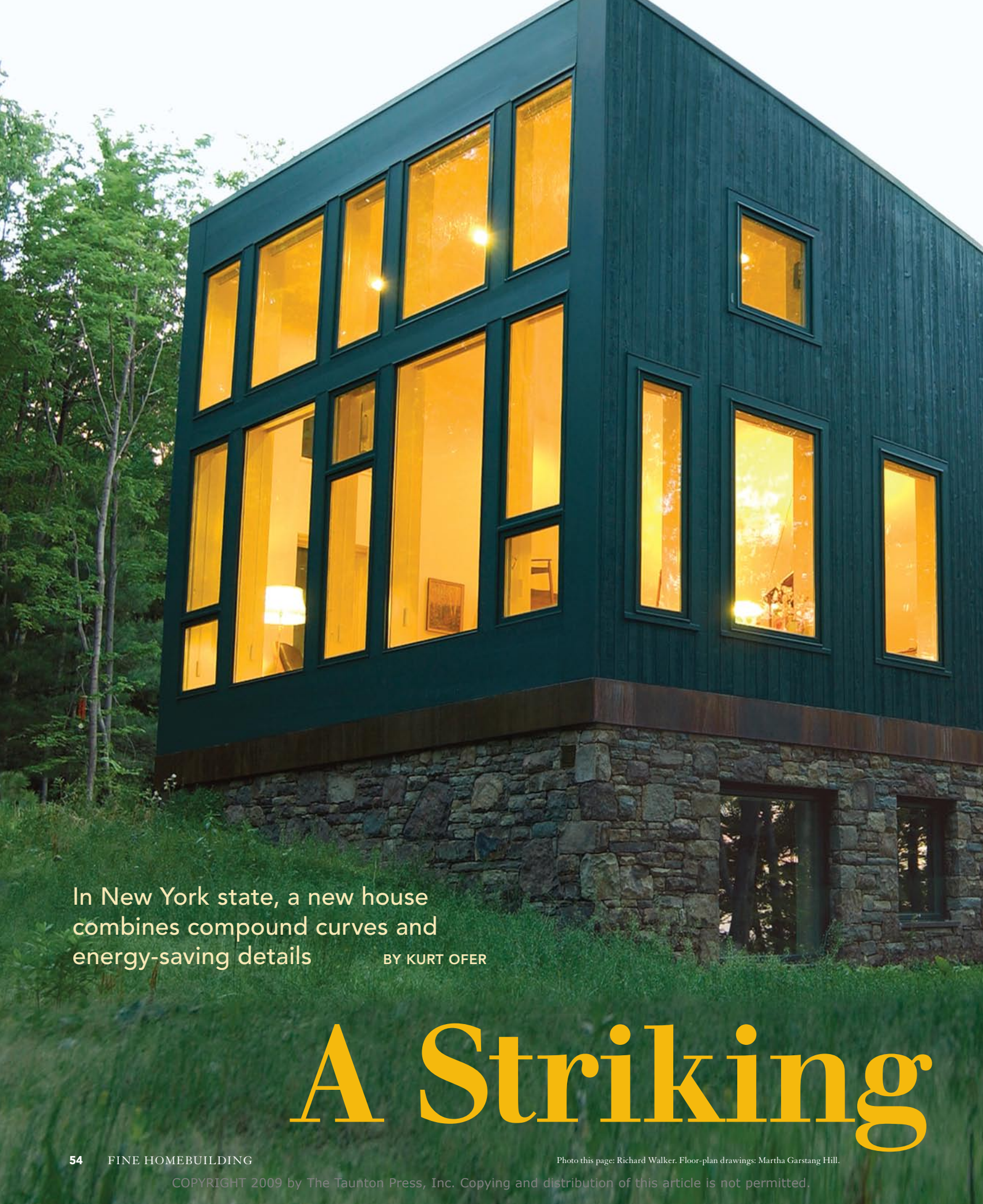


In New York state, a new house combines compound curves and energy-saving details

BY KURT OFER

A Striking

Photo this page: Richard Walker. Floor-plan drawings: Martha Garstang Hill.

For a while, Web and Helen Stayman had wanted to build a new house on their wooded hill outside of town, so they had thought about their future home a lot before they approached the architecture firm my wife and I own. They came to our first meeting armed with drawings, Web's quarter-scale model of their ideal design, and a strong desire to have a house that was as energy efficient as possible. When we suggested tactfully that we were more interested in designing houses from scratch, Helen stated, "Of course you are, and that's why we are here." In the end, we designed a completely different house of compound curves that nestles into a curved hillside. Best of all, the house has a highly insulated shell (R-38 walls, R-62 roof, and an ICF foundation) and derives its primary heat from a high-efficiency wood-fired furnace.

SPECS

Bedrooms: 3

Bathrooms: 2½

Size: 2800 sq. ft.

Cost: N/A

Completed: 2003

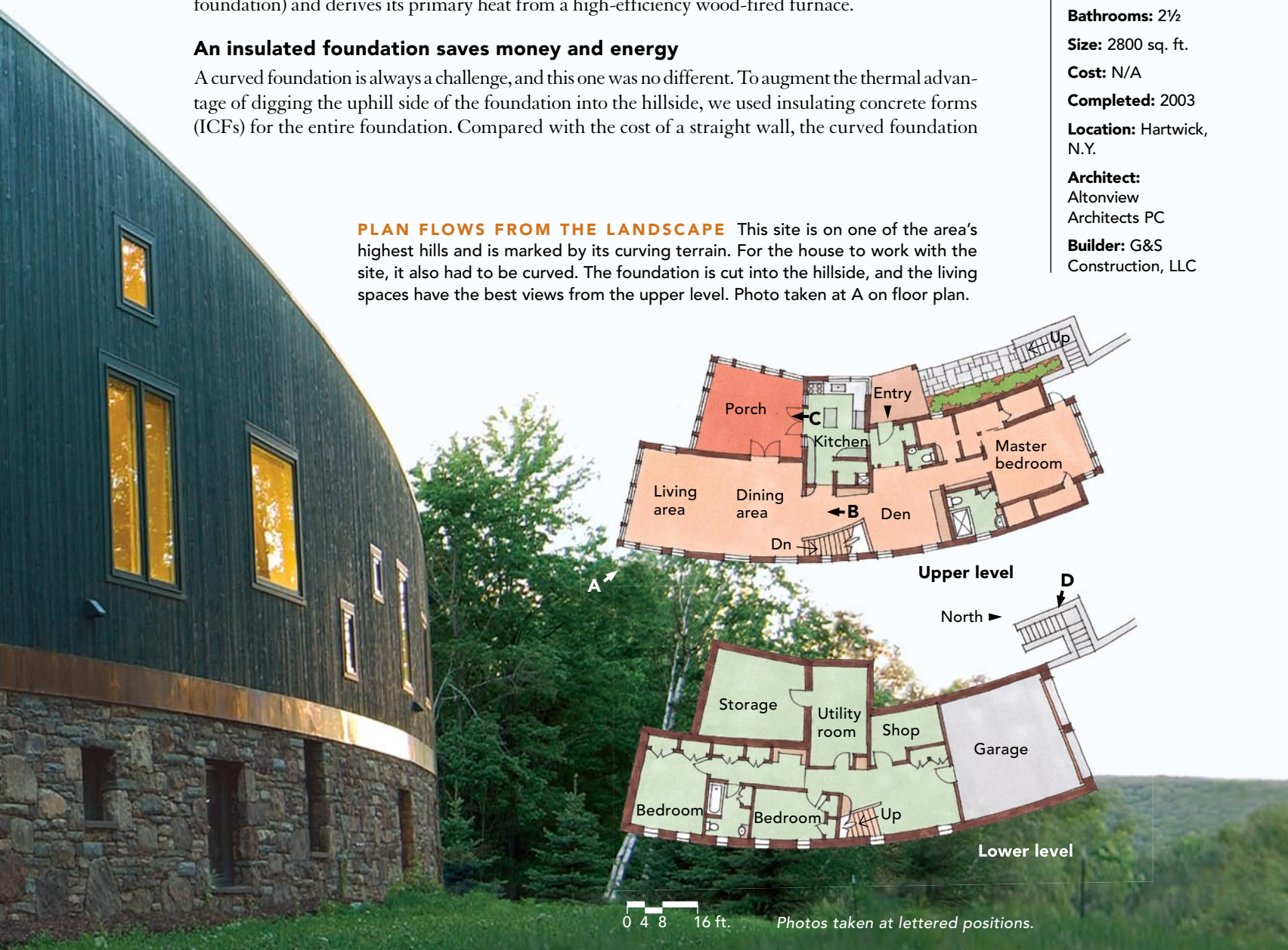
Location: Hartwick, N.Y.

Architect: Altonview Architects PC

Builder: G&S Construction, LLC

An insulated foundation saves money and energy

A curved foundation is always a challenge, and this one was no different. To augment the thermal advantage of digging the uphill side of the foundation into the hillside, we used insulating concrete forms (ICFs) for the entire foundation. Compared with the cost of a straight wall, the curved foundation



PLAN FLOWS FROM THE LANDSCAPE This site is on one of the area's highest hills and is marked by its curving terrain. For the house to work with the site, it also had to be curved. The foundation is cut into the hillside, and the living spaces have the best views from the upper level. Photo taken at A on floor plan.

Photos taken at lettered positions.

Hillside Home

Maximize the house's solar gain

and minimize its reliance on mechanical heating

A south-facing window wall in the living room dramatizes the curvature of the outer wall and the ceiling. On cold winter days, the entire house benefits from the wall's solar gain; during cold winter nights or hot summer days, the homeowners lower insulated shades (inset photo) to cover the windows. Photos taken at B on floor plan.

Inset photo: Web Stayman. Facing page: top photo, courtesy of Kurt Ofer; bottom photo, courtesy of Flex-Ability Concepts.

wall with the ICF system (labor and materials combined) was about 10% higher. (The foundation contractor's bill for using wooden forms for the curved walls would have been about 25% higher.) We confirmed with the ICF manufacturer that the curve would not compromise the system's integrity.

Much of the extra time the foundation required was due to layout and verification of the 130-ft. radius. Because of the trees, we could not stake out a 130-ft.-long cable to scribe the radius. Our office provided computer-generated drawings, a series of X and Y coordinates, to communicate the layout to the foundation contractor. Once the footings were in place, the ICF system stacked easily on top.

Windows have pros and cons

Before the footings were laid out, I spent time at the site tracking the sun's position through the day. I wanted to maximize the house's solar gain and to minimize reliance on mechanical heating during the winter. I designed the largest expanse of windows on the south-facing end of the house (photos facing page). Made by Pella (www.pella.com), the units have low-e coated, argon-filled panels that reduce heat loss in winter. (We considered triple-glazing but vetoed it because of the added cost.) Large windows in the north-facing master bedroom were a concession for the view and for more natural light, rather than thermal performance.

Of course, there's always a trade-off with windows. They can attract beneficial solar gain and views at important times of the year or of the day, but they also lose valuable heat at night. To reduce heat loss, the Staymans installed insulating shades (Comfortex; www.comfortex.com) with an R-value of 4.6.

The east- and west-facing windows are modest, but the house is suffused with light all day long. The windows along the curved east wall bring in the light at sunrise. As the sun rises, the south windows admit light deep into the living room. On the western side of the house, the summer sunlight is filtered through the trees; in the winter, the kitchen reaps the benefits of the afternoon sun.

Insulation, heat, and power go hand in hand

After the sun, the house's main heat source is an exterior high-efficiency wood-fired furnace (Pro-Fab Inc.; www.profab.org) linked to a hydronic distribution system. Helen didn't like the idea of the furnace being too close to the house, so Web built a small enclosure for it about 100 ft. away. Glycol heated in the furnace jacket is pumped through insulated pipes to the basement, where it transfers its heat to the domestic hot-water tank and a hydronic-heating loop. A liquid-propane (LP) fired boiler serves as a backup when the wood-fired boiler is not supplying enough heat. The LP boiler is fed from an in-ground 1000-gal. tank that also supplies a 20kw generator.

If the power goes out, the Staymans can get by with the wood boiler and generator for a long time. Web's new hobby is chopping wood, and the household uses about nine cords of it annually. Web also reports that during a six-week absence last winter, the backup boiler used only 60 gal. of liquid propane, a testament to the house's insulation.

To make the house as tight as possible, we insulated with Corbond (www.corbond.com) closed-cell polyurethane spray foam, which yielded R-38 in the walls and R-65 in the roof. The higher R-values were made possible by increasing the depth of the stud and rafter bays. The

From the builder

Working the curves

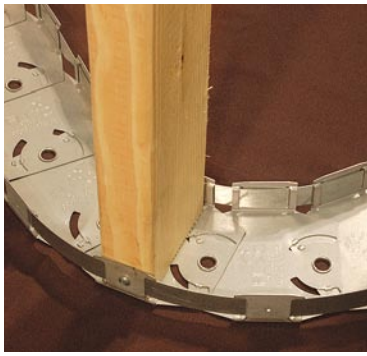
by Steven Smith

On the first day we worked on this house, two of us went to the site with the plans. Luckily, we had worked with Kurt before on his own house ("Arch Top in the Valley," *FHB* #133 and online at FineHomebuilding.com). We needed seven and a half hours just to get our heads around the process of building a house that curved in two directions. When we were ready to begin, we transferred the layout that Kurt had plotted onto the site in the rough, excavated for the footings, then re-established the layout. After the footings were poured, the foundation was formed with 4-ft.-long ICF blocks. The curve wasn't fair, but it was close enough.

Once the foundation and deck were built, we established a centerpoint back in the woods and used a transit to lay out the curved exterior-wall plates. Kurt had used a CAD program called Vectorworks (www.nemetschek.net) to design the house. The software was able to plot the length and location of each stud, which made that aspect easier.

The wall layout was critical, and two of us spent a week just determining the location of each of the 2x10 wall studs. We snapped lines from the centerpoint to the deck for each stud. At the outside wall with the largest radius, the framing is roughly 16 in. on center; on the opposite smaller-radius wall, the framing is closer to 12 in. to 13 in. on center. The trick was to maintain the fair curve of the wall and to give enough support to the roof.

We used articulating metal track (Flex-C Plate; www.flexc.com) to set the top and bottom radii. We cut each stud to length, plumbed it, and braced it in two directions; we added the top-track plate in sections. When a section was complete, we braced it periodically like a regular wall. We cut the openings after the walls were up. Because the openings on the curved walls were relatively small, we could use straight headers that we padded out at the center. We blocked all the rafters in place and strapped them with metal connectors so that they would remain plumb until sheathed.



—Steven Smith owns G&S Construction, LLC, in Cooperstown, N.Y.

For a house in the woods, a screened porch is the only way to enjoy a meal outside

With handy access to the kitchen, the porch gets plenty of tree-filtered sun during the day. The high ceiling keeps the room cool when the breeze doesn't. Photo above taken at C on floor plan; inset photo taken at D.

walls were framed with 2x10s, and the roof was framed with 12-in. I-joists.

After they had lived in their new home for a few months, the Staymans thought it might be too tight. Moisture was condensing on the windows, always a bad sign. A heat-recovery ventilator solved the problem, providing the fresh air the house required without losing any heat. (For more on these appliances, see "How It Works" on p. 16.)

The interior benefits from a cherry tree

Once you're inside, the shape of the house reveals itself. From the den to the living room, the ceiling height increases gradually, rising from 10 ft. to 16 ft., a progression accompanied by the sweep of the exterior wall. The screened porch and the kitchen are positioned on the other side of the interior wall; the kitchen was pulled from the flow of the rest of the house to isolate its higher levels of activity.

Snug and functional, the kitchen is where the Staymans have most of their meals. Next to the kitchen, the big screened porch opens out to the woods in back. It's the best place in the house for warm-weather meals and grilling.

In the early stages of clearing the site for the house, Web Stayman found an enormous cherry tree that had been knocked over. Builder Steven Smith had the tree's wood sawn and kiln-dried, and he used it for all of the cabinetry, the trim, and the built-ins in the house. The color and grain of this one tree unify the house's interior; the cherry glow is everywhere. □

Kurt Ofer and his wife, Teresa Drerup, are partners in Altonview Architects PC in Cooperstown, N.Y. Photos by Charles Bickford, except where noted.

Inset photo: Richard Walker