

Q I need to gain headroom in an 18-by-32-foot barn with a 12:12-pitch roof. The bottom chord of the roof framing is a 2x8. Can I just add a 2x8 above the existing one and then remove the original without compromising the integrity of the roof?

A Darren Tracy, P.E., owner of West Branch Engineering, in Saratoga Springs, N.Y., responds: The short answer is “Probably.” But it’s difficult to give you a definitive response without knowing the exact details of the roof. I can offer general guidelines, but my advice would always be to have an engineer do a complete analysis based on the size and spacing of the rafters and crossmembers, how much headroom you need to gain, and whether the space above the crossmembers will be used for storage.

If the crossmember does not have a vertical load applied to it—that is, if the owner doesn’t plan to use the space above for storage—then its main function is to keep the barn walls from spreading under the weight of the roof. In that case, it is probably safe to undertake the alteration you describe as long as the new crossmember also fulfills that same function. But a single 2x8 seems pretty flimsy for that span, so my first suggestion would

be to make the new crossmember larger than a single 2x8. Without knowing all the details, I would advise making the new crossmember out of multiple 2-bys. In your case, I would use a minimum of two 2x8s.

How high you can safely raise the crossmember would again depend on the details of your roof framing, especially the live loads (snow and wind in your area) that the roof needs to withstand. The lower the cross beams, the more effective they are at resisting spreading. So without reviewing your exact situation, my experience and intuition say to raise the cross beams as little as possible.

If you do plan to use the loft area above the cross beams for storage, again, there are many variables, such as on-center spacing, the material used, the depth of the joists, and the anticipated live load. Double #2 SPF 2x8s at 24 inches on-center could carry a 30-psf live load without breaking. They’d be bouncy to walk on and would fail in deflection, but they might be OK for storing lightweight items. Three 2x8s would be better, but an even better choice would be doubled 2x10s. Increased height is always better than increased thickness for resisting vertical forces.

As far as fastening the crossmembers to the rafters is concerned, there are 30 pages of design criteria for fastening wood in my NFPA National Design Specification handbook. If I were preparing a formal design for an inhabited building, I’d do a thorough engineering analysis. But for modifying a barn roof to increase the headroom slightly (and for storage), I’d install a 2x10 on each side of every rafter. Knowing that the approximate shear value of a 16d common nail is 75 pounds, I’d try to put at least 10 nails in each face. I’d also use a pair of twist straps like the Simpson TS22 to attach the rafters to the cross beams.

When installing the new raised crossmembers, first make sure walls haven’t spread and bowed out over time. If they have, try to draw them back in before proceeding with the alteration. Attach a cable and turnbuckle in the area of the bow and make it taut. Then remove the old 2x8 crossmembers to allow the wall to be cranked back into plumb. Finally, fasten in the new pieces and add steel straps to reinforce the rafter-plate connection.

Raising a Crossmember in a Roof

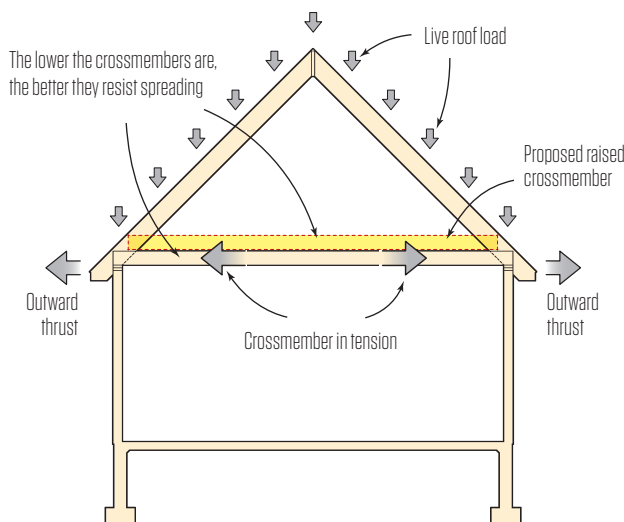


Illustration: Tim Healey

I'm replacing an exterior vertical door casing that has rotted at the bottom, but the header casing is still in good shape. Can I replace the vertical casing with PVC and not replace the header trim?

A Greg Burnet, a window and siding contractor based in Chicago and a presenter at JLC Live, responds: Though there's no issue with mixing wood and PVC trim, I can think of a few reasons for replacing all the exterior trim while you are at it.

First, if the door doesn't have a nailing fin, removing all the trim can give you access to the space between the jambs and the framing. On the doors and windows I encounter, this rough-opening space is rarely air-sealed or insulated properly. If you have access to that space, you should inject low-expanding spray foam designed specifically for use around windows and doors to insulate and create an effective air barrier around the door.

The second reason to remove all the trim is to make sure that the window or door is properly flashed. If there's no flexible flashing bridging the gap between the jamb and opening, I'd suggest installing 4- or 6-inch-wide peel-and-stick flashing tape on both the sides and head of the door. Use either butyl or acrylic tape (asphalt-based tapes should be avoided if they'll be in direct contact with PVC). Install the tape shingle-style, lapping it onto the jambs and rolling it to ensure a good bond.

With the door air-sealed and flashed, you can preassemble the new door trim. Preassembly makes for a faster installation, but more importantly, you can achieve tight, flush joints that can be reinforced mechanically with fasteners. Tight joints are important to the long-term success of an assembly, especially on an exterior. Trim joints that open up not only look bad but are also potential paths for water to enter the structure. With this in mind, replacing all the trim in your situation lets you glue the new PVC trim together with the proper cement. Once cured, that bond is usually stronger than the material itself, and the joints should stay tight for many years.

For fastening trim, I've had good luck with the Cortex system. The concealed fasteners look better and don't require messy fillers or sanding, which speeds the installation. Also, be sure to install a rigid metal head flashing above the head trim.