A young woman builds a compact, economical place to suit herself

A HOUSE *of* HER OWN

BY TIM SNYDER

PHOTOGRAPHY BY

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Acting as the general contractor, Laurie Waisel was able to set her rustic cottage on a hilltop in the woods.

LAURIE WAISEL'S HOUSE DOES NOT fit easily into any established architectural genre. A passerby, on first noticing the new home in the hilltop clearing overlooking Pownal, Vermont, might describe it as "rustic Victorian." The tall, narrow shape of the house and the steep roof with its crossing gables are distinctly Victorian touches, and the traditional proportions of the walls and roof give the house a formal stance. But the rough-sawn exterior is clearly in the practical country tradition.

Neither the traditional styling nor the rustic finish reveal the true character of this house, however. Beneath the surface, it is a thoroughly modern building, created by means of technology that didn't even exist a generation ago. Its walls and roof were pieced together using stress-skin panels — giant sandwiches of rigid foam insulation glued to interior and exterior sheathing. Exceptionally strong and energy efficient, these panels are typically used to cover timber-frame buildings, but Waisel's house is different; it doesn't have an internal frame at all. All of the structural support for the building is provided by the stress-skin panels themselves.

Waisel, a 28-year-old psychologist, was introduced to stress-skin panels through the books of Alex Wade, an architect who has worked side-by-side with hundreds of owner-builders over the past 20 years (see "In Praise of the Owner-Builder Era," page 74). Wade recommends panel construction to his clients for two principal reasons. First, the house goes up quickly, allowing the owner — in most cases an amateur builder— to concentrate on finish details rather than major construction. Second, the building is invariably tighter and more energy-efficient than a comparable house built in the conventional piecemeal fashion. "I enthusiastically endorse panels," Wade says. "I don't ram them down anybody's throat, but I haven't had many clients recently who haven't used them."

Waisel began thinking about acquiring a home of her own about three years ago. She was still in graduate school at the time and couldn't afford much of a mortgage, but she'd had her fill of student housing and rental apartments. Her first idea was to find an inexpensive older house that she could fix up-the ubiquitous "handyrnan's special." But examining old buildings with realtors was a humbling experience. "I realized I

Though much of Laurie Waisel's house is simple, unexpected details, like the custom-built spiral staircase and the rich grain of the poplar floor in the living room, give her home personality.

didn't know anything about carpentry, home maintenance or remodeling," she admits. So she began an independent study of sorts, collecting books and magazine articles on house design, carpentry and reconstruction. Week by week, a notebook filled up with sketches, photos and clippings. And the more she immersed herself in the details of home construction, the more she realized that she really wanted to design her own home and build it from scratch,

Upon graduation, Waisel moved to southern Vermont to work as an outpatient psychotherapist. By this time, she had some fairly well-developed plans for an L-shaped house, but she needed an architect to turn her sketches into blueprints It was at this point that she called Wade, whose home in Mt. Marion, New York, was a two-hour drive away. "When I read his books, I was particularly impressed by his priority on keeping costs down for the owner," she says. "I also hked his designs; they weren't exactly what I wanted for myself, but they made sense." She asked Wade if he could recommend an architect who thought the same way he did. "Well," he responded after a long pause, "that would be me." He urged her to keep working on her design and to call when she'd found a building site.

Eighteen months later, Waisel invited Wade up to Pownal to take a look at the 3-acre wooded lot she had chosen. The hilltop site looked fine to the architect. It offered a good exposure to the south and east, permitting a solar orientation for the house, with the long axis of the L-shaped building running roughly east-west. Waisel decided to build at the rear of the property, well away from the road and adjacent lots. The privacy of the site is enhanced by the fact that it abuts a 75-acre woodland that is protected from future development.

WITH A FLOOR AREA OF ABOUT 1,500 square feet, Waisel's house is small but hardly cramped. The floor plan manages to make the rooms seem open without sacrificing privacy, and the house succeeds in surviving the tug-of-war between style and economy. There are pleasant surprises here, unexpected details that reveal the taste and personality of the owner. All in all, this is, as Wade observes, "a very personal house."

The formal entry is near the center of the

By shortening the height of the sidewalls on the second story, Waisel got two floors for the price of one—almost. Cathedral ceilings open up the space in these rooms.

house, at the inside corner of the L. The entry foyer has a closet on one side and a half-bath on the other. By giving the half-bath a pocket door instead of a hinged door, Waisel reduced congestion and managed to fit foyer, bath and closet into a mere 5-by-10-foot floor area The foyer is the building's circulation center. A right turn leads to the living room, the kitchen is to the left, and the stairway is straight ahead (see *First-Floor Plan).*

For muddy feet and grocery-laden arms, there's a second entry in the northwest corner of the house Served by a single exterior door, this corner is part mudroom, part laundry and otherwise useful as an overflow area for the flotsam and jetsam of country life. Waisel wisely allowed plenty of elbow room here tor cross-country skis, boots and other seasonal gear; there's also space enough for occasional projects like stripping and refinishing furniture. The proximity to the kitchen is an important convenience. The washer and dryer are here, too, tucked into a corner behind folding doors.

A kitchen and small dining area fill out the remainder of this leg of the house. Augmenting a run of uppser and lower cabinets on the west wall are two countertop "peninsulas." These create an enclosed kitchen workspace without compromising the open plan that prevails along the full 25-foot length of this section of the house. Wall space is limited in a small house, so peninsulas offer a way to steal additional storage space from the center of a room. For Waisel, the peninsula cabinets take the place of a pantry.

The upstairs plan contains a few more small-house surprises. An avid reader, Waisel planned for two walls of built-in shelves in the master bedroom. There's also a full bathroom, as well as a walk-in closet. The closets location called for a second pocket door In a small house, closet, passage and bathroom doors are often close enough to fight with each other; pocket doors solve this problem because they slide open and shut instead of swinging.

The second floor also has space for two guest bedrooms and a full bathroom. "I have lots of friends and relatives whom I want to come visit,' Waisel explains, "so it was important to have at least one extra bedroom and bathroom."

Wade liked the way Waisel had planned the interior space of the house. The only problem

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area he noted was the stairway up to the second floor. "There wasn't really enough room for a conventional stair," he remembers, "but I told Laurie that we might be able to have a winding stair built on site."

Another significant concern was Waisel's tight construction budget: $75,000. Wade immediately eliminated a bay window that she had planned downstairs. Another thing to go was the second story — or at least half of it. Shortening the height of sidewalls all around the house reduced material costs substantially. Thanks to a steep (12-on-12) roof pitch, upstairs headroom could still be ample with short sidewalls, provided that cathedral ceilings were built, rather thanjoisted ones. The trick, as Wade explains it, was to get two floors of living space for just a little more money than one floor would have cost.

Wade proposed several other ways to trim construction costs. He and Waisel agreed that the house could do with a partial basement instead of a full one. This saved about $3,000 on excavation, formwork and concrete. The partial basement shares the 17-by-25-foot dimensions of the kitchen and utility room area. The foundation beneath the living room and main entry (also 17 by 25 feet) is a poured-concrete slab.

To save more money, Waisel took on the tile work on the first floor. She likes the clean appearance and easy maintenance of tile, so she wanted to use it on floors in the kitchen, entry, bath and downstairs hallway. The kitchen countertops are also tile: As much as two-thirds of a tile job's cost is attributable to labor, so Waisel had a strong incentive to do the work herself. "One good thing about tile is that you don't need a lot of expensive tools to install it," she observes.

Waisel was less confident about assuming the role of general contractor. Still, with Wade's advice and encouragement, she accepted that responsibility and saw it through. She lined up suppliers, picked out materials and scheduled deliveries. She also interviewed, hired and supervised the subcontractors who did the excavation, septic-system installation, masonry, plumbing and electrical work. (Painting was another sweat-equity job that she tackled herself.) Wade supervised construction of the building's shell and lined up a carpenter to do the finish work.

As a young woman in a traditionally male role, Waisel might have anticipated some condescension on the part of suppliers and subcontractors, but she says she seldom encountered any, and when she did, it wasn't a problem. "If I sensed that I wasn't being taken seriously when I interviewed someone, I would move on to the next person. There were a few times when someone would make a remark, and I'd let them know what I thought about it. I think they came to respect me."

She admits, though, that with the responsibility for keeping track of all the pieces of the project, she couldn't always do the job easily. "I was working full time in a demanding job, and I could only do so much," she says. "I put everything I had into it and tried not to worry too much about the things I couldn't get to. Sometimes it was grim determination that got me through. I learned the value of just slogging along, putting one foot in front of the other and moving on to the next thing to be done."

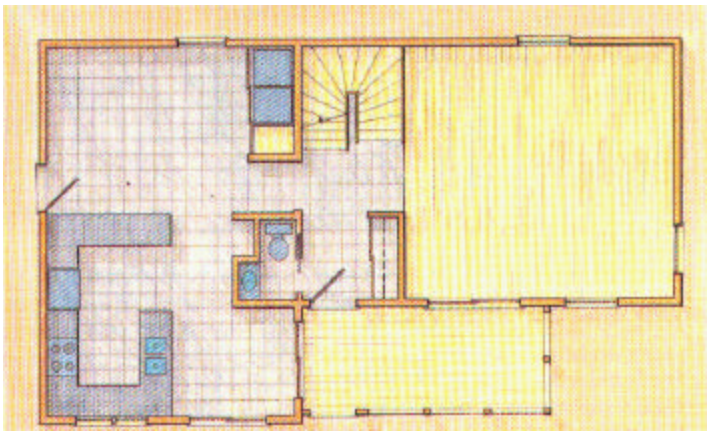
While she might have believed she was just slogging along, others were impressed with the job she did. "If I had to rate all the owner-builders I've dealt with, she'd rank with the top two or three," Wade says. "You know, there are some jobs where the workers grit their teeth every time the owner comes in sight, but everybody was always glad to see Laurie, and everybody wanted her to succeed."

EARLY IN THE DESIGN PROCESS, architect and client agreed to use structural stress-skin panels instead of conventional "stick-frame" construction. These panels are made by cladding a thick sheet (4 feet wide, at least 8 feet long and at least *Wi* inches thick) of rigid foam insulation with plywood, waferboard, or gypsum wallboard. *Structural* stress-skin panels, which are used to build load-bearing exterior walls and roofs in houses without frames, are clad on both sides with exterior-grade plywood or waferboard. (Nonstructural panels that will be supported by a post-and-beam frame can have gypsum wallboard as an interior surface.) This sandwich-style composition yields a building component that is both strong and uniformly insulated.

Stress-skin panels have long been used commercially to build large refrigerators for food-processors and restaurants. Their use in residential construction began in earnest in the late 1970s. Not surprisingly, Wade was one of the earliest advocates for stress-skin construction in new houses. In many of his early house designs, nonstructural panels are fastened to a post-and-beam frame.

In stick-frame construction, quite a few days

Waisel opted for an L-shaped floor plan with an economical layout. A half-bath, the front entry and a closet fit in a space of only 5 by 10 feet. A large mudroom off the kitchen provides ample space for the paraphernalia of country life. The deck outside the front door will be added later.



FIRST-FLOOR PLAN

are required to erect the frame, nail up exterior sheathing and install insulation and interior drywall. Structural stress-skin construction achieves all these steps at once. Labor savings are significant, and the house can be "weathered in" quickly. Panel construction also creates a tightly sealed building, with no framing members to interrupt the insulation.

For all its advantages, stress-skin construction continues to spark controversies among builders and architects. When Wade first started using panels over 10 years ago, cost and availability were problematic. Panel manufacturers were few and far between, and a freshly cultivated residential market had driven prices up. A 4x8 panel could easily cost $50 or $60. Shipping was another limiting factor, given the bulk of an average order and the long distances between manufacturers and building sites.

Wade's solution to this early stumbling block was to have owner-builders make their own panels on site. The cladding material could be purchased locally. Unfaced 4x8 foamboard in different thicknesses could be ordered fairly economically from regional distributors. Ambitious owner-builders could take on the laborious job of gluing these huge sandwiches together. The crucial ingredient in making panels is the adhesive used to bond sheathing or interior wallboard to foam, and even though delamination of some factory-made panels was a problem at first, Wade didn't give up, ultimately finding several suitable adhesives and revising his techniques for on-site fabrication.

By the mid-1980s, stress-skin panels had become a mainstream item in the building industry. Panel manufacturers had proliferated, delamination problems had largely been solved, and experienced builders had found reliable tools and techniques for handling these oversized building components. Panels are now cut to size using large circular saws or modified chain saws. Special tools are used to rout channels to accommodate the splines that fasten adjacent panels together. Manufacturers even supply panels with pre-cut channels for electrical wiring. These have reduced some of the aggravation and expense associated with electrical work on early panel houses.

Panel sizes have expanded too; some companies now offer giant-sized panels up to 8 feet wide and 28 feet long. Increasingly, builders are specifying larger panels, and they use a crane to maneuver these unwieldy slabs into position. An experienced crew can erect the shell of a house in a day or less. Openings for doors and windows are sometimes pre-cut at the factory and sometimes cut after the shell is up. The inherent strength of the stress skin makes it possible to cut openings for small- or medium-sized windows just about anywhere.

The virtues of stress-skin construction have, however, recently been tarnished by concern over ozone depletion. The urethane and extruded polystyrene foam used to make some stress-skin panels requires the use of chlorofluorocarbons (CFCs). These highly volatile compounds are a major cause of atmospheric ozone depletion, and as a result, most panel makers have voluntarily altered their urethane formulations to reduce CFC use.

Fortunately, many stress-skin panels are made using expanded polystyrene foam (EPS), the same material used to make foam coffee cups. The manufacture of EPS still relies on petroleum products, but it doesn't require CFCs. EPS is slightly less insulative than urethane foam and has a lower melting point, but in a properly designed structure, these factors needn't compromise safety or energy performance.

Balancing the environmental equation somewhat, stress-skin construction uses far less lumber than stick-framing, thus offering a way to reduce the amount of wood required for house construction.

"To make the most of stress-skins, it's important to have a good design," Wade says. Panels are still expensive, so the key is to avoid off-cuts and other waste. Just the same, Wade feels that too many poorly proportioned, boxlike houses result from panel construction. The challenge is to exploit the qualities of factory-made components while creating a house that has good proportions and well-crafted details.

Structural stress-skin panels—foam insulation sandwiched between two layers of exterior-grade sheathing— were used for Waisel's house. No framing is needed with this type of construction, yet it yields a building that is both strong and uniformly insulated.

TO ERECT THE SHELL OF WAISEL'S HOUSE, Wade enlisted Bob Dakin, a timber-frame builder with considerable experience in using stress-skins. Together, Wade and Dakin went over the house design, working out panel sizes and configurations. For the exterior walls, they decided to use panels 8 feet wide, 14 feet long and 6% inches thick. The 5 1/2-inch EPS foam core of these panels has a measured R value of 22.6. Tilted on end, each of these large panels extends the full height of the wall. Only the gable-end walls required additional triangular sections to reach the roofline.

For strength and rigidity, the large wall panels were made using 7/16-inch-thick waferboard "skins." Normally, exterior siding is applied after the shell is completed. In the interest of saving time and money, Wade proposed that Waisel's

wall panels be supplied with exterior siding in place, in the form of 3/8-inch-thick fir plywood with a rough-sawn exterior. Laminating this extra layer to the exterior waferboard added slightly to the cost of each wall panel, while saving at least $4,000 in labor and materials for a separate siding job. Rough-sawn batten strips were installed vertically on the exterior walls to cover joints between panels. Additional vertical battens, nailed to the siding every 8 or 10 inches, give the exterior a board-and-batten appearance. Both Wade and Waisel liked this traditional rustic finish, and the cost-saving benefits were difficult to turn down.

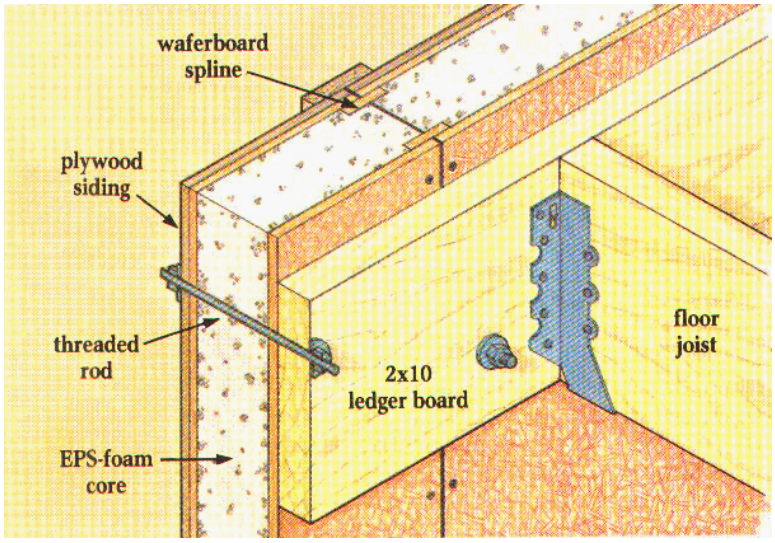
Panels for the roof also required 7/16-inch-thick waferboard skins. The exterior waferboard sheathing served as a nailbase for roof shingles, while the interior waferboard was covered with drywall. In planning the roof layout, Dakin expressed concern about the complex cuts that would be required for panels in the valleys where both gabled roofs intersect. Rather than relying on the manufacturer to make the compound-angle cuts, Dakin and Wade decided tc frame the valleys conventionally with rafters.

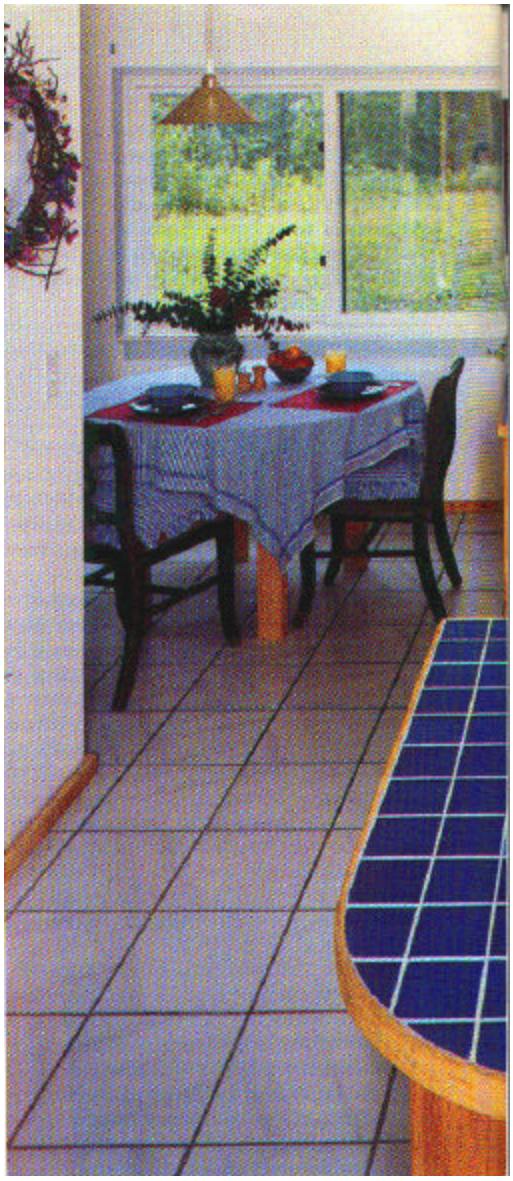
To expedite construction, Dakin devised a coding system, keying each panel to its installed position on the plans. But when Dakin and his crew arrived at the construction site, they found that the panels hadn't been coded according to instructions. It took some doing to identify some of the panels that had been pre-cut at the factory to fit into specific locations. And the 8x14 wall panels proved to be unwieldy monsters. Forgoing a crane to save money, Dakin enlisted a local contractor with a front-end loader to help hoist the 500-pound slabs into position.

In Wade's design for the roof, panels are allowed to extend beyond the walls to create 8-inch eave overhangs. Gable-roof overhangs (also 8 inches) were built out from the edges of the roof panels, using standard-dimension lumber. This extra framing took a couple of days to complete after the roof panels had been installed.

Making Connections

AT THE WAISEL HOUSE, vertical joints between panels were secured with waferboard splines that fit into routed grooves. As soon as the walls were up, the builders could install the second-floor joists. To install floor joists between stress-skin-panel walls, ledger boards need to be secured to the interior waferboard skin, using structural panel adhesive and1/2-inch-diameter threaded rod that extends through ledgers and panels. Washers and nuts are tightened to pull each ledger fast against the inside face of the panel.





Throughout the interior, the waferboard sheathing on walls and ceilings had to be covered with 1/2-inch drywall board. Aware of the problems that foam-core walls can present to plumbers and electricians, Wade located utihty raceways in stud-framed partition walls or joist bays.

Given the small size of the house and the inherent tightness of stress-skin construction, Wade specified a forced-air heating system driven by nothing more than a heat exchanger instead of a conventional furnace. When neces-sary, air drawn in through the heat exchanger can be warmed further: it is blown over a coil of hot water from the gas-fired hot-water heater.

As interior finish work proceeded, Wade, knowing that funds were running low, offered to find secondhand doors to fill the vacant open-ings in partitions and exterior walls. Salvaged materials have become one of his trademarks over the years, and the pickup-load of doors he

Waisel liked the look and easy maintenance of tile so she used it for the kitchen countertops as well as the floor. By installing it herself, she saved a substantial amount on labor. Peninsula counters increase storage space, which is at a premium in a small house.

found for Waisel saved hundreds of dollars while adding years of character to the house.

Wade also found a good deal on tulip poplar flooring at a sawmill near his home. Waisel had wanted a wood-strip floor in the living room, but balked at the price of the tongue-and-groove oak flooring that is standard fare at most lumberyards. The bargain-priced poplar is light in color, with rich figures of purple and brown running through it. After carpenter Steve Newkirk finished installing the floor, there was enough poplar left over to make Waisel's dining table.

And ultimately, Wade's idea for the spiral stairway came to fruition. Following drawings from an old German book on stair making, Dakin carefully laid out a serpentine pattern of mortises for stair treads in the 8x8 timber that would become the stairway's central post. Newkirk was then able to drill out the mortises and chisel them square to receive the tenon on each tread.

When Waisel moved in a year ago, the polyurethane finish on the living-room floor was barely dry. Floor tile for the entry and kitchen was still in boxes, resting on the plywood subfloor it would eventually cover. Interior trim was missing from most windows and door frames. And upstairs, Waisel decided to leave the guest bedroom and its separate bathroom unfinished until she had more time and money.

The house wasn't as close to completion as Waisel had hoped it would be, but her sense of accomphshment wasn't diminished in the least. Lacking in building experience and constrained by a tight budget, she had still managed to build a delightful home - a home that belonged to her in a way no other could. "In the end," she says, "I was able to look around me and see that it really was the house I had planned." ?

Tim Snyder wrote "Back to School" in Number 23.

SOURCES

Prices and specifications vary considerably among manufacturers of stress-skin panels. Most panel companies supply installation details, including recommended joinery techniques at corners, sills, eave-wall junctures and other connection points. Some companies will offer to pre-cut panels for window and door openings, while others will even produce odd-shaped panels for roofs. For a list of panel suppliers, contact:

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