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Simply Environmental

AN ARCHITECT'S HOME IS A CREATIVE LABORATORY

BY MARGE O'CONNOR

IN THE ROLLING HILLS OF VERMONT STANDS CHRISTIAN BROWN'S "ARCHITECTURAL LAB." Actually, it's his family's dream home—a contemporary version of a Vermont farmhouse that shows how easily a home can be environmental and energy efficient. • The 2,600-square-foot (242-m²), four-bedroom home in Jericho, Vt., includes a studio for Christian Brown Design, an architecture firm founded by Brown in 2002 that provides distinctive, functional and eco-friendly home designs. • "I use eco-conscious materials, natural light and energy-efficient construction methods wherever I can," Brown says. "Good design considers more than energy efficiency, and I encourage clients to use sustainable elements as much as possible."





Exterior walls are covered with fire-resistant fiber-cement clapboards and panels, some in red and some in brown. The house is topped with an 8:12 (34-degree) pitch, gray-colored standing-seam metal roof chosen for its durability and Vermont-style appeal.



Careful planning earned the home a five-star plus Energy Star rating under Washington, D.C.-based U.S. Environmental Protection Agency guidelines, a **level achieved by only 4 percent** of Energy Star-rated homes in Vermont.

NATURALLY GREEN

Brown's home was completed in summer 2005 and features abundant daylighting, energy-efficient construction and eco-friendly materials purchased locally when possible. He sited the home to minimize environmental impact on the 3 1/2-acre (1.4-hectare) property. Instead of destroying natural vegetation, the builder transplanted more than 40 native hardwood and evergreen trees to other parts of the property. He also recycled all construction waste materials offsite.

Brown's careful planning earned the home a five-star plus Energy Star rating under Washington, D.C.-based U.S. Environmental Protection Agency (www.energystar.gov) guidelines, a level achieved by only 4 percent of Energy Star-rated homes in Vermont.

The design also offers a great deal of daily comfort for Brown and his family. "I designed the house long and thin to make the best use of light. The home parallels the tree lines at the back of the site and has a southern exposure on the long side to give light to all the rooms. The open floor plan makes the rooms feel more connected, and the light opens up the space, making the house seem larger than it is," Brown explains.

To support the open floor plan, Brown chose engineered wood framing in an I-beam structure because it uses less wood and offers greater span and strength.



PROJECT TEAM **ARCHITECT:** Christian Brown, Christian Brown Design, Jericho, Vt., www.christianbrowndesign.com / **BUILDER:** Leach Construction of Vermont, Jericho, (802) 434-5578



MATERIALS AND SOURCES

- ❑ **WINDOWS** / Architect Series from **Pella**, Pella, Iowa, www.pella.com
- ❑ **STAIR PANEL** / Shoji translucent wall system from **Kalwall Corp.**, Manchester, N.H., www.kalwall.com
- ❑ **STRUCTURAL INSULATED PANELS** / **Winter Panel Corp.**, Brattleboro, Vt., www.winterpanel.com
- ❑ **FIBER-CEMENT CLAPBOARDS AND PANELS** / **JamesHardie**, Mission Viejo, Calif., www.jameshardie.com
- ❑ **CHARCOAL-GRAY STANDING-SEAM METAL ROOF** / **Englert Inc.**, Perth Amboy, N.J., www.englertinc.com
- ❑ **FLOOR FRAMING** / TJI system from **Trus Joist**, Boise, Idaho, www.trusjoist.com
- ❑ **DIRECT-VENT BOILER** / Trinity model Ti150 from **NTI**, Sussex, New Brunswick, Canada, www.nythermal.com
- ❑ **HYDRONIC-PANEL RADIATORS** / Select Panel Radiator, model 22G from **Myson Inc.**, Colchester, Vt., www.mysoninc.com
- ❑ **ENERGY-RECOVERY VENTILATOR** / model EV200 from **RenewAire**, Madison, Wis., www.renewaire.com
- ❑ **WHEATBOARD KITCHEN CABINETS AND WALL PANELS** / **Environ Biocomposites LLC**, Mankato, Minn., www.environbiocomposites.com
- ❑ **CONCRETE KITCHEN COUNTERTOPS WITH COLOR DYES AND ADDITIVES** / **Cheng Design Products**, Berkeley, Calif., www.concreteexchange.com
- ❑ **BAMBOO FLOORING** / **Teragren**, Bainbridge Island, Wash., www.teragren.com
- ❑ **RUBBER FLOORING** / **ECOsurfaces**, Lancaster, Pa., www.ecosurfaces.com

LIGHT AND VIEW

The home's windows are Energy Star rated with low-E glazing, an argon gas filling and low U-value. Most windows are operable, except for a few large fixed ones, which Brown included to provide an unobstructed view of the area. He added awning windows below the fixed windows to separate window view and ventilation functions.

On the home's north side, Brown placed a stair tower with a 20-foot- (6-m-) tall translucent insulated light panel that features two operable sashes at the top. This provides continuous natural light to all three levels of the house and ventilation and cooling in the summer when the sash is open.

"The house does not have air conditioning, so we open the awning windows at the top of the stair tower from May through October to draw the heat out. The stairs in the tower also have open risers so light filters throughout the house, and we don't need to use other lighting inside the house during the day," Brown adds.

COMFORT

For heating and comfort, Brown used passive and low-energy methods. The foundation is composed of insulated concrete forms with an R-value of 22, a waterproofing membrane and 2-inch- (51-mm-) thick rigid insulation under the concrete slab.

The shell consists of 6 1/2-inch- (165-mm-) thick Vermont-made structural insulated panels with an R-value of 38. The SIPs are installed with a continuous thermal break that provides twice the standard insulation value of a wood stud wall system. Typical wood framing has an R-19 value, which is Vermont's minimum energy requirement.

"Environmentally there is very little lumber used because there is minimal wood waste and no studs in the wall system. The panels are made to design, and

Instead of destroying natural vegetation, the builder transplanted more than 40 native hardwood and evergreen trees to other parts of the property. He also recycled all construction waste materials offsite.

the wood is oriented strand board. The system we used is really an evolution of construction. You pay a little more for it upfront, but I encourage it. There are other ways to save money in a project that won't achieve the long-term savings this will," Brown says.

One on-demand boiler supplies hot water for domestic and heating purposes, including the radiant-floor heating system in the basement slab, throughout the first floor and in the

second-floor bathrooms. Warm water is circulated through tubing under the floor and is controlled by a thermostat. The second floor bedrooms have hot-water panel radiators.

"It's a very comfortable system and is more energy efficient because it provides steady, even heat, and the house needs only one boiler system," Brown remarks.

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VENTILATION

The high-efficiency hot-water heating system features a direct-vent method with an outdoor thermometer. "The system senses when to turn on and has an average 92.7 efficiency rating. When it's not too cold out it operates at an even higher level," Brown notes. The circulators are electric, and what little gas is used in the house is provided by propane gas from a buried tank.

Because the house is very well sealed—a blower door test showed an air infiltration rating of 0.15 natural air changes per hour—Brown included a fresh-air energy recovery ventilator.

Brown explains: "For a house that's so well sealed, you have to supply fresh air. Our home's ventilation system takes in air, warms it in the winter and removes some humidity in the summer before it blows the air into the house. It's a wall-mounted basement unit with vents throughout the house and ducts to the outside. It pulls air out of the bathrooms and kitchen and puts fresh air in the bedrooms and living areas. It's a great system that we can regulate."

INSPIRATION

In addition to gaining inspiration from the home's kitchen cabinets and countertops that he handcrafted, Brown used the resources of Burlington-based Efficiency Vermont (www.efficiencyvermont.com), the nation's first statewide provider of technical advice, financial assistance and design guidance to help make buildings more energy efficient.



Efficiency Vermont estimated the home's energy usage at 59.8 million Btus for heating, 0.0 energy for cooling (because it has no air conditioning) and 27 million Btus for hot water. It also estimated annual electric cost for lights and appliances at \$599. Because Brown is so confident that his home is as energy efficient as any house can get, he has not compared Efficiency Vermont's estimates against actual usage in

the year plus that his family has occupied the home.

Brown encourages homeowners to use resources like this for new construction or remodeling because they typically offer rebates based on appliance energy ratings, lighting fixtures and overall house performance.

Brown will frequently use his home to show prospects what can be done because it is a never-ending source of enjoyment and inspiration. "I love the house because it feels like living in a space that has value to me environmentally. The eco-friendly materials are nice aesthetically, and we appreciate the quality of the home and type of life we get from it. It's a great house to live in, and we feel like we've done something good."

Helping Your Children & Your Home Breathe Easy

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INTERIORS: CUSTOM CRAFTED

Christian Brown, principal of Christian Brown Design, Jericho, Vt., frequently handcrafts furniture and other interior elements for the energy-efficient homes he designs. This combination of skills gives him a better understanding of an entire project, including interior and construction details.

For the kitchen of his Jericho home, Brown custom designed and handcrafted all the cabinets using formaldehyde-free board created from wheatstraw, a rapidly renewable resource used as an alternative to traditional hardwood or panel products. Panels made of the same wheatboard cover portions of the kitchen walls.

He also custom designed and molded countertops for the kitchen and baths from colored concrete. "I created a separate form for each countertop but used the same grayish-purple color for all of them. We had quite a production line going," Brown explains.

Stained and waxed concrete forms the basement floor. Other flooring uses materials that are rapidly renewable or have recycled content. Light-colored bamboo flooring covers kitchen, dining and living areas on the first floor, as well as the second floor hallway. In the entry and laundry room, Brown chose rubber flooring that combines 100 percent post-consumer recycled rubber with colored, UV-resistant EPDM flecks that contain 30 percent recycled postindustrial waste.

