder and owner. Bringing in a third party means that both parties are certain everything is being done according to recognized, yet elevated, standards."

Even without its energy-conscious improvements, Baker's project was demanding from the start. The 4,000-square-foot house was laid out with extra large rooms and only a partial second floor, and adding one meant reinforcing the walls and floors with steel footers. There were HOA requirements to follow that eliminated renovating the front of the home; everything had to be done in the back. Plus, in order to accommodate a new stairway, 100 square feet in the basement had to be hydro-excavated because big machines could not maneuver into that space.

Greening the house proved to be the biggest challenge because changes had to be done at multi-levels throughout the building. While the entire interior of the home was gutted, Baker was able to work from what was there.

"With an existing structure, you have all the materials," says Baker. "We didn't need a foundation, didn't have to reframe. We were already on our way to accomplishing a green house when we began."

Building envelope

The most important part of energy efficiency, the "envelope," includes the windows and walls of a home. In Baker's project, all the drywall and



Brian Baker

A new Lehigh Valley project by studio26 homes, Orefield, involves upgrading an existing home to Gold- or Platinum-level LEED standards, which typically define energy efficiency in commercial, industrial and institutional buildings.

plaster board was removed as was all the wiring, which was outdated. More insulation was added where it was lacking, and put in place for the first time where there was no insulation at all, in order to achieve levels well beyond code. Baker used closed-cell spray foam, which offers "the highest R value per inch, and provides an excellent air barrier as well," he says.

He specified the highest-efficiency Anderson windows in the home with an R value of about 4. Baker says that he thinks windows will be the next new frontier in building products, since windows with exceptionally high R values are

triple the cost of those commonly used today.

Duct work and heating system

The heating and cooling ducts in a house may be out of sight, but are important as far as the home's ability to use heat wisely or cool well. Baker stresses that they should be located in "conditioned spaces," where systems are not required to work harder than they have to.

"If your air conditioning ducts are in a 150 degree space — say an uncooled attic — and the air conditioner is working to cool the air to 60 or 70 degrees, by the time the

air gets to the room it's intended for, it's lost 5-10 degrees," he says. "Your system ends up working harder and harder."

Also, the way the air is delivered through the ducts is important. Flexible ducts have the potential for leaks at every transition, which will pull air in from the outside or push it out. If the ducts are located in the attic, for example, you can be heating and cooling your attic. These issues led Baker to redo the ductwork in the entire home, using smooth metal ducting wrapped in insulation with mastic liberally applied at every seam and penetration to help ensure an

ultra-tight enclosure.

Perhaps the biggest impact in energy-efficiency among active systems comes from the home's geothermal system, which provides both heating and cooling from the energy already found in the ground. The high-performance ground-source heat pump also provides heat for most of the home's domestic hot water needs, further saving energy and money throughout the year.

To deliver more energy savings and increase overall comfort, the HVAC system was equipped with a "smart"

GREEN PAGE 2

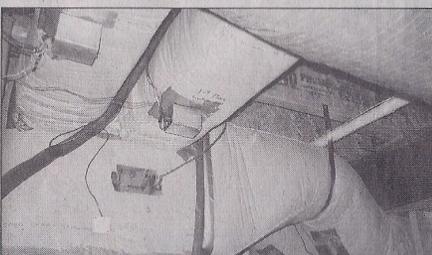
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HVAC control system, which has the ability to sense where certain areas of the home are a little warmer than others, and redistribute the warmer air to cooler parts. This reduces the need to turn on the ground-source heat pump, creating incremental savings over time.

Lighting, appliances, water and air quality

Throughout the house, Baker installed LED lighting saving up to 85 percent energy compared to incandescent, along with an advanced lighting control system. By selectively dimming the 10-12 watt LED lights (60-75 watt incandescent equivalent) to 5 watts, as much as 50 percent of energy is conserved. He also chose Energy Star appliances for the washer, dishwasher and refrigerator. In the kitchen and bathroom, WaterSense faucets were installed and a WaterSense toilet was chosen. A proposed outdoor cistern will likely handle rainwater harvesting, gathering it for watering plants



Brian Baker

This view of the ductwork shows the detail and effort required for succeeding in achieving high-performance construction.

and washing the car.

On the interior, alternative materials that promote a healthy house were used wherever possible. Products such as zero-VOC paint, stains, finishes and wallpaper adhesive, which produce no off-gases, help make the house a healthy place to live. The kitchen cabinets were put together with non-formaldehyde bindings. And a whole-house ventilation system brings in fresh air, exhaling stale air, so that the house is still able to "breathe."

Baker anticipates the entire renovation will take nine

months to complete, and may serve as an example of how homeowners will begin to approach building and renovation in anticipation of putting the new Home Energy Score to use.

"People are becoming interested in creating buildings that are sustainable long-term," says Baker, noting that his current clients specified a LEED home for their own "peace of mind." "The Home Energy Score is part of that responsibility. Efficiency as a goal is coming, and just may result in adding value to homes."

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