Raising a Shed-Dormer Roof

Lift up and use the existing roof instead of throwing it away

Photos by Mike Patterson; Illustrations by Mike Patterson, adapted by *JLC*

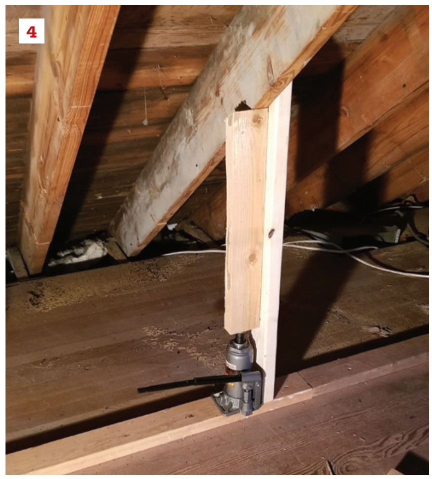
BY MIKE PATTERSON

Recently, my company was asked to build a shed dormer in the rear part of an attic to create a pair of bedrooms and to make the attic space more usable. Removing the old roof and framing the dormer was doable, but as a small company that rarely uses framing subcontractors, we had a couple of concerns.

HATCHING A PLAN

The primary consideration was how quickly we could get the existing roof demolished and the new one dried in. We'd be working in August, and here in the Maryland suburbs of Washington, D.C., thunderstorms are almost daily events. I wanted to have the house open to the weather as little as possible, and without a large framing crew, we would run a high risk of exposing the interior of the house to rain. Our solution—hinging up the existing roof—would allow us to keep a mostly weathertight roof over the house at all times. To cover open areas during construction, we planned to supplement with tarps that we could deploy quickly.

A secondary, but still important, consideration was cost. Raising the existing roof to the new pitch would save us more than $1,000 in framing material compared with building the dormer from scratch. As an added benefit, we would keep all the old—but perfectly good—material out of the landfill. The engineer we consulted was on board with using the existing 2x8 roof framing. So we just needed to figure out how we were going to get it done.



To prepare for lifting the roof, the crew set up a line of vertical 2x10s near the ridge to support it **(1)**. They also bolted 2x4 support posts to the rafters; the opposite ends of the 2x4s would come to rest against stops nailed to the floor as the roof went up **(2)**. To allow the roof to hinge at the ridge, the crew attached metal twist straps to every other rafter **(3)**. The straps went through holes in the roof and attached to the opposite roof. The crew also set up hydraulic jacks with lifting posts on the low part of the roof **(4)**.

AT THE DRAWING BOARD

Our first task was to create an accurate drawing of the existing site conditions, such as the existing roof pitch, the amount of sag in the attic floor, overall dimensions, and so on. I've gotten comfortable with SketchUp, having used the program for more than 10 years now. Using SketchUp in conjunction with accurate measuring and line lasers, I was able to generate an accurate 3D model from which we could pull critical measurements.

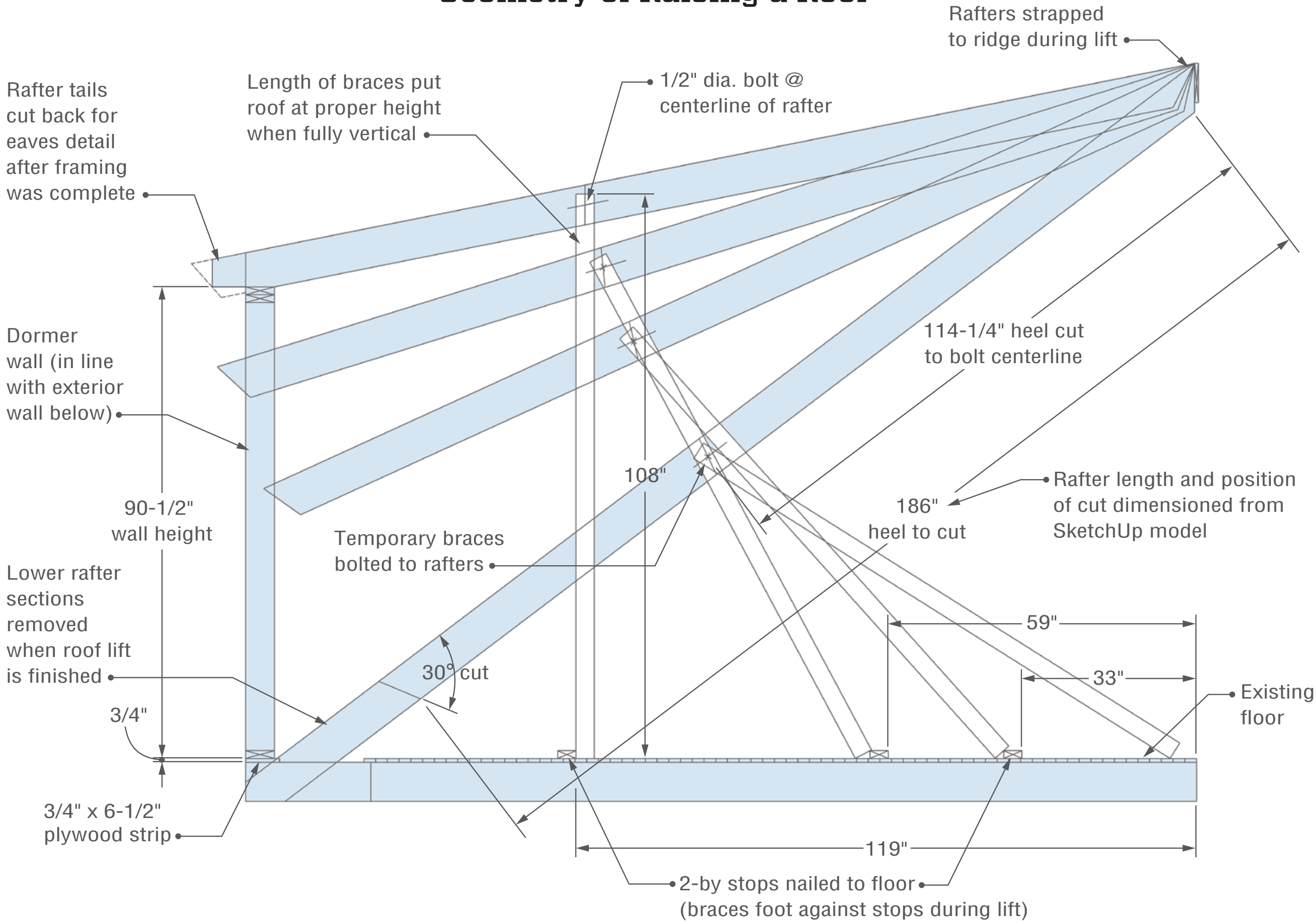
Once I drew it in SketchUp, I could easily see how the geometry of the roof would change as we lifted it (see Geometry of Raising a Roof, facing page). We could also determine where to bolt the lifting posts and where on the floor to place the positive stops, which, when the lifting posts were snugged up to them, would tell us that things were where they needed to be.

PREPPING FOR THE LIFT

Inside the house, we installed vertical 2x10 supports, set back about 18 inches from the ridge, at every other rafter on the side of the roof opposite the future dormer **(1)**. These supports would keep the ridge from sagging or shifting once we cut and raised the rear part of the roof. The small cantilever between the support and the ridge was acceptable, and it would keep the supports out of our way as we worked on the ridge and in the attic.

Outside, we set up a cut station on the ground and precut all the

Geometry of Raising a Roof



The author used SketchUp to plot the rotation of the roof from the existing pitch up to the pitch of the dormer roof. The program helped determine where the rafters needed to be cut. It also gave the crew the length and position of the temporary 2x4 braces, along with the locations of the floor stops to foot the braces as the roof hinged into position. When the braces were tight against the final stop, the dormer roof was at the proper height.

pieces we'd need for the dormer walls based on the measurements from our drawings. These parts included studs, jacks, and sills (we made headers from the support materials when they were removed later). We stacked and labeled all of the pieces so they were ready to be lifted up to the attic as soon as we needed them.

We bolted support studs to the rafters every 4 feet **(2)**, so that when the roof was at the proper height, the 2x4 bracing would be hard against a 2x4 stop nailed to the floor. Thinking that we'd need to pause and reposition a few times as the roof went up, we also installed intermediate stops that would hold the bracing in place while we shifted everything between lifts.

To ensure that the connection at the ridge board would act as a hinge, and to keep the rafters from shifting, we attached metal twist straps at every other rafter at the ridge **(3)**. We fed the straps through holes drilled through the roof, nailing the straps to the rafters inside, and face-nailing them into the roof from above.

I looked at the weather forecast and saw that we had a couple of dry days with light winds predicted. So on the day before the lift, our final task was to cut both the rafters and the sheathing. From the ridge, we measured down the underside of the rafters an equal distance at both ends and then snapped a line to mark the start of our rafter cuts. We cut the rafters with a reciprocating saw at a 30-degree angle so that the cuts wouldn't bind once the lifting began. Also if anything slipped, the roof would be supported as it came down. We

The crew cut the rafters at an angle to eliminate binding as they lifted the roof **(5)**. Initially, they used T-shaped lifting posts between the jacks and the rafters **(6)**. When the jacks had reached the maximum distance that the crew could lift in one shot, temporary supports held the roof while the jacks were placed on 2-by scraps for the next lifting stage **(7)**.

The author devised movable "jacking boxes" to hold the posts as the jacking progressed **(8)**. After each lifting cycle, the crew installed temporary supports until the jacks could be reset **(9)**. Instead of cutting new support posts for every lift cycle, they stacked cribbing made from 2-by scraps under the jacks **(10)**.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As the roof went up, the vertical supports footed against stops nailed to the dormer floor **(11)**. The crew continued the lift in increments according to the lifting height of the jacks **(12)**. When the supports were plumb and in contact with the outermost stop, the roof was at the proper height **(13)**.

positioned the cuts so that once the roof was tilted up, we'd have about 10 inches overhanging the dormer wall. We would string the rafters and cut them off after the roof was raised into position. From inside, we projected a laser line of each perimeter line of the dormer onto the underside of the sheathing. After poking nails through to the exterior at the four corners, we snapped chalk lines between the nails for our cut lines. Using a demolition blade in a wormdrive saw, we were able to cut through the asphalt shingles and 1-by board sheathing in a single pass.

THE LIFT

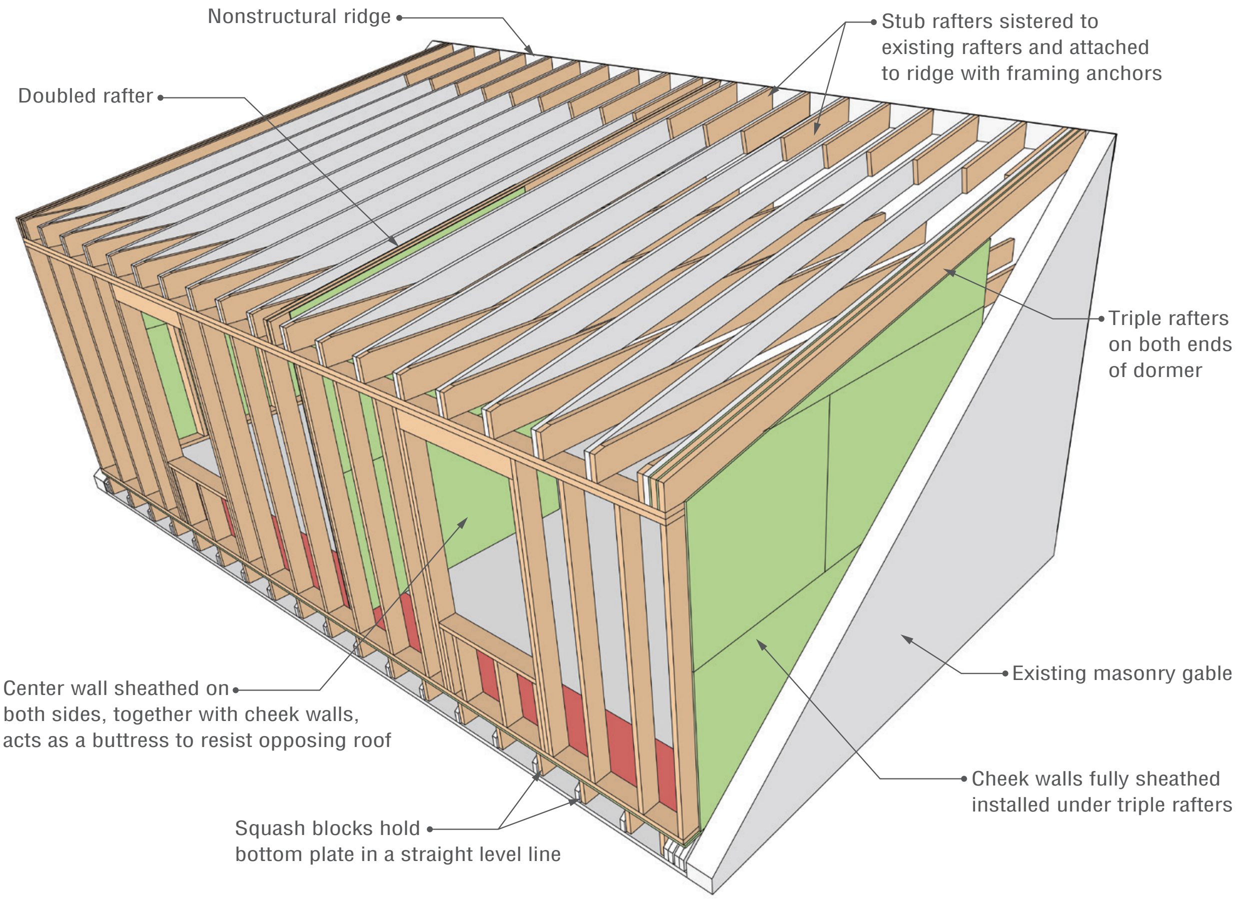
My initial plan was to gather 10 or so people with strong backs and lift the roof until the 2-by supports were vertical. As a backup, we set up five 4-ton hydraulic jacks with lifting posts positioned down low on the roof **(4)**. On the lift day, we positioned all of the assembled strong backs under the rafters and gave the order to "Heave ho!" The roof didn't budge. We tried several more times but with no success. Disappointed to discover that the roof was much heavier than we expected, we shifted to plan B: using jacks to raise the roof **(5)**.

We'd positioned the five jacks on top of the outermost 2-by stops to help distribute the load **(6)**. To address the problem of lifting straight up against the angle of the rafters, we made T-section lifting posts. One part of the T went between the underside of the rafter and the jack, and the other part of the T screwed to the first part as well as to the side of the rafter.

We pumped the jacks, and the roof rose easily, but slowly. When we reached the maximum jack height (about 7 inches), we braced the roof and reset the jacks **(7)**. After a few lifting cycles, fastening and unfastening the jacking posts became bothersome, and the ends of the posts started to split. I devised "jacking boxes," which straddled the rafters with slots to capture the ends of simple 2x4 posts **(8)**. The boxes screwed to the rafters and could be repositioned easily. Now that we were no longer concerned with the angle of the post or fastening to the rafter itself, the lift progressed quickly and easily **(9)**.

To avoid having to cut new jack posts after every lift, we stacked 2-by scraps under

Shed Dormer Framing



The crew framed the dormer using SketchUp to work out the details. Cheek walls at the ends of the dormer and a wall in the center of the dormer act as buttress walls. With continuous sheathing, they resist the thrust of the opposing roof, preventing the ridge from sagging, and eliminating the need for a structural ridge. At the ridge, stub rafters cut to the dormer roof pitch were sistered to the existing rafters. Framing anchors were used throughout to achieve the engineered specifications.

the jacks as cribbing as the roof went up **(10)**. With the jacking boxes and the cribbing, we used the same length posts through several lift cycles.

We lifted in increments **(11)**, and when the braces bolted to the rafters footed against each set of the stops nailed to the floor, we adjusted the jacking boxes for a better lift angle **(12)**. When the braces finally contacted the outermost stop, the roof was at the correct height **(13)**. After checking the new roof pitch against my SketchUp calculations to verify that the lift was essentially done, we braced the end rafters at the exact height and string-lined the rest of the rafters, shimming under the jack posts until the bottoms of the rafters were perfectly in line.

FRAMING THE DORMER

With the dormer roof raised and supported, we cut away the part of the original roof that was still in place, leaving the exposed ends of the floor joists **(14)**. To correct a slight dip in the floor, we established a benchmark height with a laser level and nailed 2x6 squash blocks to the sides of the existing floor joists. The line of blocks was exactly level, and we installed the 2x6 bottom plate for the new wall directly on top of them.

We projected a laser line onto the rafters at the height of the new dormer wall, which gave us the locations for the horizontal seat cuts. Aligning the laser with the outside plane of the wall, we projected a line onto the rafters for the vertical cuts of the birdsmouths.

After raising the roof into position, the crew removed the bottom sections of the existing rafters **(14)**. Using a laser level, they laid out and cut the birdsmouths for the dormer wall **(15)**. The crew installed squash blocks along the floor joists to support the plate for the dormer wall **(16)**. They also built and raised cheek walls at the ends of the dormer.

We then cut the birdsmouths in place **(15)** and nailed the top plates to them. Next, we filled in the wall framing that we'd precut, and we sheathed the wall's exterior.

At each end of the dormer, we tripled the rafters per the engineer's specs, and removed the support posts and the floor stops (see Shed Dormer Framing, facing page). The engineer called for the cheek walls to have continuous sheathing from the top to the bottom plates. Building the walls in the dormer space and tilting them into place was an easy way to get sheathing between the outside face of the cheek walls and the remaining rafters inside the masonry gables. In the center of the dormer, we installed a double rafter with a wall below sheathed on both sides with 1/2-inch plywood. The center wall and cheek walls act as buttress walls to resist thrust from the front roof and to eliminate the need for a structural ridge.

To account for any differences in floor height, we framed the cheek walls slightly short. When we tilted them up, we shimmed them tight to the underside of the triple rafters and fastened them to the floor **(16)**. To join the cheek walls to the rafters, we installed engineer-specified clips.

Next, we installed 36-inch-long stub rafters at the ridge, cut to the pitch of the dormer roof and sistered to the existing rafters. We left the tension straps in place; they were later cut off flush with the roof sheathing. The engineer specified framing anchors on both sides of each sistered rafter. With the framing complete, we could then remove the roof props.

After setting up staging, we peeled back the shingles at the eaves of the dormer roof, snapped a chalk line, and made new cuts for the fascia and soffit. The roofers stripped off the old shingles and renailed the 1x6 sheathing in areas where it had become loose—either due to age or from the jacking process.

The interior of the house was never directly open to the weather. The savings in labor were modest, but real, and a few tons of material stayed out of the landfill.

Mike Patterson, owner of Mike Patterson Builders and Remodelers in Gaithersburg, Md., is a frequent presenter at JLC Live and the Remodelers Show.