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ENERGY EFFICIENCY | **RESEARCH INITIATIVES**

THE BUILDING ENVELOPE

CAN MAKE OR BREAK GREEN

Though many energy-efficient products are initially more expensive, the benefits and cost savings are easily justified over time.

By Aleta Walther

According to the U.S. Department of Energy, or DOE, more energy is consumed in the building sector than in any other industry — including transportation — with 53 percent of this energy going toward space conditioning. The latest statistics available through the department state that Americans spent more than $95 billion to heat and cool buildings in 2000. Unfortunately, most of this energy was lost through the buildings' envelopes: walls, roofs, floors, doors and windows.

According to the DOE, "Advances in building envelope technologies are key to reducing overall building energy consumption and costs."

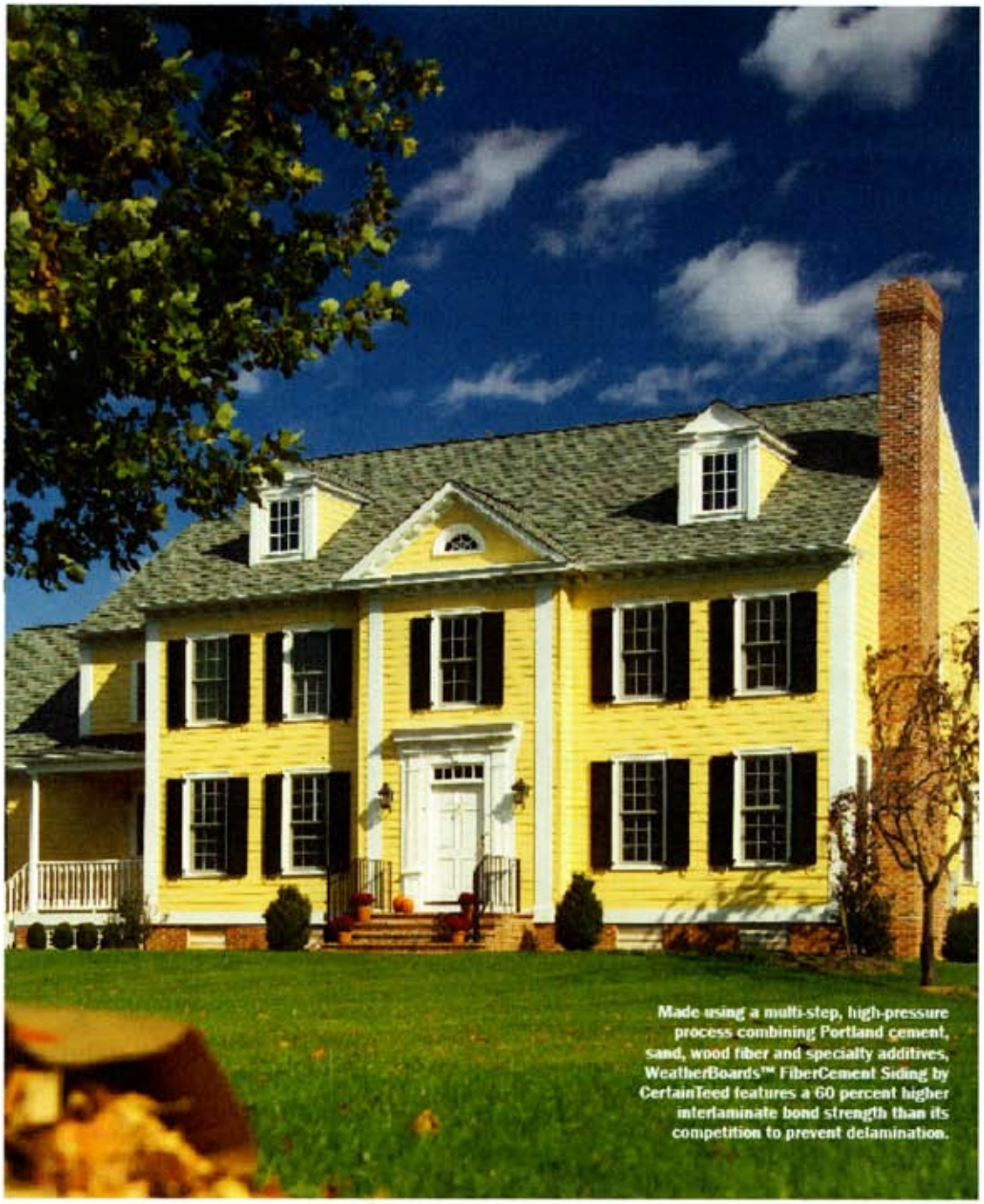
Reducing consumption

Ongoing research by government agencies and building product manufacturers strives to produce technologies and products that further reduce energy consumption and costs associated with new building construction and the retrofit of existing buildings. Two manufacturers aggressively pursuing increased energy efficiency and sustainability of their products are MonierLifetile in Irvine, Calif., and Better Building Systems in Grass Valley, Calif.

A leading manufacturer of concrete roofing tile, MonierLifetile offers a complete spectrum of tile and component products designed to work together to promote a roof's functionality, performance and integrity.

Five years ago, MonierLifetile was invited to participate in "cool roof" studies funded by the California Energy Commission, or CEC. Although the company's management knew tile roofing was cooler than asphalt shingle and other similar roofing products, they had no significant research to show how much better. Therefore, they enthusiastically

▲ From left to right: Products from MonierLifetile, Milgard and Dupont Tyvek, respectively, are among the most energy-efficient in the industry.



Made using a multi-step, high-pressure process combining Portland cement, sand, wood fiber and specialty additives, WeatherBoards™ FiberCement Siding by CertainTeed features a 60 percent higher interlaminate bond strength than its competition to prevent delamination.

agreed to participate. The tests were done at the Oak Ridge National Laboratory in Roane County, Tenn., where 75 percent of studies are funded by the DOE. Scientists at Oak Ridge conduct research that strengthens the nation's leadership in key areas of science, including the availability of clean and abundant energy and the restoration and protection of the environment.

Cool roofing reflects heat away from a building, thereby reducing air conditioning demands and consequently lowering energy requirements. Initial cool roof tests were performed on low-slope roof assemblies. When testing concrete roof tile systems typically found on residential buildings, researchers discovered they had to alter the research to account for the inherent air space between the roof deck and tiles. The tests completed by Oak Ridge took this inherent air space a step further by recognizing that certain roof assemblies — the components used to waterproof and support the roof tile — make a significant difference. By elevating the roof tile off the deck and allowing for airflow through a vented sub-assembly, the cool roof effects are substantially greater. Today this air space is referred to as sub-tile ventilation.

"As it turns out, the air space between the tile and the roof deck has a significant effect on heat transfer into a building," says Jerry Vandewater, technical services manager for MonierLifetile. "The research proved that regardless of color, the air space is an effective barrier against heat gain."

Innovations from research

Based on Oak Ridge's research findings, MonierLifetile is

With proper installation, MonierLifetile's Energy Efficient Roof™ can result in a lifetime of savings for the homeowner. An array of beautifully crafted concrete tile and superior functioning Roof System Components have been engineered to seamlessly work together to reduce energy consumption, protect the home from the elements and increase curb appeal. *Photo courtesy of MonierLifetile. Profile: Plaza; Color: Aztec (L) Madrid (R).*

introducing a new cool roof assembly this summer called the MonierLifetile Energy Efficient Roof™, or EER. The assembly consists of several patented products and technologies: MonierLifetile's Vented Eave Riser, which allows air flow to enter through the eave of the roof; elevated battens, which raise the batten off the roof deck to allow air-flow up the slope of the roof; and MonierLifetile's vented hip and ridge products, Figaroll and Zephyroll, which allow air to flow out the ridge of the roof while providing weather blocking protection.

MonierLifetile's management team is also proposing that the CEC's 2008 Energy Efficiency Code for residential construction recognize sub-tile venting as an energy-efficient assembly eligible for energy credits and/or rebates. Builders would get credits for energy-efficient construction if the products, systems or assemblies are tested and certified as energy efficient by the Cool Roof Rating Council.

"The next phase of research will help determine the actual percentage of energy savings MonierLifetile's Energy Efficient Roof produces," Vandewater says. "Preliminary testing done at the Florida Solar Energy Center indicates that our Energy Efficient Roof can reduce the amount of heat transferred into the structure by as much as 50 percent."

Benefits versus cost

Considering that tile roofing usually costs 25 to 35 percent more than traditional asphalt shingle roofing, do the 20 percent savings outweigh the initial installation costs? Vandewater believes so.

"The reduced transfer of heat into the structure will reduce

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the demand for energy cooling and heating costs over the life of the structure, outweighing the relatively small premium to install a cool roof system," he says. "If tile roofing saves homeowners 20 percent on their annual energy bill, that 5 percent extra up-front investment can represent a payback in less than five years, but the savings actually go on indefinitely. If you do a life cycle cost analysis, a tile roof is the least expensive roof you can put on because it lasts a lifetime, whereas asphalt shingle roofs last only 15 to 30 years. Even if an asphalt shingle roof costs half as much as a tile roof, you still have to replace it twice over the lifespan of a tile roof. It's the same cost without any of the other advantages a tile roof offers."

Better insulation is key

Associates of Better Building Systems are similarly enthused about research findings the DOE has released on the energy efficiency of structural insulated panels, or SIPs. Oak Ridge National Laboratory and the National Renewable Energy Laboratory collaborated on the research.

Better Building Systems is a leading panel design and fabrication company in Northern California and Nevada, providing services to support the use of SIPs, including architectural design, engineering, fabrication, site supervision and material selection assistance and sales.

Also referred to as sandwich panels or stress-skin panels, SIPs consist of a core of rigid foam insulation — usually expanded polystyrene — sandwiched between a variety of surfaces including plywood, oriented strand board or metal. SIPs are considered more energy efficient than conventional framing and can replace up to 50 percent of dimensional lumber required to construct a conventionally framed structure.

The research consisted of testing procedures for determining a wall's insulation performance. It compared 18 different wall systems, including conventional 2x4 and 2x6 framing with fiberglass, similar fibrous insulations and SIPs.

"SIPS have been around a long time, but the industry continually strives to improve performance and energy efficiency," says Fred Stoenner, an architect who also serves as president and CEO of Better Business Systems. "This new research quantifies that today's SIP systems outperform conventional frame construction by saving homeowners up to

▲ While other builders may offer solar panels or energy conserving appliances as an option, at Vista Montana by Clarum Homes in Watsonville, Calif., every home is "green." All 257 single-family dwellings and townhomes come standard with an array of environmentally friendly features, including electricity-generating solar panels on the roof, sustainable building materials such as bamboo and cork flooring, special insulation and gas-bill busting tankless water heaters.

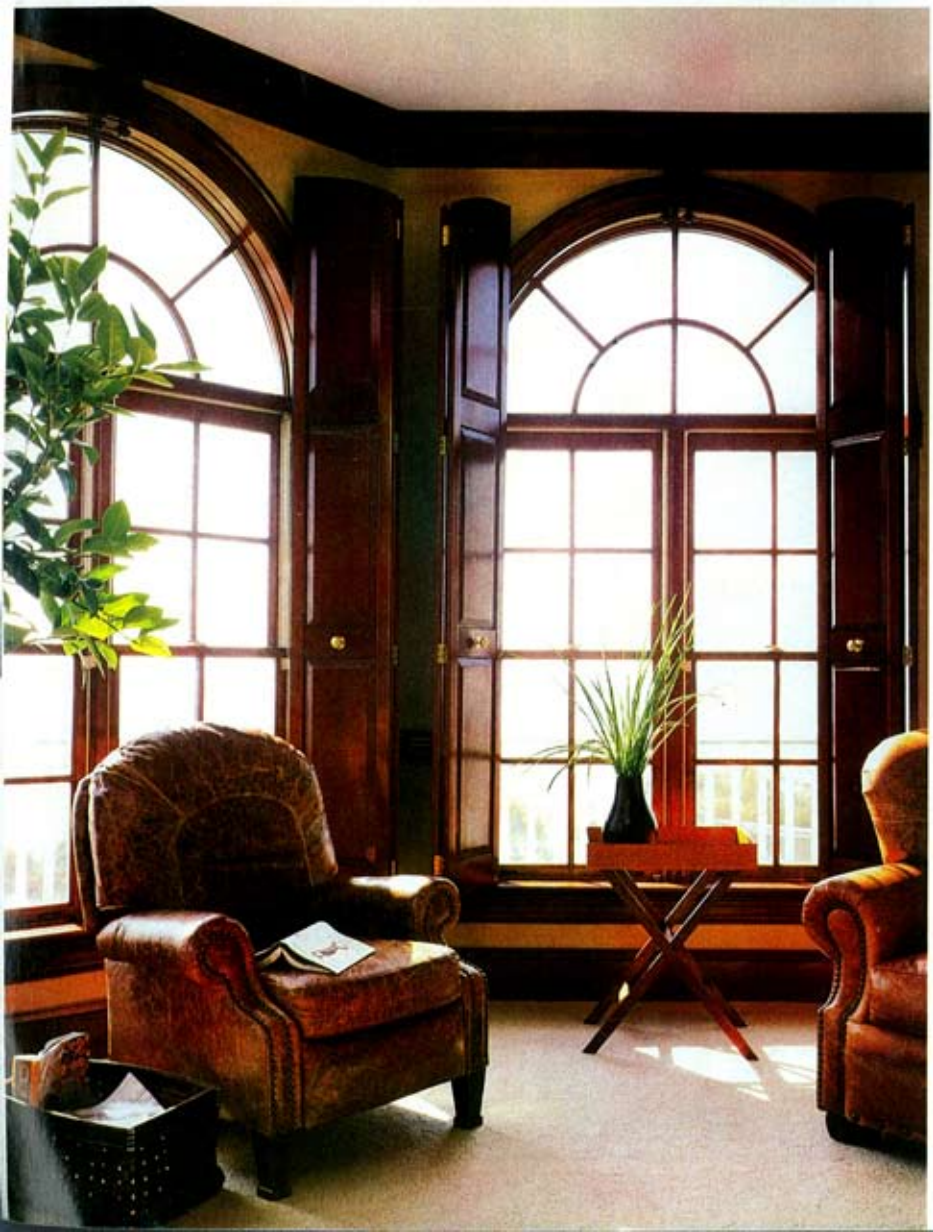
▶ Sharp Solar is a top manufacturer of solar cells, giving homeowners the ability to generate their own electricity from the inexhaustible energy of the sun — with no harmful emissions.

◀ CertainTeed WeatherBoards™ FiberCement Siding features the most authentic-looking grains and textures of any fiber cement siding on the market. Available in an array of beautiful pre-finished colors and premium stains for faster job completion, WeatherBoards is a complete system of lap and vertical siding, decorative shapes, soffit, and trim.

60 percent on their energy bills compared to conventionally framed homes. The research also concluded that a SIP wall with a 3.5-inch foam core, the same thickness as a 2x4 wall, actually performed better than a 2x6 wall with R-19 insulation."

"When you construct a SIP building, it is glued together with caulking to create an air-tight envelope," Stoenner adds. "This enhances the R-value, but it also reduces draftiness and the infiltration of dust, mold spores and household pests. SIPs also interact with other building systems, such as heating and cooling, to create the sturdy, high performance envelope architects, builders and homeowners are looking for."

Particularly effective in extreme thermal climate zones, the high thermal insulative value and minimum thermal bridging composition of



▲ **The inherent insulating properties of MonierLifetile concrete tile combined with the proper installation of an Energy Efficient Roof™ can reduce heat transfer into the home by 50 percent. This reduction in heat transfer can significantly reduce annual energy costs for the homeowner. Add to that the beauty of concrete tile — available in a full spectrum of colors and textures that closely emulate the look of traditional clay, slate and shake roofs — and you have a tile roof with undeniable curb appeal. Photo courtesy of MonierLifetile. Profile: Villa; Color: Mesa; Builder: Oakwood Homes; Location: Denver.**

◀ **Weather Shield Windows and Doors has been aggressively pursuing energy-efficient initiatives for years and makes ENERGY STAR®-certified products for every climate.**

SIPs make them extremely energy efficient.

"A SIP home will often have a higher initial cost in materials; but when you consider all of the long-term variables, it is a more cost-effective way to build," Stoenner says. "SIPs also have many environmental benefits in addition to the long-term savings on energy costs that they provide, and they are the preferred framing system specified by many leading environmental designers."

Stoenner adds that SIPS are up to three times stronger than conventional framing; have lower labor cost; are straight, square and plumb; create less waste; have no fiberglass or toxic components; resist mold; and provide a quieter, more comfortable home environment.

Experienced SIP framers can often deliver a home at cost roughly equal to stick-framing."

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