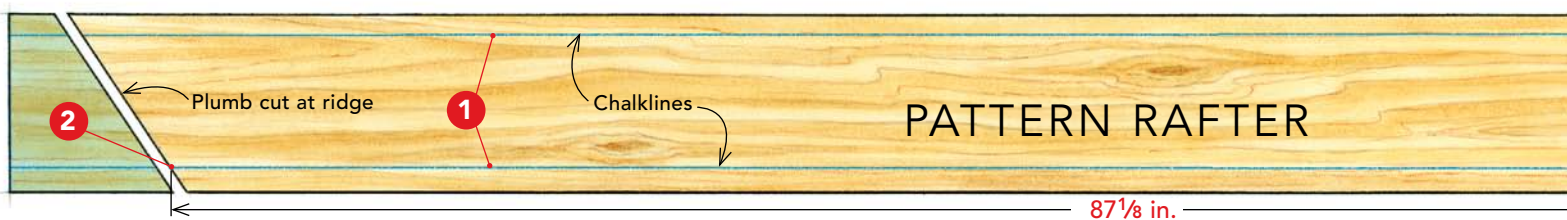


Perfect Roof

Focus your efforts on the pattern rafter, and the rest of the roof falls into place easily

BY SAM KOERBER



1 **Start off straight.** Mark 1 in. and 8 in. from the top edge on both ends of a 2x10, then snap a crisp chalkline between each pair of marks (0.5mm string is best) to create dead-straight reference lines.



2 **Mark the ridge plumb cut.** Align your framing square to the chalkline on the appropriate numbers—the 8-in. and 12-in. marks for this 8-in-12 pitched roof—and scribe a line for the ridge plumb cut. I use a utility knife for all cross-grain marking because the knife line is more accurate than the sharpest pencil line, and it shears off cleaner when cut with a circular saw.



My process for framing a roof starts the same as anybody else's: laying out and cutting a pattern rafter, which I then use as a template to cut the rest of the rafters to make up the roof frame. Just like everybody else, I choose a flat, straight, and dry piece of stock for the pattern rafter, which I crown so that any natural arch is facing up when installed, and I set the piece atop a pair of sturdy sawhorses that are at a comfortable working height. From there, I get a bit more fussy than most with the layout, which I believe pays off big time in terms of the quality of my frames.

Lessons learned from timber framing

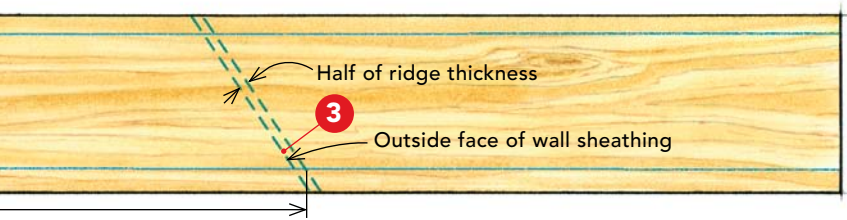
Most of the time, framers use a 6-in. rafter square to lay out the plumb and seat cuts of a rafter. But two practices on recent jobs have convinced me to change up my approach. First, I've begun to incorporate components of timber framing into otherwise stick-framed houses; second, I do exposed rafter tails on most builds. Timber framing has taught me to use chalklines and a framing square for accurate layout on boards that don't have a reliable straight edge for reference. It also has taught me that a knife makes crisper layout lines than a pencil. Those same layout techniques have improved the consistency of the

Rafters

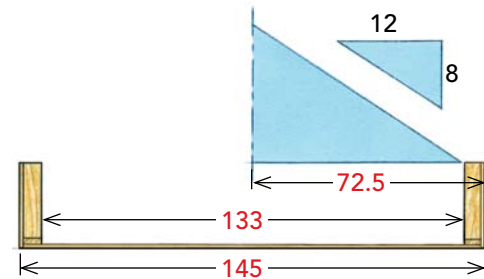


FINDING THE RAFTER LENGTH IS EASY

All you need to find the length of a rafter is the width of the building, the desired roof pitch, and a basic calculator. The math may look intimidating at first, but go through the steps once and you'll see how easy it is.



3 **Follow the line.** Measure from the intersection of the chalkline and plumb cut—starting from the 1-in. mark for accuracy—to mark the rafter length. Adjust this line by half the thickness of the ridge to mark the plumb line that represents the sheathing's outside face.



Measure between the insides of the plates at the bottom of the wall (the easiest place to get an accurate read), and then add in the plate width and sheathing thickness:

133 in. (plate to plate) + **12 in.**
(total combined width of plates
and sheathing) = **145 in.**

A standard gable has two rafters that meet in the middle, so divide this number in half:

145 in. ÷ 2 = a rafter run of 72.5 in.

The roof pitch provides the next two numbers in the calculation. We want an 8-in-12 pitch, so multiply the run by 8, then divide the result by 12 to get the rise:

(72.5 × 8) ÷ 12 = a rafter rise of 48.33 in.

The key formula here is $a^2 + b^2 = c^2$. Plugging the run and rise into the formula lets you solve for c , the rafter length:

$$72.5^2 + 48.33^2 = 7592.0389$$

Hit the $\sqrt{\quad}$ to find the square root, which is **87.134 in.**

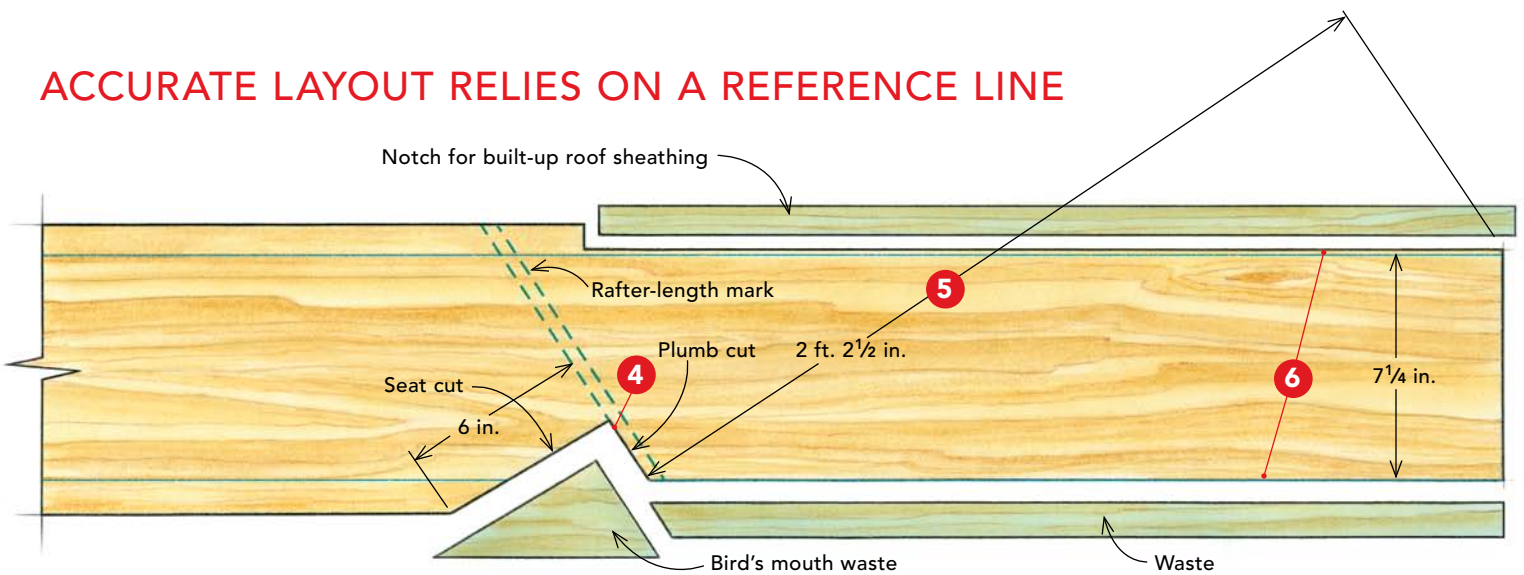
Carpenters don't deal in decimals, but converting the 0.134 remainder into 16ths is simple:

0.134 × 16 = 2, which is $\frac{2}{16}$, or $\frac{1}{8}$ in.
The final calculated rafter length is **87 $\frac{1}{8}$ in.**

exposed rafter tails, ensuring that they not only look crisp and uniform but that they line up nicely without trimming and shimming once in place. Now, even on roofs without exposed rafter tails, I use this technique because it works better than the conventional methods.

Lumber, even the dimensioned stock we use for framing, is far from perfect. Referencing the ridge, seat, and other cuts off the edge of a board can throw off the layout more than you might think. Wavy edges from the milling process, natural dips and humps in the board, and knots and other grain patterns all affect the trueness of a board edge. The conventional approach means trying to fit a long 2x

ACCURATE LAYOUT RELIES ON A REFERENCE LINE



4 Square up for the seat cut. The bird's mouth is 6 in. wide—the combined width of the top plate and the wall sheathing—and referenced off the line that marks the rafter length.



5 Add the overhang. Reference your framing square off the plumb cut of the bird's mouth to calculate the desired amount of overhang, which is measured perpendicular from the bird's mouth plumb cut.



6 Cut the tails. Use the chalkline as a reference when marking the depth of the notches on the top and bottom of the tail, and connect them with a sharp pencil, which won't wander to follow the grain.

MAKE CUTS WITH CARE



Start with the bird's mouth. Penciled-in arrows ensure that the seat and plumb cuts are made on the right side of the knife line. Stop the sawblade where the lines intersect to avoid overcutting.



Next come the cutouts. Working from the plumb cut in, cut along the pencil lines to create the clean-cut 2x8 rafter tail.



Finish up with a chisel. A few whacks on the end of a sharp chisel make quick work of removing the waste from the corner of the bird's mouth.

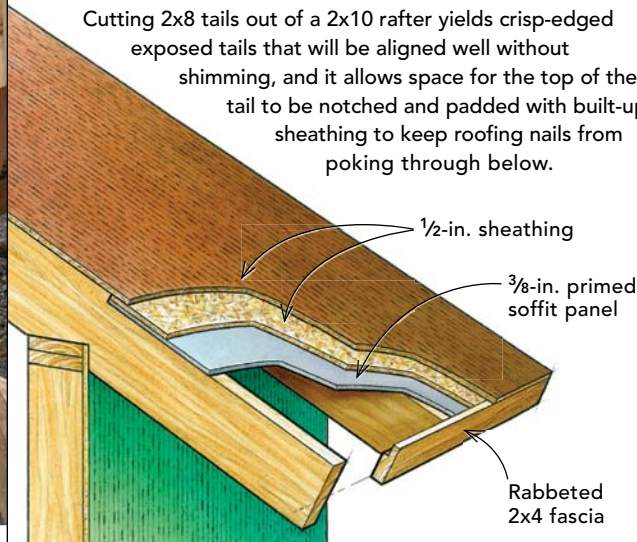
THE PATTERN IS SET

Add blocks. The rafter template is completed with a reference block screwed near each end of its top edge to ensure that the peaks and tails all line up, regardless of crowns in the middle of the board.



WELL-TAILORED RAFTER TAILS

Cutting 2x8 tails out of a 2x10 rafter yields crisp-edged exposed tails that will be aligned well without shimming, and it allows space for the top of the tail to be notched and padded with built-up sheathing to keep roofing nails from poking through below.



between walls and roof when the layout of the angles is based only on the 6 in. of wood that is directly in contact with the rafter square. Snapping your reference lines eliminates the inaccuracies.

Trust your rafter

Does such a fussy level of accuracy really matter with rough framing? My answer is that it's not about being perfect for the sake of perfection; it's about making the rest of the job go easier. If I'm confident that my rafters are laid out and cut to a high level of accuracy, I can trust them. This way, if they don't fit perfectly, I have a clue that something else in my framing is out of whack and needs to be

adjusted. Maybe the top plate is a little crooked, the walls are slightly out of plumb, or the ridge board is cupped, crooked, or set too high or too low. Two wrongs don't make a right, and correcting these other components makes more sense to me than altering the ridge or seat cuts of a perfect rafter to fit a problematic frame.

I've found this process to be well worth the extra time spent doing layout. It's satisfying to be able to maintain control over the building throughout the roof framing process. □

Sam Koerber is a builder in Asheville, N.C. Photos by Justin Fink.