

# Eco-Renovation

by P.W. McRandle



When James and Claudia Horn bought their 1950s Pueblo-style home in Santa Fe, New Mexico, the interior, as James remembers it, “had red curtains and carpeting, lime-green and white paint and an overall David Lynch feel.” The exterior was more gothic: aging stucco, metal-framed windows leaking trails of rust, the lawn dying, the trees dead. But the house was affordable and had large, non-compartmentalized rooms “prime for a modern renovation,” James says. The Horns also planned a master-bedroom addition to open the home toward the beautiful mountain views. And, as longtime residents of New Mexico, James, a building designer, and Claudia, an architect and landscape designer, wanted to respect the desert ecosystem they lived in, with its extremes of hot and cold and its short supply of water.

“Any green renovation project requires a careful balancing act to satisfy the environmental goals of the project while dealing with aesthetics, product availability and budget constraints,” says Alex Wilson, executive editor of Environmental Building News. Given America’s vast range of climates and landscape, materials and design can vary greatly, but there are always common concerns such as healthy indoor-air quality, sustainable materials and water and energy efficiency. Read on to learn how the Horns addressed these concerns, along with tips from green building professionals. (For products and services, see Resources.)

## **SUSTAINABLE MATERIALS AND INDOOR AIR**

Levels of air pollutants—including allergenic dust mites, lung-clogging particles of soot and grime and toxic volatile organic compounds (VOCs), which evaporate from many materials—can be two to a hundred times higher indoors than outdoors, according to the EPA. One of the first things James and Claudia did was to remove the carpet and heavy curtains, filled with years of dust. All the ductwork as well as the natural gas, forced-air heater were professionally cleaned to remove grime, dirt and soot.

### **Flooring**

The Horns removed old vinyl tile and ground away the glue to expose the concrete floors. They will install some linoleum in the kitchen and entryway, while leaving bare concrete everywhere else, a minimalist look of which they are fond. A new concrete floor, with radiant heat coils underneath, will be used in the bedroom addition.

Vinyl tile should not be used, says Paul Novak, owner of Environmental Construction Outfitters (E.C.O.), a consulting and green retailing firm in the Bronx, New York. Vinyl can offgas phthalates, toxic plasticizing chemicals (see GG#90). Instead, Novak recommends natural linoleum, cork, recycled rubber or ceramic tile, installed with no-VOC grout and glue.

For the wood floor of their master bathroom, the Horns will use sustainable bamboo flooring, at \$5 to \$7 per square foot. Another option is wood certified by the Forest Stewardship Council (FSC), or recycled or salvaged.

## **Cabinetry, Woodwork**

Although composite woods are more affordable than hardwoods, Novak advises against conventional particleboard and plywood, as these offgas formaldehyde. Instead, look for low-VOC options. These cost about 20 percent more, however, so another option Novak suggests is to coat pressed woods with a low-VOC sealant.

## **Walls and Beams**

The framework of the addition will be made from FSC-certified wood, with beams of engineered wood (made from recycled materials such as newsprint, straw or wood chips). Recycled gypsum board, to match existing walls, will be used for new ones. If you need replastering, Paul Novak notes that “premixed plasters will have preservatives, latex and other VOCs, so put the primer over it fast to seal and prevent offgassing.” Or find plasterers who will mix traditional plaster—made of gypsum, rock and sand—with water. “That’s basically no-VOC,” Novak says.

## **Paint**

Lead, a brain-damaging toxic heavy metal that has been banned from paint since 1978, persists in an estimated 38 million homes. Before renovations that can disturb old paint, potentially releasing lead dust into the air, have your paint tested by an EPA-certified lab. If lead paint is found, hire a certified lead specialist to remove it correctly. A recent case study published in the February 2003 *Environmental Health Perspectives* found that power-sanding lead paint from an exterior wall produced dangerous lead levels indoors and out, and the cleanup cost was over \$195,000.

New paints come in all sorts of less-toxic formulations; the Horns chose low-VOC natural latex paint to freshen their interior walls. (See “Paints,” p. 3)

## **Asbestos**

Asbestos, another hazard appearing in pre-1970s homes—in insulation around steampipes, boilers and furnace ducts; vinyl floor tile; roofing, shingles and siding; and dry-wall joint compound—should be removed only by professionals.

## **Mold**

Mildews and molds, potent allergens, can be exposed during renovations. Although the underlying problem, usually a leak, will need to be fixed, light infestations of mold can be scrubbed from wood or plaster with a nontoxic detergent or non-chlorine bleach mixed with water. In cases of pervasive contamination, contact a certified contractor—and be sure to ask for references from previous clients.

## **Exterior**

The Horns will use modified bitumen, made from recycled tires, for the addition roof. Exterior walls will receive fresh stucco, a no-VOC mix of portland cement, lime, sand and water. Pressure-treated (CCA) wood, often used for outdoor structures such as decks and playgrounds, is another renovation concern, since it may contain arsenic. It has a greenish tint and can be easily tested for and safely encased. Avoid breathing sawdust, and wash hands after touching CCA wood.

## **CONSERVING WATER AND ENERGY**

**Water** Since April 2002, Santa Fe has been in a Stage 3 drought emergency that limits outdoor watering to once a week. The Horns’ answer: rooftop canale, or scuppers, to channel runoff into rain barrels from which water is fed into a drip irrigation system. They’re also considering a gray-water system for irrigation, which would reuse the water from clothes washers, bathtubs, showers and sinks (50-80 percent of total wastewater from U.S. households). Gray-water systems (which cost upward of \$1,000) use automated pumps and sand, gravel, mechanical or biological filters that clean water and prevent the growth of anaerobic bacteria. “For now, we just bucket our shower water for our plants,” Claudia says. They’re also choosing plants that aren’t so thirsty: blue gramma and buffalo grass, both tolerant of desert conditions.

Appliances and fixtures can help save water. The Horns purchased an Energy Star front-load washing machine that uses about half as much water as a standard one. And, since toilets consume up to 45 percent of a household's water, they installed a low-flow model that uses 1.6 gallons of water per flush, saving 1.9 gallons or more each flush.

## **Energy**

For long-term energy savings, and even financial gains, Alex Wilson recommends a photovoltaic system, which draws energy from the sun and sells surplus energy back to the electric company. Called net metering, it is available in 33 states. Prices range from \$10,000 to \$25,000, but some states, such as California and New York, offer rebates. (See Resources, below.)

The Horns use natural gas for their heater and clothes dryer, and plan to install a solar water-heating system. In hot weather, they'll use an evaporative cooler, which works best on dry air, uses up to 75 percent less electricity annually than an air conditioner and can cost half as much. They're also planting trees to shade the house. In Honolulu, architect Philip White has found that proper ventilation saves energy. "We design homes with high attics and cross ventilation to make sure the air conditioner is used as rarely as possible," White says. He installs small air-conditioning systems to cool individual bedrooms as needed.

Wilson recommends positioning windows to maximize daylight and reduce the need for electric light. For further energy efficiency, he advises that homeowners "put in tightly sealed, coated windows and increase insulation in attics, walls and floors." The Horns will tear out their leaky, single-glazed windows and install double-glazed ones, which insulate almost twice as well.

The old fiberglass batts in the wall cavities will be supplemented with rigid foam insulation added to the exterior, which will then be covered by building paper, lath and a new layer of stucco. Because fiberglass can also yield airborne pollutants that can irritate the lungs and stimulate asthma attacks and migraines, walls should be carefully sealed with an airtight barrier such as Tyvek or Typar. Among other options, spray-on polyurethane foam is a common choice, but brominated fire retardants, proven toxic in animal tests, can leach out of it. And cellulose insulation, made from ground-up newspaper, can be extremely dusty unless applied wet.

## **DESIGN**

Overall, the Horns' goal is to build a healthy, aesthetically pleasing environment by arranging interior walls and openings to enhance circulation of air and light. They will avoid the kind of lot-filling "'Tudor-Burger' house, which disregards adjacent buildings and forfeits any openness, natural asymmetry, counterpoint or connection to the exterior," says James. He and Claudia will alternately compress and expand space by such means as using a small entryway for protection from the harsh elements and adding large windows in the bedroom addition. "It's far better, from an environmental standpoint, to build a more compact space that adequately serves needs without wasting resources than to just maximize your square footage. Then you can better afford to use safer and more environmentally responsible materials," Alex Wilson says. Wherever you live, designing with flexibility and attentiveness to the climate and landscape will result in a living space that is healthier for the environment and for you.