# Resurrecting a Sagging Roof

BY JAKE LEWANDOWSKI

**On a recent job**, we were called in to repair a garage that had been converted to the primary bedroom of a home near Chicago. It was visually apparent that the roof had some deficiencies. The ridge had a substantial sag, which in turn pushed the exterior wall out of plumb upward of 3 1/2 inches at its worst location.

The roof structure was insulated and had been finished with wood paneling. It also included widely spaced tie beams that were more cosmetic than structural. Cathedral ceiling areas like this one require a structural ridge beam to support the roof loads, or adequate rafter ties or ceiling joists to resist the outward thrust of the roof loads. This building lacked both.

A true ridge beam should not be confused with a ridge board, which is not a structural member and functions only to make installing rafters easier during construction. A true ridge beam must be sized appropriately to support the roof loads and have a clear load path that transfers the loads through columns to a solid foundation. On top of a poorly designed ridge and inadequate ties, the roof rafters on this building were only 2x4s, which are greatly undersized for this part of the country.

Our job was to bring this home's primary bedroom to a structurally sound state. Working with a local engineer, we determined the most cost-effective approach was reinforcing the 2x4 rafters with modified 2x6s and adding rafter ties along with intermittent collar ties.

We started the repair work by temporarily reinforcing the existing ridge board to support our shoring. We then mounted eye hooks to the top plates at the bowed wall section and, using a come-along to pull the wall inward and our shoring to lift the ridge upward, we were able to make significant improvements in the ridge sag and the wall bow.

Once we had everything where we wanted it, we sistered new members to the rafters, then locked everything in with 2x6 rafter ties, using a laser to define their elevation. To maximize headroom, we set the rafter ties at the top of the lower third of the rafter elevation (the "1/3 rule"). We also installed collar ties just below the ridge board on every other rafter-and-tie assembly to help hold each structural assembly together.

*Jake Lewandowski is a construction manager with his family's business, Great Lakes Builders, based in Chicago.*




Photos by Jake Lewandowski

**Before.** The structural problems of a small primary bedroom addition were immediately apparent to the author: The ridge sagged **(1)** and the bearing walls had been pushed out of plumb, causing the top plate to bow outward **(2)**. The cathedral ceiling had only widely spaced ties that were boxed-in to look massive but were more cosmetic than structural **(3)**.

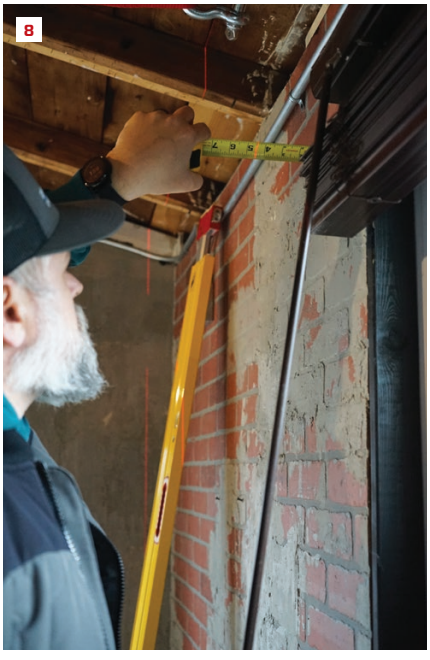

4


5


6

The crew begins by demolishing the ceiling **(4)**. Next, they cut the roofing nails near the ridge board flush to the underside of the sheathing **(5)**. This allows them to install blocks on both sides of the ridge board to support shoring for lifting the ridge **(6)**. Note the laser installed just below the ridge; this will provide a reference line during the lifting.


7


8


9

To lift the ridge and pull in the outer walls, Toby raises the shoring **(7)** while tension is kept on a come-along attached to the top plates. Measuring near the top **(8)** and bottom **(9)** of the outer wall to a laser that was set up to provide a reference plane, the author checks progress on the outer walls during the lift. (Note: The wood frames are covered with a faux-brick paneling.)

Toby installs 2x6 sisters to the existing 2x4 rafters **(10)**. To optimize headroom, the engineer allowed the crew to cut a slight taper on the underside of the sisters from the point where the rafter ties intersect to the end near the wall plates **(11)**.

Toby fastens the rafter ties with structural screws **(12)**. Note the eye hook attached to the top plate of the wall to secure the come-along. On every other rafter assembly, the crew also installed 2x4 collar ties just below the ridge board **(13)**.

**After.** When the job was completed, the sag in the ridge **(14)** and the bow in the outer wall were vastly improved.