July 13, 2008

SPOTLIGHT

In Search of Better (and Greener) Building Blocks

By AMY CORTESE

IN 1999, fresh out of architecture graduate school, Blaine Brownell was put in charge of researching materials for a high-profile renovation of Jones Plaza in Houston's theater district. He quickly became frustrated with the lack of information about new materials and the scant knowledge that some design and building professionals had about anything beyond the conventional bricks, mortar and steel of their trade.

Thus began what he calls "a very humble project" to collect and share information on innovative new materials.

Today, Mr. Brownell's Web site, transmaterial.net, has become a clearinghouse of sorts for information on the latest innovations. He has cataloged more than 1,000 products on the site as well as in a companion book, "Transmaterial," the second volume of which was published this year by Princeton Architectural Press. More than 3,000 people have signed up for his "product of the week" e-mail message, which spotlights materials like smog-eating concrete.

The first wave of materials he tracked was driven by technological advances. Now, Mr. Brownell says, the primary motivator is environmental.

Common materials like steel, concrete and drywall require vast amounts of energy to manufacture, emitting carbon dioxide in the process. And, once constructed, buildings take an enormous amount of energy to run. In the United States alone, buildings of all kinds account for 39 percent of carbon dioxide emissions, 65 percent of waste and 70 percent of electrical use, according to the United States Green Building Council, a nonprofit group.

As energy prices have skyrocketed and concerns have mounted about the effects of greenhouse gas emissions on the climate, there is a new urgency in developing alternatives to traditional building products. Buildings must not only operate more efficiently, they must be constructed from materials that are produced with less energy, waste and harmful chemicals, according to a growing chorus of industry professionals.

"It's one of the greatest challenges that architecture and building construction has ever faced," said Mr. Brownell, who will continue his research while teaching at the University of Minnesota School of Architecture this fall.

New companies — in many cases backed by venture capitalists — have responded with innovative products. Some are experimental, while others are new takes on common materials.

McGraw-Hill Construction projects that the so-called green building market will grow to $60 billion by 2010

from $12 billion today. Industry experts say that the materials can pay for themselves in energy savings and that many of the latest products are comparable in price to their conventional counterparts.

Some of the most exciting work is occurring in decidedly unglamorous markets, like that for concrete. Many of the products haven't yet hit the market, and details are sometimes scarce.

Calera, a start-up company in Los Gatos, Calif., that was founded by a Stanford scientist and backed by Khosla Ventures of Menlo Park, Calif., is developing a concrete product that the company says can trap carbon dioxide. CalStar Cement of Newark, Calif., says it has raised $3.4 million from venture capital firms; its Web site says it aims to "reinvent cement." For nonstructural uses such as countertops, ecoX, made by Meld USA, based in Raleigh, N.C., is made from recycled glass.

Kevin Surace, the president and chief executive of Serious Materials of Sunnyvale, Calif., says the product his company is focusing on — drywall — has essentially been produced the same way since its invention in 1917: gypsum is mined, then subjected to intense heat. A typical gypsum drywall plant consumes one trillion to two trillion B.T.U.'s of natural gas a year, according to Mr. Surace.

Later this year, his company — backed by $65 million in venture capital funding — plans to offer a zero-carbon drywall called EcoRock. It looks and performs like traditional drywall and will be priced comparably, but it uses no heat in its creation. Instead, the mix of ingredients, which Mr. Surace would not disclose but said were mainly materials diverted from landfills, are heated through a chemical reaction. "This is brand-new materials science," he said.

He said that using EcoRock instead of gypsum drywall could reduce carbon dioxide emissions in nationwide by 25 billion pounds a year.

Beyond concrete and drywall, there is an explosion of promising new materials, from energy-harvesting glass to panels made from sorghum stalks and paint that cleans the air.

Traversing Mr. Brownell's Web site is like browsing through a catalog of human ingenuity. A natural paint called Reben from the Suzuran Corporation in Japan contains scallop shell powder, which prevents mold, bacteria growth and the spread of flames, and titanium dioxide, which absorbs pollutants.

Want to cut down on waste? The Enviro Board Corporation in Westlake Village, Calif., makes low-cost, versatile building panels out of wheat straw and grass, while Kirei USA of San Diego makes woodlike panels made from sorghum stalks.

Some of the most interesting developments involve harvesting energy and sunlight in novel ways. Mr. Brownell points to "daylight delivery" systems, like the Parans Solar Lighting System by the Swedish company Parans. Its system works by collecting and intensifying sunlight on a rooftop like a solar panel, then transmitting it over a fiber optic network to unlit interior spaces for a remote-skylight effect.

Then there was Mr. Brownell's "product of the week" last week: GreenPix, a zero-energy "media wall" designed by the architects Simone Giostra & Partners and the engineering company Arup. Designed for a Beijing entertainment center, it uses polycrystalline photovoltaic cells laminated within the building's glass

facade to absorb solar energy that powers thousands of tiny light-emitting diodes.

In a similar spirit, the Eco-Curtain by Inaba Electric Works in Japan integrates miniwind turbines into a building's facade. A shopping center in Nagoya, Japan, outfitted with an Eco-Curtain incorporates 775 vertically placed windmills and produces an estimated 7,551 kilowatt-hours annually — enough, Mr. Brownell says, to power the shopping center's indoor lighting.

"Buildings can play a much broader role in harvesting energy," Mr. Brownell said. And not just new buildings. He also envisions retrofitting existing facades with energy-harvesting materials. In the future, he muses, "we may look at city skylines and see gold in them thar facades."