

Special Home Edition: Trends & Resources

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BEING *Green*



IN THE WHITE
of Winter



Sustainable housing with an eye to the sun,
blending technology and artful design
while saving big on energy costs

By Cynthia West

Photography by John Hession

PEAUTIFUL HOMES share many elements, one of which is a connection to their environment. One of the most significant ways in which a home can be a reflection of healthy living is through sustainable design. For Patrick Miller and Pamela Andruszkiewicz, designing an environmentally friendly structure in the Plymouth area was a decision based on their lifestyles and commitment to a natural, healthy and sustainable home.

Miller, who is the executive director of The Jordan Institute, a non-profit organization committed to improving New Hampshire's environmental quality of life, has focused his career on improving the relationship between the man-made environment and public health. Andruszkiewicz's interests in science, climate change, and pollution led her to explore passive solar design while still in college. Together, the couple worked closely with architect Miche Booz of Brookeville, Md., to create a stunning structure that offers healthy, sustainable living rooted in traditional New England vernacular.

Environmentally friendly homes can be built for the same or lower price than conventional structures, and function at a fraction of the operating cost. By working with an architect or contractor familiar with "integrated design" concepts, occupants reap the benefits of a rewarding process resulting in high performance design.

A tall, octagonal tower resembling a silo is the visual centerpiece for the Miller farmhouse, with its long, narrow farmer's porch and "outbuilding" garage. With just under 2,000 square feet of living space for four people, the house was designed to maximize sunlight for both wintertime heating and year-round daylight. As part of the passive solar design process, a computer model was used to determine the shape of the farmer's porch in order to allow for the most sunlight in the winter and almost none in the summer. The tower, which serves as a passive cooling device in the summer months, employs what is known as the "stack effect," where at night, hot air exits through upper-story windows as fresh air enters through lower windows. During the day, the windows are closed and increased levels of insulation keep the house cool. There is no central air conditioning required — thereby avoiding an extra upfront and ongoing expense.

Left: While natural sunlight provides lighting during the day, energy-efficient light sources are used to illuminate the Miller home during evening hours.

Above: A computer model was used to determine the shape of the farmer's porch in order to allow for the most sunlight in the winter and almost none in the summer.



"The house is reminiscent of an old New Hampshire farm in that it's a collection of shapes, such as simple sheds and gable structures, arranged with connectivity and energy efficiency in mind."

—Miche Booz, the Millers' architect

"The house is reminiscent of an old New Hampshire farm in that it's a collection of shapes, such as simple sheds and gable structures, arranged with connectivity and energy efficiency in mind," explains the Millers' architect, Miche Booz. "We had the challenge of working with a site where the view was in one direction, but the solar orientation was in another. We oriented the tower toward the view of the mountains, and the long face of the house toward the south to collect heat from the sun." Booz, who visited the site from time to time as it evolved, took special pleasure in seeing the less-traditional materials, such as corrugated steel siding, begin to take shape and define the exterior. "Seeing the evolution from framing to skin, and being able to stand on the site and see how the orientation brought about certain lighting conditions was the biggest thrill for me," he says.

While the exterior exemplifies extraordinary forethought and detail, the interior is a veritable textbook of energy efficiency. An Energy Star home with the highest rating of 5+ stars, the Millers participated in

the U.S. EPA program where they received rebates from their local utility company for purchasing high-efficiency appliances and lighting, installing a whole-house fresh air ventilation system, and increasing the levels of insulation in the exterior walls and roof beyond what is typical.

"When people think of green homes, they often start with solar panels for electricity generation, but we began instead by minimizing our demand for energy. We also wanted a home that was economical to operate and low maintenance," explains Miller. "New Hampshire has higher rates of asthma than other states, and with two children living in the house, we wanted to maximize our indoor air quality and avoid toxic pollutants in the products we chose." The Millers built an "envelope" with little air leakage and high levels of insulated glass. The project cost slightly more than a "standard" house, primarily in the purchase of better windows and insulation for the roof and walls. However, the extra, up-front costs will be paid for in less than three years because it takes very little energy to provide heat



Top: A bank of large windows on the south side warms the living area. Additional windows in the "silo" contribute to the passive solar gain.

and electricity for the home. Additionally, the exterior siding of the house will never need to be painted, they do not need air conditioning, and they rarely turn a light on during the day. They also have a much smaller heating system than in conventional homes, and only need to use it for a few months out of the year.

In order to make the house feel larger than its 1,980 square feet, the home includes nine-foot ceilings on the main level, cathedral ceilings on the upper floor, and dropped soffits in some rooms. The walls are organically colored with Benjamin Moore's EcoSpec line of low volatile organic compound (VOC) paints, the flooring is renewable bamboo rather than PVC-backed carpeting, "natural" linoleum made of wood rosin and natural pigments was installed instead of vinyl, and stain-

TOOLS FOR GREEN LIVING

Having a more energy-efficient home does not mean your roof has to be lined with solar panels. You can start by simply buying a new household appliance like a GE refrigerator, which uses 53 percent less energy. Investing in renewable energy systems or new energy-efficient products reduces monthly bills and reduces environmental impact. The following is a list of resources that provide understandable information to get you started.

Energy Star

www.energystar.gov

Energy Star is a federal program designed to encourage people to build homes that are 30 percent more energy efficient. Energy Star offers rebates on home appliances and a special rating for compliant homes.

The Green Guide

<http://thegreenguide.com>

This publication delivers online environmental and health information, product reviews, green home tips and advice.

Home Energy Saver

<http://hes.lbl.gov>

Developed by the Environmental Energy Technologies Division at the Lawrence Berkeley National Laboratory, this Web site offers a "do-it-yourself" energy assessment.

NH Office of Energy and Planning

(603) 271-2155, www.nh.gov/oep

This N.H. state office provides information on energy-efficient programs running in the state and other relevant information.

NH saves

(866) 266-2420, www.nhsaves.com

NH saves is a Web site that provides energy information for consumers and businesses. The site also lists the public utility companies in New Hampshire and a connection to their Web sites in an effort to improve energy efficiency, reduce costs and protect the environment. The phone number offers automated information on statewide energy-efficiency programs, products and rebates available.

NH Sustainable Energy Association (NHSEA)

(603) 989-5359, www.nhsea.org

The NHSEA is a local organization that provides the public with information on energy-efficient systems and products. The NHSEA Web site offers a list of resources, including businesses specializing in renewable energy, green home builders, and related publications.

Northeast Sustainable Energy Association (NESEA)

(413) 774-6051, www.nseea.org

The NESEA is a regional association that encourages the understanding and development of renewable energy technologies and provides people with a network of resources.

Solar Works, Inc.

(800) 339-7804, www.solarworks.com

Solar Works assists customers with the design process and installation for their renewable energy systems. These systems range from solar domestic hot water, which produces up to 70 percent of all hot water for a single household, solar electric systems, water storage and pool heating systems.

less steel and butcher's block counters were used in the kitchen. By building a smaller home, they were able to invest in higher-grade materials for flooring and other finishes that will hopefully last the life of the home. "Sunlight streams through our windows and the house is always warm and welcoming," Andruszkiewicz says. "By installing a fresh air exchange system, where the indoor air is exchanged with outside air multiple times an hour, we also have a house that smells like you've just stepped outside."

Through thoughtful design and many hours of product materials research, the Millers have created a proportional, well-sited, New England-style home that is respectful of nature and low maintenance. "Buildings are living, breathing organisms," says Miller. "We've worked hard to co-exist with the very complex ecosystems both within and without our home. We've used materials in a way that we believe is ultimately sustainable, and we love sharing our backyard with New Hampshire's abundant wildlife. In the end, the choices that we make about how we live affect not only this generation but also future

A house is a long-term contract with the environment.

— Daniel D. Chiras, author of "The Natural House"

generations and our environment. It's time that the man-made environment begins to tread a little more lightly."

To initiate energy-efficient retrofits to an existing home or to begin designing a new, environmentally friendly home, do plenty of research and work with a consultant or architect. Michael Petrovick, a Franconia architect, says that the dramatic architectural designs of the 17th and 18th century can become the template from which modern, efficient and aesthetically pleasing structures arise today. He believes that regardless of architectural style — historic reproduction or contemporary, new construction or renovation — any home can be designed to incorporate environmental friendliness without compromising architectural integrity.

Chris Williams of Christopher P. Williams Architects in Meredith, has a 30-year history of green-building projects. He offers the advice that it's critical to work with someone who understands the larger issues. "When choosing an architect or consultant, you need to be sure they understand sitting, orientation, and the placement of rooms to maximize energy efficiency," he says emphatically. "You'll need someone who is very familiar with solar heating concepts and issues relating to the benefits and drawbacks of green materials. Frankly, it can be complicated because new products arrive on the market every day. You need someone who stays on top of it all."

Williams should know. He built his own home to include a 37-foot-long, three-story-high solar greenhouse that spans the back of his south-facing façade. The home, which was designed as a modern interpretation of New England vernacular — similar to the principles behind the Miller house — stays very close to ideal room temperature. A large stone wall partially separates the greenhouse from the open living area, and is punctuated by windows, doors and a fire-

place. As light comes through the greenhouse and hits the stone, it converts to heat, is retained and radiated by the wall. The Williams' also use solar collectors on the roof to heat their hot water. "A home built on sustainable principles will have higher market value in the future because it is healthier and more efficient — two qualities that we are all searching for within our dwellings," says Williams. "You'll also have lower operational costs, and the knowledge that your home is made from the land on which it stands."

There are many ways to live a more environmentally friendly lifestyle. By veering from the linear, formulaic "box" building that is rampant in the suburbs, green buildings bring about crucial synergies with the environment and promote community-based benefits such as the use of renewable energy resources and the reduction of pollution.

Retrofitting existing homes or altering building plans to include high-performance sustainable design grants homeowners an immediate return on many levels, including the knowledge that they are doing their part to celebrate a deeply rooted connection to the environment. ■

RAW MATERIALS

Along with the better-known "native" materials, such as logs and stone, several ancient techniques use earth-friendly elements for building in harmony with nature.

Rammed earth, or earthen construction, has been used successfully for more than 10,000 years. Sand and clay are tamped into forms, allowed to harden, and then the forms are removed. Rammed earth is durable and weather resistant, and can be coated with stucco for further protection. Walls are often up to 24" thick, and offer a quiet interior retreat. Check local building codes, as inspectors may not be familiar with the engineering tolerances of this construction.

Straw bale construction derives from a centuries-old, European tradition of shelters made from straw. Modern construction typically includes overhangs to protect the walls from rain, a first course of bales that is positioned some 6 to 8 inches above grade, a foundation sealant, and breathable walls that permit moisture to escape. Gunite, a dried cement mix often used in pool construction, can be sprayed on outer walls and followed by decorative plaster. Snow load is a limiting factor with straw bale walls, although if used as an infill material for traditional timber frame construction it is an excellent insulator.

Cordwood houses are low-cost, natural dwellings built from firewood laid wide-wise, one course at a time, and then mortared in place with cement. This 1,000-year-old tradition may have been introduced by the Vikings. Cordwood homes can be built with split logs, round, peeled log ends or an artful combination of both. Dry wood, an adequate foundation, and a design that includes overhangs to keep water away from exterior walls make for a cost-effective alternative to other types of construction. Although harvesting wood is extremely labor intensive, cordwood homes offer a beautiful aesthetic, combining the warmth of wood with the beauty of stone masonry.

Adapted from "The Natural House, A Complete Guide to Healthy, Energy-Efficient, Environmental Homes" by Daniel D. Chiras

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