Raising the Roof

For speed and safety, frame on the ground

BY LEE MCGINLEY

My least favorite part of house building? Easy call: the roof. While I enjoy the challenge of working complex layouts—such as skewed roof intersections at different pitches—typical trussed roofs present few intellectual challenges or aesthetic compensations. Given the risks involved with wrestling with heavy materials in high winds far above solid ground, I'd rather pass. Then it occurred to me that my crew and I could eliminate the danger and discomfort of framing and shingling a roof by doing everything on the ground. I was more than a little excited by the idea.

With frigid weather fast approaching our area in northern Vermont, I was also eager to use a method that would save time. And this particular roof was a good candidate for this somewhat novel approach: Stack the trusses on the ground, sheathe and roof the structure, then lift the whole assembly using a crane. The house was a new two-story, 26x28 with a 20x20 ell, built on a relatively flat site. It had two roof sections, each with a 10/12 pitch and simple trim details; there were no fancy overhangs on the rake or eaves, only flat trim that could easily be installed later while clapboarding the house.

Photos: Lee McGinley

FRAME, ROOF, LIFT

A local crane operator assured me that my project was "doable" and that I need not worry about his equipment distorting the roofs or


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otherwise causing them to need remedial work. He told me where to position the roofs in relation to the house to facilitate the hoisting.

I broached my plan to the two carpenters working with me. They were enthusiastic about not having to lug materials and equipment up two stories, and of course the safety aspect was important to them, too. We all recognized that when working in easier conditions on the ground, we would be less tempted to take shortcuts that might compromise quality than we would be when working higher up.

I knew precision layout would be important, but that wasn't a serious concern because my crew consistently frames to ⅛-inch tolerances. Some research led me to the next essential: a roof-truss manufacturer that could deliver a consistent product. High quality was critical because we would need to factor in some "wiggle room" so that the trusses could be set atop the wall framing with enough clearance that we could finesse them into alignment.

PREPARATIONS

Trusses ordered, I sourced rough-sawn 4x8 and 6x6 timbers locally. They would be the "runners" on which we would set the trusses **(photo, page 45)**. We framed each roof section separately, beginning with the smaller one. The site had a slight downward slope, so I placed one row of the rough-sawn timbers on the uphill side, extending each end about 3 feet beyond the planned length of each roof. I elevated this row about 1 foot above grade using jobsite scraps.

Next, I placed a second row of timbers parallel to the first, spaced 2 feet narrower than the width of the trusses. I tied the ends of each set of timbers together with 2x4s so they would stay parallel. With a helper, I shot elevations and leveled the timbers, keeping to our ⅛-inch standard.

I then snapped a line 4 inches in from the edge of the uphill timbers **(1)**. Measuring across to the downhill timbers, I snapped a second, parallel line. These parallel lines, marked out on both sets of runners, served as reference points.

Each set of runners was longer than the length of the roof it would support, so I arbitrarily marked a point 2 feet in from one end of each row on the uphill timbers. From that point, I measured the length of each roof: one at 20 feet, the other at 26 feet.

Knowing the distance between the parallel lines on each row and the length of each roof, I calculated the hypotenuse. Using two tapes, I located a third point on the snapped line of the downhill


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row. The fourth and final point was located by measuring the length along the snapped line. I checked my triangulation by beginning at opposite points. Now I had a perfectly square footprint. With eight man-hours invested in setting the timbers and layout, we were ready to frame.

FRAMING

We laid out the trusses along the snapped lines and nailed 2x4 blocks perpendicular to the lines to serve as stops for the trusses to bump against as we set them **(2)**.

Since the smaller (20x20) roof was built several feet from a new garage, we braced the first gable truss to that **(3)**, then set the remaining trusses using Simpson's Spacer Bracers (strongtie.com) at three points along the top chord **(4)**. We aligned the end of each bottom chord 8 inches from the snapped line on the uphill timbers.

We checked for plumb and verified the on-center layout, then nailed on the lateral bracing required by the truss manufacturer **(5)**. Down the middle, I nailed two 2x6 catwalks to facilitate blowing in loose-fill insulation. We also stiffened the assembly by nailing on 2x6s 2 feet in and parallel to the ends of the trusses. Cross-bracing the truss webs also stiffened the assembly. I checked diagonals along the roof plane on both sides of the roof and they were right on.

The gable-end trusses were the same design as the common trusses so the steel rails used to raise the roof would apply uniform pressure on the roof. The gables were sheathed on the ground, with cutouts where the rails would slide into place. Two-by nailers backed up plywood seams; mending plates were secured behind to strengthen the connection.

SHEATHING BOTTOM UP; SHINGLES TOP DOWN

Sub-fascia was next. Beginning on the smaller roof, we used full-length 20-foot 2x6s to avoid the flexing that might occur with a joint.

I laid the sheathing out from the peak down, which left a 20-inch opening at the bottom of the smaller roof, giving us a grab hole to move the airborne roof into place, as well as allowing room for fastening the trusses to the top plate. Starting 20 inches up from the sub-fascia, we nailed on the first course of ⅝-inch plywood sheathing **(6)**. When we got to the top, we reversed course and shingled from the top down.


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Since roofline trim would be installed when the house was clapboarded, I tacked on spacer blocks that simulated the width of the rake trim and eaves fascia before running the drip edge **(7)**, which was nailed in place as we shingled.

We laid out shingle courses from the eaves drip edge so weather exposure would be consistent. We measured down 6 feet from the peak, found the closest layout mark, snapped guide lines—which aligned the top edge of the shingle—and shingled up. The first course of shingles was nailed at the top so we could slip the last course from the next layout group under it before nailing off that course. We repeated the process until we were within a course of the opening at the eaves **(8)**.

Before the lift, we ripped plywood the width of the eaves opening and tacked it onto the roof above the opening so it would be lifted by the crane operator. This way, we could easily reach it from staging on the wall brackets to complete the sheathing and shingling once the roof was up.

We followed the same procedure for the larger (26x28) roof, bracing it to the smaller roof. I was able to source 28-foot-long Douglas fir 2x10s, from which I ripped 2x6 sub-fascia. This eliminated any splices, reducing possible flexing. Drops from the rips were used for bracing. As a final step, we nailed in place a 2x10 catwalk.

UP & AWAY

On roof-raising day, two cranes arrived at 8 a.m.; one small (10 tons) to set the steel rails, the larger (40 tons) to do the heavy lifting **(9)**. Spectators came as well. Though this home is in the country, neighbors with digital camcorders appeared and passing vehicles slowed to a crawl so that drivers could watch.

The big roof would be set first. Two steel I-beams carried its nearly 3-ton weight **(10)**. Rigging this roof took three hours, setting it only 30 minutes. We had allowed ¼-inch clearance on either side of the wall framing for wiggle room. With two tag lines, we placed the roof with little effort **(11)**.

The smaller roof was hoisted on two 8-inch round pipes **(12)**. Probably due to its lighter weight (less than 1 ½ tons), this roof dodged back and forth before settling down.

By 2:30 p.m. the cranes were finished and we set about doing final tweaks with come-alongs and pipe clamps **(13)**. We nailed hurricane clips to the inside and called it a day, after celebrating with a tiny fireworks display.

The following day we nailed off the ripped sheathing and shingled the eaves. It took about 12 man-hours total for two men working together to flash the smaller roof to the gable end of the larger roof section, despite the 20°F temperature.

BOTTOM LINE

Building the roof on the ground was both a time and money saver (see Cost Comparison, right), not to mention the added sense of security it gave us.

Had we elected to frame and shingle the roof in place, we would have sheathed the gable end trusses on the ground and lifted all trusses into place with a crane—a full day's work for a three-man crew and crane. Getting the materials up there would have required two weeks' rental of a Lull with a 56-foot reach, about $900 per week, plus delivery.

I'm beginning to like roofs again—as long as I can build them on the ground.

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COST COMPARISON

Three carpenters worked 2.3 weeks (306.5 worker hours) to build the roof on the ground, lift it into place using a crane, and finish up by nailing down the pre-cut sheathing and shingling the lower section.

Here's the breakdown:

1. Prep (set and level timbers, lay out trusses): 18 hours
2. Set trusses on timbers (includes bracing, sub-fascia, and sheathing): 80 hours
3. On-ground shingling (place drip edge, shingle, apply ridge cap): 60 hours
4. Sheath gable ends (frame up, cut and secure sheathing, attach mending plates): 32 hours
5. Staging setup on house walls: 11.5 hours
6. Crane prep and roof-setting (includes one day of tweaking after setting roof): 30 hours
7. Nail off ripped sheathing fill-ins at eaves: 12 hours
8. Fill-in shingling (shingle at eaves and install step flashing where small roof meets main house): 47 hours
9. Staging take-down: 16 hours

The extra tasks we would have had to complete had the roof been built in place:

1. Material handling: We would have had to move sheathing and shingles into place, either by hand or using a Lull. Although the site only sloped a bit (3 feet over 28 feet), a 56-foot Lull would have been needed to reach the ridge and a two-week rental would have cost $900 per week plus a $150 delivery and pick-up charge.
2. Up and down: To access the work area, we would have had to climb stairs, then ladders to get to the roof.
3. Daily setup, breakdown time: Lugging pneumatics and compressors to the second floor would have added two to three worker-hours daily.
4. Slower pace: While my crew works efficiently and anticipates tasks, the cutting and passing back and forth of materials and equipment—think pneumatic hoses—would have slowed us down.

The one task that would have taken less time if we had framed in the conventional way was sheathing the gable ends on the ground and installing the louvers. We would have used typical gable end trusses for this. I'm guessing it would have taken three of us four weeks to build the roof in place. Add the additional labor and Lull charges (but subtract the crane charges for lifting the roof) and my extra out-of-pocket expenses for building on the ground would have been north of $4,000. *—L.M.*