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### **Aiming for a Zero-Energy Home**

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PATERSON -- ON a hill over Route 20 here, dozens of businesses are collaborating to create something good for the environment: a completely "green" home.

The house, going up on an empty lot on East 29th Street, is one of several hundred homes being developed by builders nationwide who seek to create models for energy-efficient, environmentally friendly residences.

The Green Building Council, a national nonprofit agency, is monitoring construction of the houses. After they are completed, it will rank them based on an existing set of standards for energy use and use the results to help develop new national standards for green residential construction.

When the Paterson house is finished some time this spring, it is expected to generate energy, not just consume it. A solar panel system on a specially designed metal roof will enable the homeowner to sell energy back to the power company -- probably resulting in a profit, rather than a loss, on heat and electric bills.

"We believe we are creating the most energy-efficient house in New Jersey," said Gary DeSantis, corporate architect for the chemical company BASF, based in Florham Park.

BASF is spearheading construction of what it is calling the Paterson Showhouse project. It has brought in more than 50 other companies to donate conservation-minded products, building materials and labor.

The Showhouse itself is to be donated to the family of a local boy who is a quadriplegic as the result of a car accident. But it will be open for showing this spring -- after completion, and before the family moves in -- so that building industry representatives can tour it and take the measure of its "green power" for themselves, said a BASF manager, Jack R. Armstrong.

Right now, it costs a builder 3 to 8 percent more to put up a "green house," Mr. Armstrong said. When green construction becomes routine and is done in volume, however, the cost will be roughly equal, he said.

Pulte Homes, which already makes use of prefab insulated panels to construct homes in many developments, has found that less-skilled -- and less-expensive -- workers are required, Mr. Armstrong noted.

BASF is a manufacturer of building products that are made of expandable polystyrene -- the material used in "popcorn" pellets for packing -- and the Showhouse makes liberal use of such products. In fact, its foundation, first and second floors are each constructed of different types of polystyrene blocks made with BASF's Styropor foam.

The blocks were precision cut in the factory, and the walls were assembled at the site.

"The basic idea is to construct a building envelope -- that's the exterior structure and roof -- that doesn't leak energy," Mr. DeSantis explained. "We want to build something with as few seams as possible, like where the window meets the wall, and where the foundation is supposed to be flush with the floor, because that is where most of your heat and cooling is lost."

The model house has been designed to seal tight like a thermos or a cooler, he said, with proper air circulation assured by the mechanical ventilating system.

The basement walls were built by using insulating forms made of two expandable polystyrene panels. Concrete was poured into the space between two foam panels. The panels remain as part of the structure of the house, serving as thermal insulation.

The first and second floors were built with two different types of foam blocks, to demonstrate the "green building" qualities of each.

On the first floor, the walls are composed of rigid polystyrene panels nailed to the wood frame. The walls were then treated with a one-half-inch layer of a fiber-reinforced polymer blend called Monocrete, which is sprayed or troweled on both sides of a panel.

"You can do anything with this stuff," Mr. DeSantis said one recent afternoon. "Finish it anyway you want, hammer nails into it, cover it with Sheetrock, whatever."

The second floor and roof were built using solid insulated panels made by a Canadian company called Insulspan. The panels have molded polystyrene cores and are laminated on both sides with manufactured "strand board."

One benefit to building with these types of rigid materials is that the insulation never sags inside the walls to create cold spots, Mr. DeSantis said. Also, the Showhouse was designed by GRAD architects of Newark to have a high cathedral ceiling upstairs and there is no need to drop the ceiling down to accommodate fiberglass or injected foam insulation.

Mr. DeSantis, Mr. Armstrong and GRAD designers pointed out numerous other positive qualities of the "green house":

The polystyrene is recyclable; it can be reused in many types of building, including as a base for roads.

A green house is a clean house; dust and dirt are sealed out, and this cuts down on grime and allergens. Mold and insect problems are eliminated; bugs and bacteria do not feast on polystyrene.

Fire danger is greatly reduced; polystyrene is not flammable.

The house is virtually "hurricane proof"; because it is built of solid molded pieces, the house stays put, even in extremely high winds.

The heating, ventilation and air-conditioning system could be downsized, reducing its cost -- and the operating cost.

The Showhouse on East 29th Street is in a modest neighborhood. Under the city redevelopment plan, Paterson aims to fill its vacant land with 3,000 units of housing for low- and moderate-income residents.

"This will be a zero-energy house," Mr. Armstrong said about the Showhouse. "Who better to have the advantage of low utility bills -- or no bills at all -- than a lower-income family?" He said the city is looking at the Showhouse as a "template" for its entire redevelopment program.

The Green Building Council has designated the house and more than 100 others as pilot projects as it develops its LEED standards for residences in addition to commercial properties. LEED -- Leadership in Energy and Environmental Design -- has been used to rate commercial buildings for about five years.

In Paterson, the house is being equipped with some unusual features to suit the quadriplegic boy's needs. It has a built-in oversized garage with an elevator to the second floor, wheelchair ramps and a specially designed suite for the youngster.

Photo: SHOWHOUSE PROJECT -- This house on East 29th Street, Paterson, is to be donated to the family of a boy paralyzed in an accident. (Photo by Timothy Ivy for The New York Times)

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