Want to get off the grid?

Contributed by KARIN MARIE

Tierra Concrete systems take this idea seriously

Shock is the word that best describes American homeowners' reaction when they opened their electric bills last winter. For many surprised consumers, the amount was as much as four times higher than usual. It made people wonder about the future of energy prices and ask, "Is there a better way?"

Judy Fosdick, president of Pueblo, Colorado-based Tierra Concrete Homes, thinks there is. Her company designs and builds houses that combine the energy-efficiency of concrete wall systems with passive solar features. The resulting homes, in many cases, don't require mechanical cooling or heating systems to maintain comfortable indoor temperatures year-round.

Front view of home with southern exposure. Photo courtesy of Tierra Concrete Homes.

There's solid evidence that Tierra Concrete Homes' designs are technically sound and energy efficient. But these practical aspects are just the outward manifestation of the company's inner philosophy — a focus on the environment and building green. "We use as many environmentally friendly concepts as we can," Fosdick said. Among these are the use of recycled products, water-conserving features and the recycling of scrap building materials. Fosdick's own home is completely off the electric grid.

Tierra Concrete Homes worked with the U.S. Department of Energy's National Renewable Energy Laboratory to develop its award-winning designs. Rigorous testing and monitoring was conducted, including the use of infrared cameras to find points where energy was escaping the tested houses. "They monitored the home, and if they found any heat loss, they let us know," Fosdick said. The current design, the third in a series, is 63 percent more energy efficient than a conventional home.

One of the features that makes these homes so efficient is the use of thermal mass, an age-old principle. The concept involves building with materials that absorb and store heat or coolness, then release them as the surrounding air temperature changes. Concrete is a material that possesses this characteristic.

Living room with Rumford fireplace. During the winter, the concrete walls and floor absorb and store heat from the sun. Photo courtesy of Tierra Concrete Homes.

During the winter, the concrete walls and floor absorb and store heat from the sun. When temperatures drop at night, the heat is released, warming the house. Think of the way sidewalks and parking lots warm up in the daytime sun and then radiate heat at night. In summer, open windows allow cool nighttime air into the home. This is stored by the concrete. That coolness is released into the house during the day.

To make this work, Tierra put a new twist on the standard masonry wall system. While masonry systems place concrete on the exterior of the house and foam on the interior walls, Tierra reverses that order, placing the concrete on the inside and the foam on the exterior. The interior walls are also constructed of concrete rather than wood. No sheet rock is used. Holes to hang cabinets or decorative elements are drilled with masonry bits. Exteriors are finished with materials like stone, brick or stucco.

Other design features include placing the garage on the northwest side of the house so that its mass provides a buffer against winter weather. The southern exposure is built with banks of windows that allow light and heat in during winter. To keep summer light and heat at bay, overhangs provide full shade. Overhang depth is calculated with software created by the government. It uses the home's latitude to pinpoint the location of the sun during hot months. Minimal windows on the other three sides of the house help prevent heat loss in winter.

Another Tierra innovation is the use of a shallower than normal insulated foundation. "We build a protected shallow foundation," Fosdick said. "It keeps the house warmer and the foundation doesn't freeze, which can cause cracking." A thin layer of extruded polystyrene underlying the poured concrete provides the insulation. This design also keeps the foundation cooler in hot climates where cracking can occur from intense heat and dry soil conditions. Fosdick said that the company has had to convince a few inspectors that the foundation is a sound design.

Aside from the foundation and walls, the home is standard construction. "Once the walls are up, everything else is conventional," Fosdick said. Wiring runs through conduit pre-placed in the wall units. Electric boxes are placed during the

pouring process and a frame wall is put in for plumbing.

Accolades and awards came the company's way with increasing regularity. In 2000, Tierra Concrete Homes was awarded both the Custom Home Builder of the Year and Home of the Year (under $500,000) designation from Built Green Colorado, an organization that promotes energy and resource efficient construction. It also received the National Association of Home Builders Energy Value Housing Award for the past five years as well a recognition for Best Practices by the Sustainable Building Energy Council.

Tierra is gearing up for a new challenge — a 45-home development north of Denver. For this project, they have some interesting problems to solve, such as where to place the homes so that each gets exposure to the sun. "We're going to stagger them," Fosdick said.

Fosdick and husband, Frank, began building these climate responsive homes in the early 1990s. Frank Fosdick experimented with building concrete homes in the 1970s, but left the business. After meeting, they visited with the owners of those houses and found them very enthusiastic about the construction. They reported being sick less often and found them comfortable and quiet. "Many of them would say, 'This house just feels good,'" Fosdick said.

Fosdick began studying passive solar design and is now considered a national expert on the subject, frequently speaking and conducting seminars.

Inquiries about Tierra Concrete Homes' system and designs come from builders and housing authorities around the world. The company is working with two builders — one in California and another in Kansas — to begin using their system. The company's goal is to find more builders who are interested in doing the same.

Concrete as a home building material will continue to gain popularity, Fosdick predicted, especially with an increasing focus on "green mortgages" and financial incentives for the purchase or building of energy-efficient homes.