

Framing to a Fixed Elevation

Use this simple technique to adjust for height above plate when figuring roof cuts

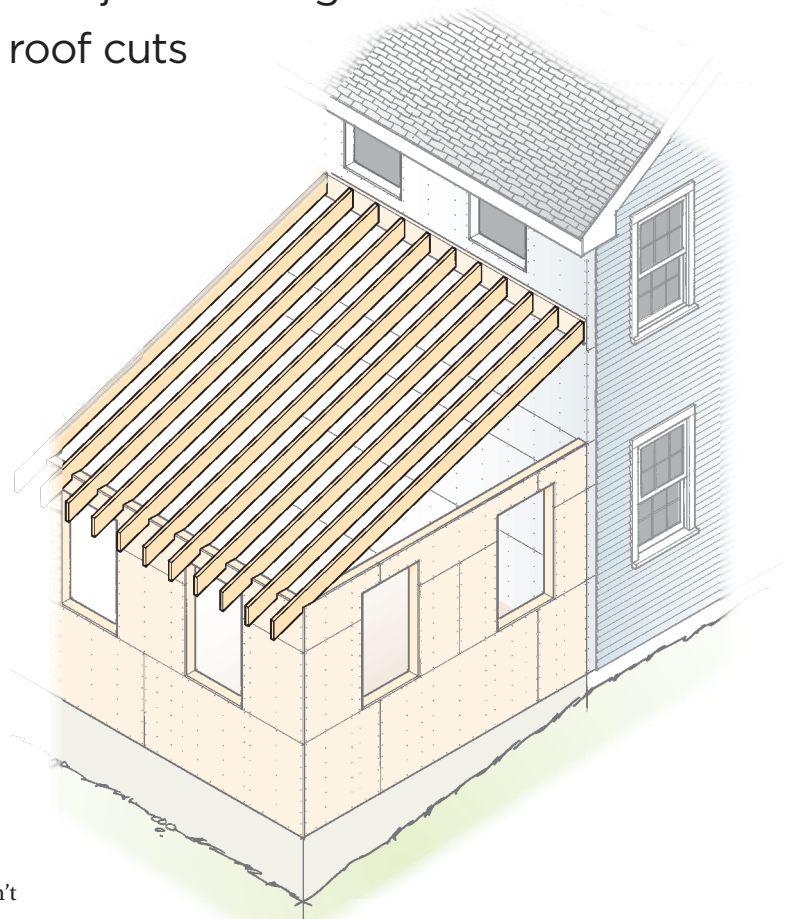
by Mike Sloggatt

I like using a Construction Master because it allows me to calculate rafter cuts without resorting to trigonometry, referring to a rafter table book, or converting fractions to decimals. But one thing it doesn't do is work in 3-D. Unless you take into account the actual width of your rafter stock, your calculations will be off, either by a few degrees or a few inches.

This becomes a problem when trying to frame to a specific height. On a shed-roof addition, for example, the rafters are hung from a ledger that often must be placed so that there is adequate clearance between the new roof and existing windows above the addition (see illustration, right). Or if the site has a building height restriction, you need to make sure that the ridge doesn't exceed it. If you haven't determined the height above plate (or HAP) — that is, how much of the rafter remains after you've made the seat cut — and deducted that from the overall rise, your calculations for the pitch and the diagonal will be wrong. Your ledger or ridge could end up being too high.

Estimate, Then Recalculate

Most of the time, I frame with a predetermined seat cut — typically 4 inches — and not with a specific HAP. To find the actual pitch and length of my rafters, I estimate an approximate pitch using the known rise and run, as well as an approximate HAP (which will be within a fraction of



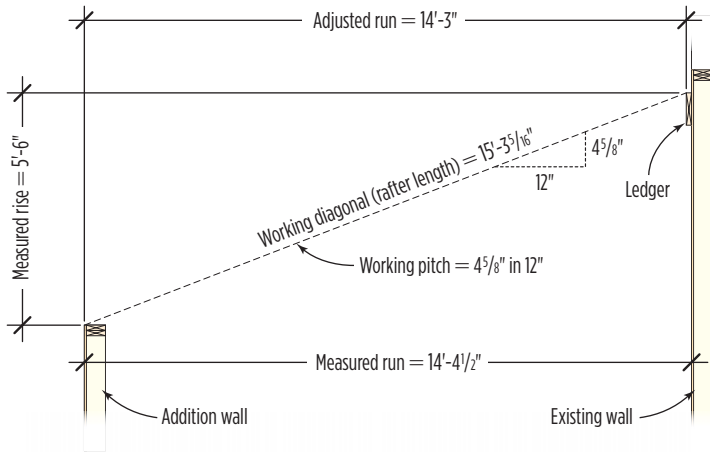
an inch of the actual HAP). I use the HAP to adjust the rise, then recalculate to get the actual pitch and rafter length. The steps I follow when framing the shed roof for an addition are shown on the opposite page.

By making this quick adjustment, there's no more guessing about the height of the ledger — it will end up at exactly the elevation you want.

Mike Sloggatt is a remodeling contractor in Levittown, N.Y.

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Calculate the Working Pitch



1. I first measure the rise to the top of the installed ledger board, then measure the run from the outside face of the sheathing on the new wall to the outside face of the sheathing on the existing wall.

Run = 14 feet 4 1/2 inches

Rise = 5 feet 6 inches

2. Next, I deduct the thickness of the ledger to get the adjusted run.

14 feet 4 1/2 inches minus 1 1/2 inches = 14 feet 3 inches

Adjusted run = 14 feet 3 inches

Rise = 5 feet 6 inches

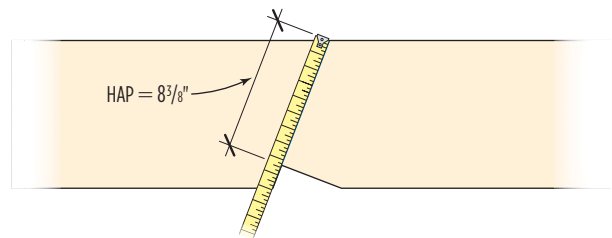
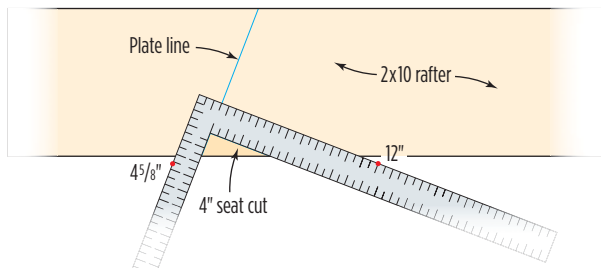
3. Using the Construction Master, and plugging in the adjusted run and the measured rise, I determine the preliminary, or "working," pitch — a number I use to figure out the approximate height above plate (HAP).

Working pitch = 4 5/8-in-12

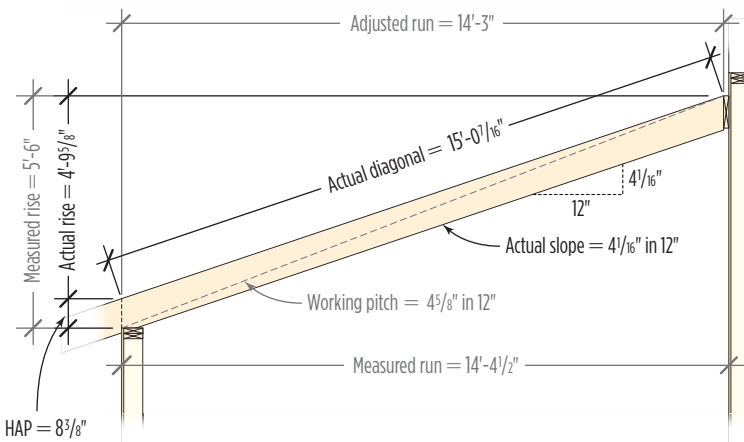
Working diagonal (or rafter length) = 15 feet 3 5/16 inches

Determine the Approximate HAP

4. Using a framing square, I lay out a birdsmouth on the rafter with a 4-inch seat cut at the working pitch of 4 5/8/12. I then measure the HAP — the distance from the top of the birdsmouth plumb cut to the top of the rafter. So, for example, a 4-inch birdsmouth on a 2x10 rafter at a 4 5/8-inch pitch results in an 8 3/8-inch HAP.



Recalculate Actual Rise and Run



5. I now use the HAP for the working pitch rafter as the approximate HAP for the actual rafter. Guaranteed, it's close enough: If I deduct that number from the rise and recalculate the rafter numbers, the new pitch and diagonal will be accurate within a small fraction of an inch. Time to cut wood.

Rise = 5 feet 6 inches minus 8 3/8-inch HAP =
4 feet 9 5/8 inches

Run (adjusted) = 14 feet 3 inches

Pitch = 4 1/16-in-12

Rafter length (diag) = 15 feet 7/16 inch