Site-Built Modular Addition

by Rick Johnson

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Using a crane made it possible to frame the second-story addition on the ground and minimized the time the house was open to the weather

Three years ago, an article entitled "A Second Story in Five Days," by Chuck Green, appeared in the *Journal* (3/93). In that article, Chuck tells how he lifted the entire roof off of a house with a crane, lifted preframed walls for a second-story addition into place, then set the original roof back on top of the new walls. The story couldn't have been more timely for me: I was in the middle of negotiations for a second-story master bedroom addition and was considering a similar approach. The main difference was that I was contemplating building the entire 600-square-foot addition on the ground. The article gave me a good sense of how the job might work and the confidence to win the contract.

I saw a couple of advantages to the crane approach: We would save on labor by building on the ground, rather than having to move men and materials up onto the roof. It would also be easier to square and rack the unit on the ground. At the same time, we would leave the existing home in the dry longer (we were moving into the rainy season), and the owners could continue living there with minimal disturbance — a fact they especially liked.

Preliminary Investigation

There were two important questions we had to answer before any work could begin: whether the existing framing and foundation could handle the addition, and whether there was working room for a crane to set up, boom out, and lift it into place.

Detective work. Even though there was a designer on the project, it was up to us to make sure the structure could handle the new loads. We started by locating and measuring the existing bearing walls that the addition would sit on. Crawling around in the attic, we decided that the best way to

Figure 1. *The author's crew framed the 32x18-foot addition on built-up beams supported on cement block piers (above). Hangers attached to the floor joists held the steel I-beams used to lift the addition (left).*

Figure 2. *Short kneewalls built on top of first-floor bearing walls support the addition (left). To avoid exposing the lower story to the weather, the carpenters opened only as much of the roof as necessary to frame the kneewalls (above).*

support the second floor was to build a short kneewall on top of the existing top plates, creating a 2-foot cavity between the first-floor ceiling and the second floor. This would leave the existing wiring and insulation in place and allow room for new ductwork.

Foundation. Next, we crawled under the floor to make sure that the foundation could support the additional weight of the addition. We were pleasantly surprised to find that the foundation footing, made of poured concrete with Coquina shells (a common aggregate here in Florida), did not have a single crack. It was 30 inches wide and a consistent 8 to 10 inches in depth throughout. The brick stemwall was in good shape, with only a few voids that we would fill to provide continuous support under the bearing walls.

Lining up the crane. I next met with Jim Bryson of Bryson Cranes in Daytona Beach, Fla., to go over the plans and make sure there was enough room for him to work. He advised that we build the addition 24 inches off the ground so we could slide two 12-inch-deep steel I-beams (to be provided by Bryson) under the floor for the crane to lift by.

Platform Framing

The first order of business was to build piers on which to frame the deck. We used concrete block and pavers for the piers and set double 2x8 girders across them (see Figure 1).

The floor framing was 16-inch-deep wood I-joists, 18 feet 6 inches long, with 2-by southern pine band joists. Once we had a level deck in place, wall and roof framing went smoothly. We installed the roof trusses with metal straps (Simpson H7s) rated to withstand 125-mph winds.

Once the roof was on, we stapled R-30 Kraft-faced batt insulation in the floor of the addition so we wouldn't have to do it from inside the attic afterward. We also built "hangers" — five for each side — to support the I-beams before the lift. Using 2x4s, plywood, and 1-inch galvanized pipe, we built them so they were beefy enough to handle the 1,000-pound weight of the steel beams.

Getting the Roof Ready

Building the two kneewalls in the attic was definitely the most grueling part of the whole job. There was little

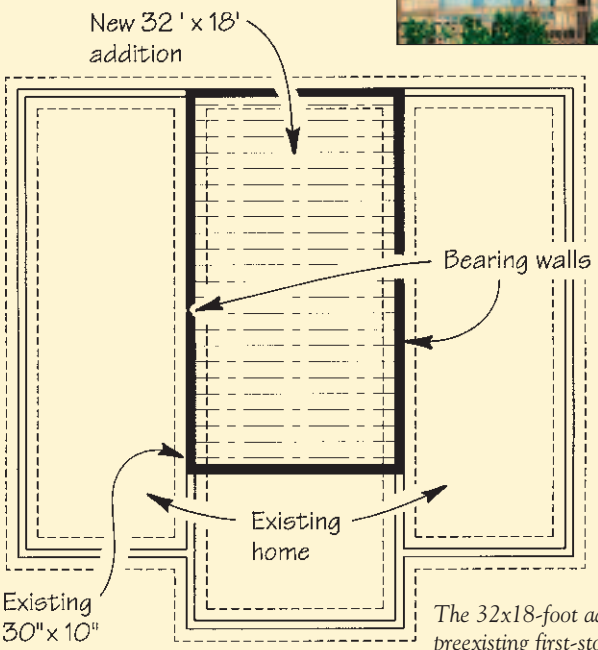
ventilation, and the existing insulation was of the blown-in variety (dust masks helped, but not much). We cut an access hole in the roof and covered it with a hinged hatch cover and a tarp, to avoid having to go through the house every day. This allowed us to start work in the attic at 7:00 a.m. and get out by noon, when the heat began to get too intense.

We used a combination of strings, levels, and even a transit set on the roof ridge to accurately lay out, plumb, and square the 30-inch-high kneewalls. Because some sections of the kneewalls were higher than the existing roofline, we cut out narrow sections of the roof as needed, but left most of the roof intact for as long as possible (Figure 2).

To make sure the kneewalls were secured against uplift forces, we tied the kneewall studs to the existing studs below with Simpson LSTA straps (rated at 440 pounds). Finally, to strengthen the wall against lateral forces, we nailed plywood across the kneewall and the top 12 inches of the studs below, using 8-penny ring-shanked nails.

On the inside. We also had to beef up the bearing walls inside the house. We made sure we had studs 16 inches on-center, adding them where necessary. We also retrofitted double 2x12 headers above all door openings, ripping off the drywall as necessary rather than stripping the entire wall.

Before and After



The 32x18-foot addition is supported on preexisting first-story bearing walls that in turn are supported by a wide footing and stemwall foundation. The author had to retrofit studs and headers in interior bearing walls and fill up voids in the stemwall.

Liftoff

On the day the crane was scheduled, I increased my crew to nine men, plus a two-man crane crew. (We needed everybody, as it turned out.) We arrived at 7:00 a.m. and started removing the roof while the crane crew set up. We had hoped to have the crane assist us in removing the roof in large sections, but because the crane setup was going to take a while, we did the roof demo by hand.

Next, we began the process of rolling the steel I-beams underneath the addition — the most difficult task of the day. We used a dolly to roll each beam up to the first hanger. It then took all nine of us to muscle them through all five hangers into place. By 11:30 we were ready for liftoff.

We took a ten-minute break while the crane operator told us what each of our responsibilities would be. We were divided into two groups, a ground crew of five men responsible for attaching and balancing the addition, and a placement crew of four responsible for guiding and setting the load. Jim Bryson suggested cutting through the roof and floor of the addition in order to get a straight-line tie-in to the I-beams below.

Once the addition was airborne, we guided it with lines attached to each corner until it settled on the marks we had made. The lift went off without incident, and the addition sat down perfectly on the kneewalls. The scale on the 100-ton crane said the addition weighed in at 13,350 pounds.

With the addition in place, we began to remove the I-beams. Two of us went underneath and cut away the hangers as the rest of the crew worked from the roof pulling the beams out. The crane assisted by tugging on and supporting the end of the beams. Once a beam was three-fourths of the way out, the crane could balance and support the load. By 12:30 the crane was finished and leaving the site. Overall, I'm very satisfied with how this job went. I estimate that framing the addition on the ground saved a week or more of labor, plus it enabled me to use a smaller crew. The local newspaper ran a big photo of the crane in action, and because I accomplished something that had not been done in this area before, the job has helped solidify my position in the market. ■

Rick Johnson is owner of R/J Group Inc., a custom building and remodeling firm in Port Orange, Fla.