A Timber-Frame/Modular Hybrid House

This economical house design features factory-built rooms that surround a post-and-beam core

BY LIBBY SCHROEDER

My husband and I like to think of ourselves as practical people who aren't afraid of a challenge. For years, we've dreamed about building a post-and-beam house for our retirement. We had always admired the tradition of timber-frame construction and liked the bright, open spaces in the timber-frame homes we've seen. Lush post-and-beam catalogs whetted our appetites. We also wanted a house that was large enough to accommodate visiting children and grandchildren. However, because all the prices we were quoted for post-and-beam homes ran over $120 per sq. ft., we had to rethink our plans.

Engineering a compromise

During our research of several companies, we met Kent Natirbov of Pre-Engineered Housing (6752 Old McLean Village Drive, McLean, VA; 703-827-8203), a design and supply company. After we discussed our situation, Kent assured us that we could save money by incorporating a timber-frame center attached to factory-built modules. Frankly, the concept of prefab housing bothered us; like many people, I think we confused *modular* with *mobile*. A tour of Kent's preferred modular subcontractor, Nanticoke Homes Inc. (800-777-4561) of Greenwood, Delaware, changed our minds because their level of quality control was so impressive. Moreover, we could customize any part of the design as long as we didn't deviate from the width of the module.

Designing in concert with Kent, we planned a total of six modules for the entry, kitchen, powder room, laundry, master bedroom/bath, two upper bedrooms and baths plus study (floor plans, p. 105), all built around a timber-frame great room. We decided to use panelized construction for the garage only; we've found it's a faster method, especially when there's a crane already on site. A long, open front porch and screened-in back porch would be stick-built on site.

Careful planning is the rule

There is no turning back in the modular world. Modules arrive complete; everything from drywall, plumbing and wiring to switch plates, windows and doors is installed at the factory. There would be no way to change door openings or sink locations once the plans got to the factory floor.

Due to width limits on most U. S. roads, modules can be put together to make large rooms, but no individual "box" can be wider than 14 ft. For example, to design the 15-ft. by 20-ft. master bedroom, one module needed to be 13 ft. by 20 ft. That meant the fac-

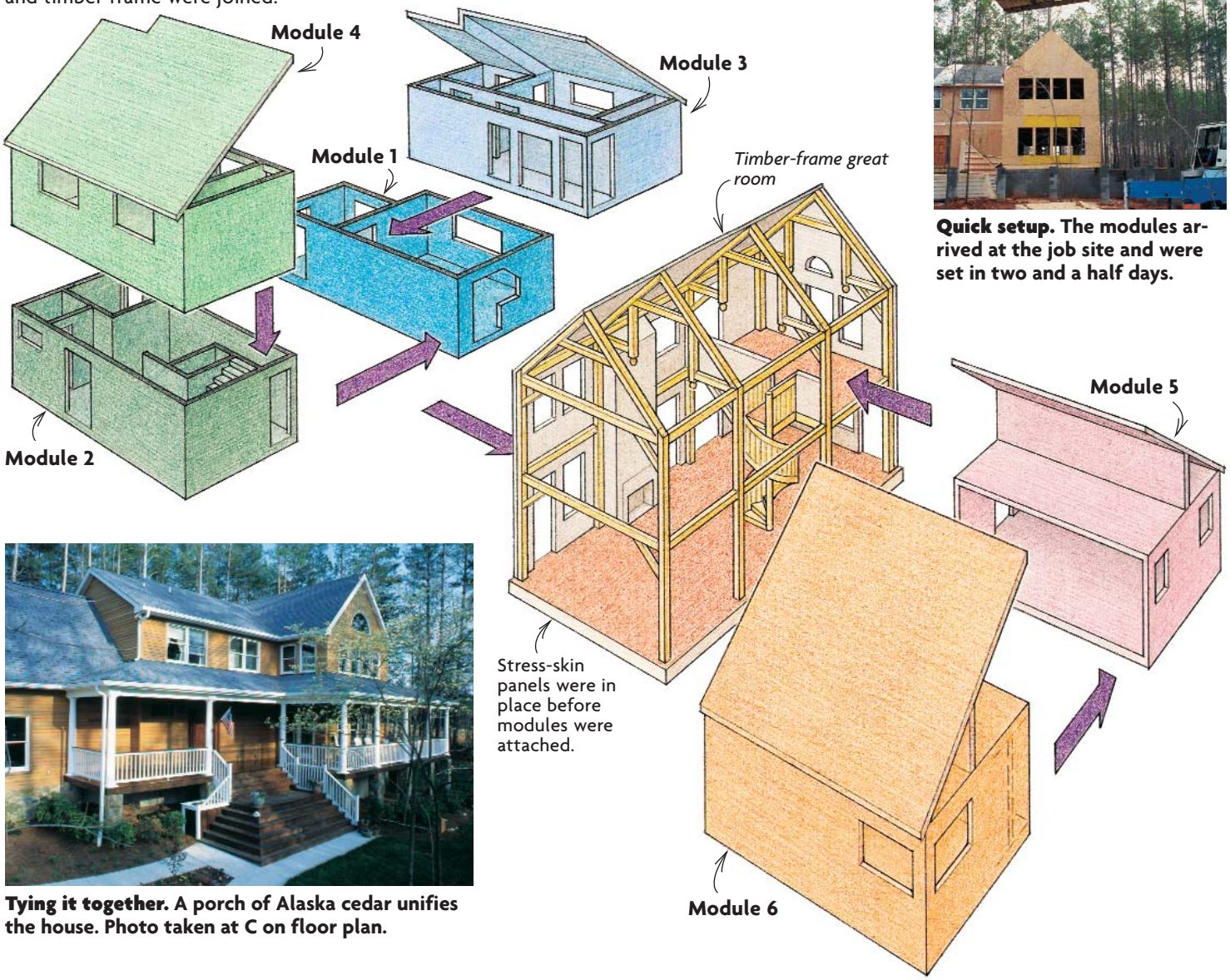
Marriage wall is the only hint of a prefab. Because the modules and great room were built as independent units, the wall thickness doubled where they were joined together. The only evidence is visible in the extra thickness of framed openings. Photo taken at B on floor plan.

ing bathroom and closet module would contain the extra 2 ft. of the bedroom's width.

We also had to consider the placement of doorways and halls that linked the great room to the modules. Because the modules' door openings are in place when they arrive, the finished floor heights in the timber frame had to match exactly. To allow for variations, the great-room plan called for approximate door measurements; smaller-

INTEGRATING THE TIMBER FRAME AND THE MODULES

Each factory-built module arrived at the site as a freestanding unit ready for installation. Hurricane ties on 16-in. centers strap the modules to the foundation, to each other and to the timber frame. To avoid a misalignment of interior doorways, door openings in the timber frame's stress-skin panels were left rough and trimmed to size after the modules and timber frame were joined.



Quick setup. The modules arrived at the job site and were set in two and a half days.

Tying it together. A porch of Alaska cedar unifies the house. Photo taken at C on floor plan.

than-final size openings were cut out of the stress-skin panels (prefab sandwiches of oriented strand board, rigid insulation and drywall) to provide flexibility in the final matching with the modules. Exact door and opening sizes would be cut and framed later.

Electrical planning became important as well. Five separate electrical subsystems—two from Nanticoke, one each for the great room, garage and stick-built porch—had to be carefully planned so that they could be wired into the main electrical panel under the kitchen module with relative ease. The wiring for the great room had to be installed as each stress-skin panel was put into place. It's difficult to go back and bore long chases to pull forgotten wires. The plumbing in the modules would be installed in the Delaware plant but later tied together in the basement.

Crew scheduling is critical

Unlike houses built by one crew, our house was built by a number of specialized crews, so one of the most important tasks became crew coordination. With help from construction manager Tony Mariano, we undertook the general-contracting job, knowing full well that it would add to the stress but would save money in the long run.

Once the foundation (one crew) was in and the timber frame erected (another crew), we needed a third crew to set modules in place.

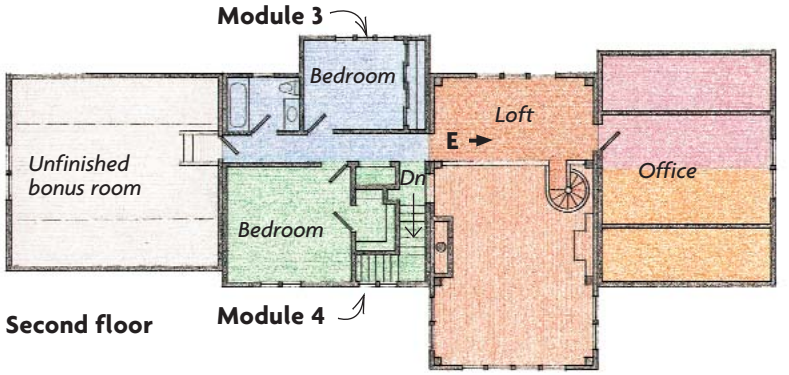
With the modules set, we would need a fourth crew to integrate the modular and timber-frame sections. It was a rainy fall; if these roof and sidewall junctions were not linked together as soon as possible, rain from the next storm would leak down into the great room and damage the drywall interior of the stress skins. Last, the roofing crew was scheduled to shingle the post-and-beam section and to weave all the roofs together.

Concrete-block foundation

In this region of the country, concrete-block foundations are the norm rather than the exception. Our foundation walls had to be both sturdy to support the weight of the

Drawings: Vince Babak. Photo right this page: Libby Schroeder.

Module size determines floor plan. Due to transportation restrictions, each module was limited to a maximum width of 14 ft. The kitchen, front hall, upstairs bedrooms and bath are built with four modules, essentially one per room. Designing larger rooms such as the master bedroom meant reapportioning the space among two modules.



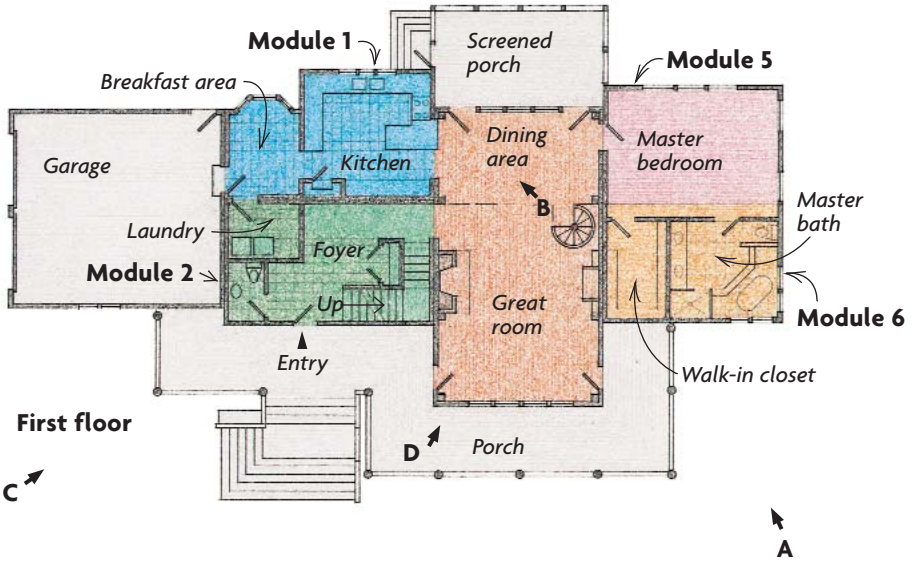
SPECS

Bedrooms: 3
Bathrooms: 2½
Size: 4,393 sq. ft. (includes heated basement)
Cost: $74 per sq. ft.
Completed: 1998
Location: Mooresville, North Carolina
Architect: John and Libby Schroeder, Kent Natirbov

North

0 2 4 8 ft.

Photos taken at lettered positions.



house and wide enough to accommodate the side-by-side wall plates where timber frame and modules met. To make sure that there was ample room, Kent specified 12-in. wide block. The entire block foundation was grouted in every cell and reinforced with vertical rebar at 3-ft. intervals. Kent also incorporated block piers that would support the marriage walls of the master-bedroom modules and the carrying beam that runs beneath the great-room/master-bedroom walls.

Once the foundation was complete, Decelle Post and Beam of Elkin, North Carolina, began erecting the frame. Aided by their computer-generated design, Del, Harold and Eric Decelle had cut and assembled the frame in their shop, broke it down and trucked it to the site. They reassembled the bents on the ground and hoisted them into position with a crane. Stress-skin panels completed the first section of the house. The entire process took six weeks.

The modules stack up fast

Scheduling the exact day for module arrival was complicated by weeks of rain that cleared once or twice a week. A lead person came down from Nanticoke to manage a local set crew; his careful briefing developed good crew coordination.

The next two days were exciting for us after all of our months of planning. The plastic

Analyzing the costs

by John Schroeder

When it comes to estimating the actual cost of building a house, everyone seems to have a different method. Most costs are based on heated living space. When I sat down to see where the money went for our house, I added up the total square footage of the house; I included the garage, the porches and the basement. Each part of the house was built using a different method of construction; I thought it would be instructive to see the relative cost of each type of construction. Here's how the parts of the house broke down:

Modules	2,072 sq. ft. @ $105 per sq. ft.
Timber frame	1,007 sq. ft. @ $118 per sq. ft.
Stick-built porches	843 sq. ft. @ $42 per sq. ft.
Panelized garage	528 sq. ft. @$61 per sq. ft.
Concrete-block basement	1,314 sq. ft. @ $16 per sq. ft.

Ultimately, the modular portion of the house was closer in price to that of the timber frame, but the modules also contained the most expensive rooms in the house, the kitchen and bathrooms. The garage costs look a bit high until you consider that it's insulated and drywalled, and has a roughed-in bonus room that's accessible from the second-floor hall. On paper, the porches look like extravagant places for people to use occasionally, but how much do you want to pay for aesthetics? The front of the house wouldn't look right without the porch and wide steps. You just have to swallow hard and tell yourself that it was worth it.

—Retired from careers in the U. S. Air Force and the aerospace industry, John Schroeder can now concentrate on local aeronautics.

Great room showcases the timber-frame design. The inspiration for the house, the red-oak timbers create a space that's open and inviting. Built-in bookcases provide smart storage around the oak spiral stairs that climb to the loft. Photo taken at D on floor plan.

Upstairs office space tucked away under the eaves. **Seen from the loft area, a 12-in-12 roof above the master bedroom gave the owners space for their skylighted office. Photo taken at E on floor plan.**

wrapping on each module was removed, a huge crane lifted each unit, and the set crew guided it all into place (photo right, p. 104). The crew pushed to do the job and to set the six modules in two and a half days, despite horrendous mud and rain. We kept sneaking inside to see how everything lined up and to check on the features that we had ordered but had never seen. After they filled in the gable ends and pulled off interior supports, the set crew strapped the modules to the foundation with hurricane ties on 16-in. centers. Although the modular and timber-frame sections were freestanding, the crew also tied the sections together on exterior corners, using three galvanized angle brackets per story.

The site-built roof extensions, called overbuilds, were the last link between the post and beam's exterior and the newly set modules. Unfortunately, due to rain delays at their previous job, our scheduled framers arrived late, which resulted in water damage for the house and sleepless nights for us. But additional spackling, sanding, caulking and time repaired these problems.

Trim work unites disparate sections

After so much activity, the pace of the finishing work seemed to drag on. But as the garage, porches and cedar clapboards were added, our house became more horizontal, blending into the wooded setting. When painted, the white trim and porch details provided a nice contrast (photo left, p. 104).

Inside, openings between the modules and the great room were finished (photo p. 103). Pine window frames and moldings in the great room were stained to match those in the module. We indulged ourselves and bought clear heart pine for the great-room floor (photo facing page). When the 6-ft. dia. spiral stairway (York Spiral Stair, North Vassalboro, ME 04962; 800-996-5558) was installed on the newly varnished wood and we could ascend to the balcony above (photo above), we knew that the parts of our house had finally knit together as planned.

Once the dust settled, we crunched numbers to see where the money had gone. After factoring in porches, heated basement and garage, we were surprised by the results (sidebar p. 105). The modular part of the house cost only 12% less than the timber frame, a figure probably due to the kitchen and bathrooms, high-cost rooms in any house. Tile and hardwood floors, solid-surface counters, the geothermal heating system and a 100-ton crane also pushed up the modular price. Still, if we had timber-framed the entire house, the cost would have been much higher.

By using modular construction, we primarily saved a great deal of time, but we were also able to control cost and quality. We saved money by taking on many of the management and design tasks ourselves; our sweat equity also included a big chunk of the electrical work and some finish carpentry. □

Free-lance writer Libby Schroeder lives in Mooresville, NC, with her husband, John. Photos by Charles Bickford, except where noted.