A Second Story in Five Days

Careful preparation and a large crane kept this addition on a tight schedule

by Chuck Green

PHOTOS BY GERALD EPSTEIN AND CHUCK GREEN

Using a crane to remove and replace this 26-foot-long roof section saved about $2,500 and left the building open to the weather for less than a day.

Last May, my company, Four Corners Construction, added a second story to a three-bedroom ranch-style house. The owner of the house was about to be married in June. Both he and his wife-to-be had children from previous marriages and they needed the extra space for their expanding family. This gave us about six weeks to convert the house to four bedrooms, which involved adding a new master bedroom and bath, plus an office, on the second floor.

What made this project unusual was that we used a crane to remove two-thirds of the existing roof, then replaced it atop the new second level a few hours later. The house was opened to the weather for less than a day. It was an astounding event to all who were there, seasoned carpenters and onlookers alike. In remodeling, you rarely see so much progress in one day.

Adding on by going up with the existing roof meant we would not need to cover an opened house each night, and I liked that a lot. I'd recently heard of a case where a remodeling company had to pay thousands of dollars for damage caused when tarps failed to keep a rainstorm out of an opened building. Plus, demolishing a good roof, paying to have the debris removed, then rebuilding another roof 8 feet higher than the original did not seem to make sense. I figured that, even with the expense of the crane, reusing the old roof would save at least $2,500, and it would certainly shorten the length of the project.

The choice to add the second story on only two-thirds of the house was dictated by aesthetics and a board of health ruling that limited the space the owners could add. Also, for affordability, we chose construction-grade 2x12s to make the beams used to support the roof during the lift; the longest ones available were 26 feet, which also limited the length of the roof section we could remove.

Day One: Preparation

Starting with a two-person crew, we began work on the house on May 1, 1992, a Friday. We met a lot of supply trucks that day, and did some framing work on the first floor to accommodate the new staircase.

Day Two: Demo

On the second day, we removed the lower siding and sheathing from the front of the house. We were planning to replace all the windows and siding on the front and gable end, so we didn't bother to be surgical with this part of the demolition.

Next, we made some structural modifications to the first floor. In order to carry the new loads from the second-story, we had to double the first-floor joists in the front half of the house, where they cantilevered over the foundation. To do this, we pulled off the band joist and removed the basement ceiling, then slid in new 2x8s from outside and sistered them onto the original joists. In the rear, there was no cantilever, so no extra support was needed.

To convert the existing first-floor 2x6 ceiling joists into floor joists would require sistering on 2x10s. Considering how cramped the attic was, we decided to wait until the roof was off to add the 2x10s, when we'd have plenty of room to maneuver. In preparation, we cut a 14-inch square hole in the gable end and passed in the new floor joists. We also passed up the six 26-foot 2x12s that would become the beams for lifting the roof.

We also cut and removed the gutters and removed the top 10 feet of a small chimney that would be in the way of the crane.

Day Three: In the Attic

On the third day, the crew expanded to three. We worked in the very tight attic space, removing the cellulose insulation. We filled 68 30-gallon garbage bags with the old insulation — easily the most grueling part of the job.

After the insulation was out of the way, we reinforced the 26x26-foot section of roof that was to be lifted (see illustration, next page). We attached collar ties to every rafter pair and nailed together the two lifting beams using the 26-foot 2x12s. We used duplex head nails so we could dismantle the beams later. Working over the existing 2x6 ceiling, we set the laminated 2x12 beams in place, then laid what would become the new 2x8 second-story ceiling joists right on top of them. We scribed these new

All in a Day's Work

❶ *A few days before the remodel: The addition will go on the section of the house to the right of the front door.*

❷ *The crane lifted the roof with heavy nylon straps, swinging it over the house and setting it on the driveway. Four square holes cut in the roof provided access to two 26-foot-long lifting beams.*

❸ *After installation of the second-story floor joists, the crane lifted the prebuilt walls into place. Two-by-four bracing, run diagonally from the lifting points to the bottom plate, held the walls rigid.*

❹ *Carpenters nailed, straightened, and braced the walls, then the crane lifted the roof again. Workers on the ground steered it into place with guy lines.*

❺ *With the roof reattached, the author's crew relaxed for lunch. By the end of the day, they had finished the sheathing, tying the new structure to the old.*

ceiling joists to the rafters at each end, cut them, and butted them up tight to the rafters, making the connections with large Simpson metal plates.

We also built two T-shaped strongbacks of 2x8 material and installed them between the beams opposite the lifting points, to prevent the beams from sliding towards each other.

Day Four: Prebuilding Walls

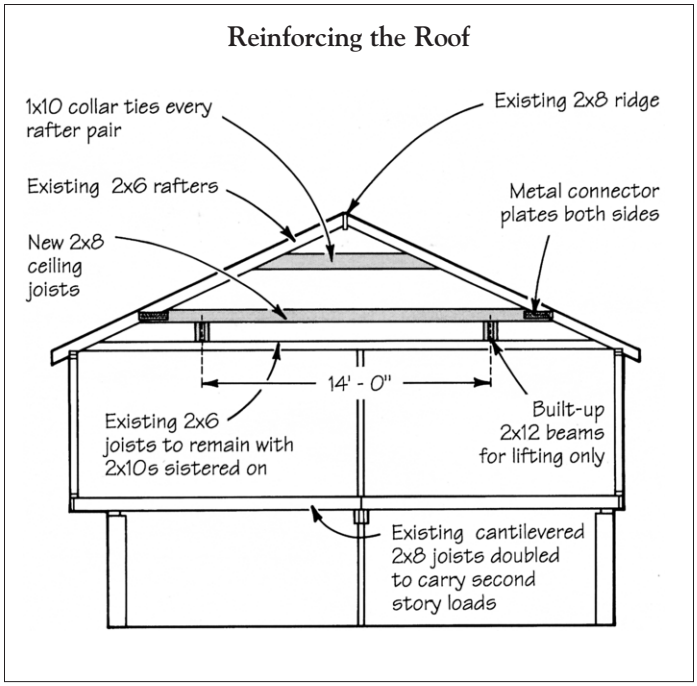
The fourth day I added four more carpenters to the job. Fortunately the weather was nice. We prebuilt the front and back walls of the second story in the front yard. These would give us all the support we would need to set the roof back on. We made sure we stacked the walls properly for the crane to lift them directly into place.

We left off the lower 3 1/2 feet of 1/2-inch sheathing from each wall. This we would install after the walls were in place to overlap the lower floor and tie the structure together. We braced the 2x6 walls for the crane lift with temporary 2x4 braces set diagonally down from the lifting points. We also prebuilt the headers for the gable ends.

To finish out the day, we tore out the old staircase, completed the inside structural modifications, and stripped the gable end of siding.

Day Five: The Roof Comes Off

The weather cooperated on day five — it was a beautiful day. Starting early, with yet five more crew members, we released the roof by cutting the studs and sheathing in



To reinforce the roof for lifting, the author's crew added 1x10 collar ties and 2x8 second-story ceiling joists to every pair of rafters. Two 26-foot-long triple 2x12 beams supported the roof for the lift.

the gable end, pulling the toenails holding the rafters to the top plate, and cutting a line through the roof sheathing and shingles from front to back. We then cut four 10-inch-square holes in the roof above the lifting points on the 26-foot beams.

The crane arrived at 7:30. The operator hung two 14-foot-long heavy-duty steel spreader pipes from cables. From these we hung four strong nylon straps, which we passed through the holes and around the two beams. At 9:30 the crane lifted the roof free of the house and set it on the drive at the end of the house. Nobody was allowed to stand under the roof at any time while it was in the air.

The engineer had predicted the roof would sag 6 inches in the eaves. This seemed unacceptable to me, so I had installed solid blocking along the eaves. This kept the sag to less than an inch.

With the roof off, we immediately started installing the second-story 2x10 floor joists. I had one carpenter cut back the 2x6 floor joists 1½ inches at each end, using a chain saw. We ran the new floor joists all the way to the edge of the existing 2x4 walls to give them a full 3½ inches of bearing, then installed 2x10 blocking between the new joists at the outer edge of the plates. Some on the crew thought this was odd when we could have installed a band joist much more quickly. But it seemed prudent to give the floor joists as much bearing area as possible, even though this meant extra time putting in 36 blocks while the crane idled at $135 per hour.

We then installed T&G plywood subflooring along the front and back of the second floor where we would be setting the exterior walls. We left the rest of the floor open for the plumber and electrician.

The crane switched rigs, reached over the house, and lifted the front and back walls into place. We nailed off, straightlined, and braced the two walls in place. Meanwhile the crane switched rigs again to lift the roof back in place.

It was tricky to get the roof back in its exact location. The crane operator lifted it into approximate position. I put a carpenter at each corner with a guy line. I stood on the untouched part of the roof yelling directions to these carpenters; another man stood next to me to yell directions to the crane operator. We got the roof in place, then installed hurricane ties on each rafter to thoroughly secure it. We broke for lunch about 1:30 as the crane operator packed up.

That afternoon we built the new gable at one end and extended the existing gable with 2x6s to the new floor. We finished the exterior sheathing, tying everything together. Then, since the weather was great, with no rain in the forecast, we relaxed for the rest of day.

The following morning we installed housewrap and windows, then dismantled the lifting beam and strongbacks. Rather than move them outside again, we recycled them right there, ripping them with a worm-drive saw for 2x ceiling strapping.

The rest of the job went smoothly, as did the planned wedding. We completed the house on schedule, in time for the new family to move in. ■

Chuck Green is owner of Four Corners Construction in Ashland, Mass.