Adding Timber Rafter Tails To a Stick-Framed Roof

by Mike Rand

I run a specialty millwork shop in Narragansett, R.I. For several years I've been working with a local custom builder, David Baud, to produce major components for the high-end homes he builds. Typically, these are relatively complicated pieces of the building that would ordinarily be built on site but require extensive layout, complicated scaffolding setups, and lots of crew. Tackling these tasks off site in the shop simplifies and speeds the entire process. The advantages are numerous — including no weather delays and close control over scheduling and quality — and have proven themselves on job after job. Now, whenever we sit down to bid a set of plans, one of the first things we do is to circle every element that might lend itself to off-site fabrication.

A good plan and shop-made parts simplify this classy detail

In this article, I'll describe how we completed a decorative timber-rafter roof overhang for a new home on the coast of Rhode Island. The house was designed to look like a converted barn. Though it was stick-framed, it contained various timber-frame components both inside and out. The eaves details I worked on create the impression of heavy timber rafters, but in fact the roof was conventionally framed with 2x12 rafters on 16-inch centers.

You'll probably never replicate the exact details shown here. Still, this method could be easily adapted to most any type of decorative rafter tails.

Framing

The false rafter tails actually start at the frieze board, which we used as a kind of mounting plate (see Figure 1). The framers stopped the actual 2x12 rafters flush with the plate, minus 1½ inches to accommodate a 2x8 band, or subfascia. They ran the wall sheathing up over the band, leaving it about 2 inches short of the rafter tops to provide roof ventilation.

When they sheathed the roof, they held the bottom course of plywood up a couple of feet from the ends of the 2x12 rafters. That way, after the overhang assembly was fastened in place, the bottom course of plywood provided a strong lap, securely tying the tails back to the roof diaphragm.

There were two different overhang details on the project shown here. The eaves of the main roof have 22-inch-long shaped tails, while the overhang at the entry and garage has 3-foot-long tails that rest on a beam supported by large structural knee brackets.

Ideally, I would have used solid cedar

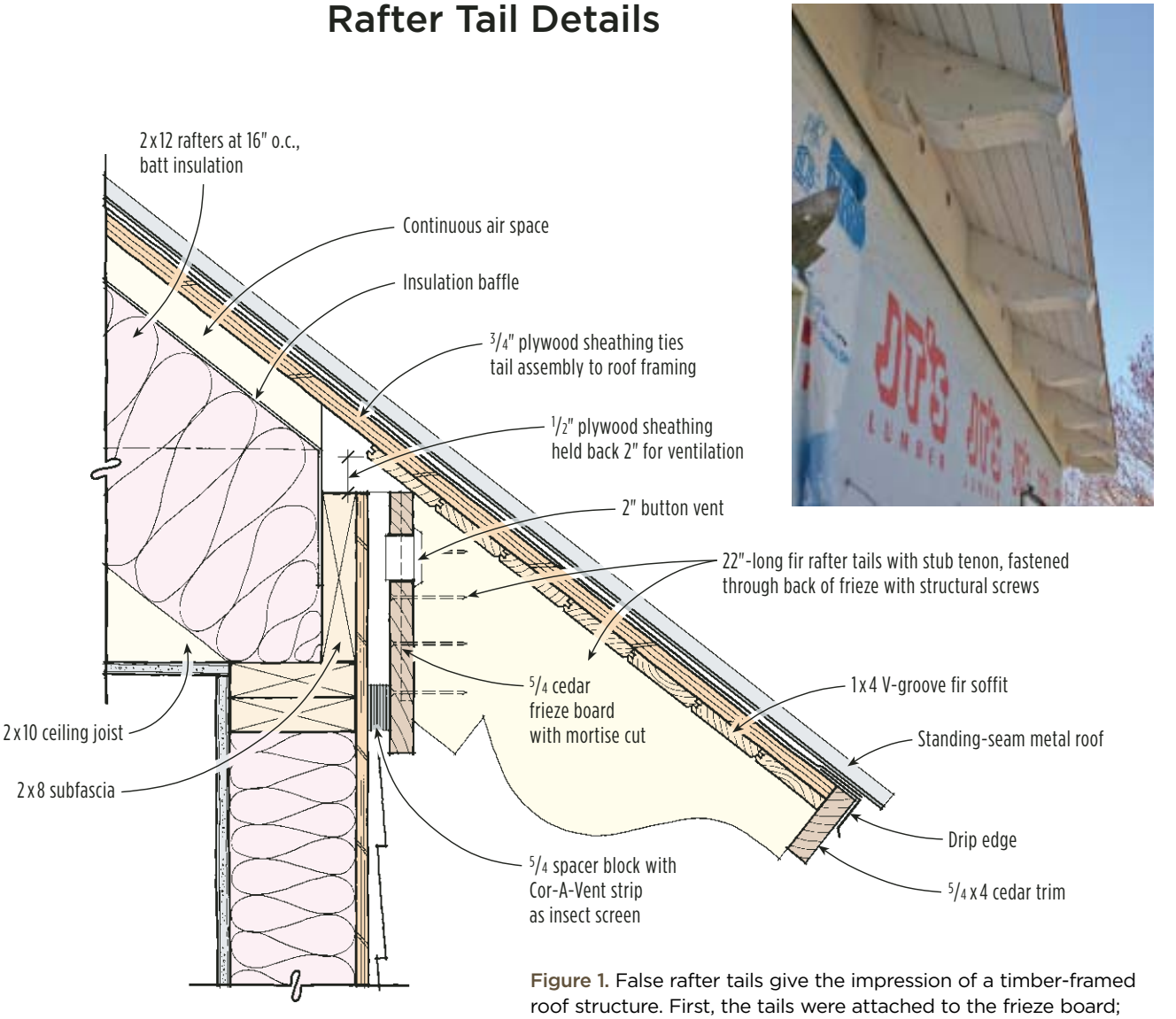

Figure 1. False rafter tails give the impression of a timber-framed roof structure. First, the tails were attached to the frieze board; then the entire assembly was secured to the frame with a space left for roof ventilation. The bottom course of plywood roof sheathing ties the overhang to the actual framing.

stock throughout for its exceptional stability, decay resistance, and paintability. But, except for the frieze and rake boards, cedar didn't fit in the budget, so we ordered green 6x8 #1 Douglas fir instead, specifying no heartwood for best stability.

Because the wood was green, we had to take measures to minimize twisting and checking, and to accommodate shrinkage as it dried. One of the great advantages of doing this work in the shop, out of direct sunlight, is that it protects against rapid moisture loss and the resultant checking you'd get if you were out in the field. Once the tails were installed, they were further protected by the shade of the overhanging roof, allowing the wood to more slowly acclimatize.

The overhang assemblies also included frieze and rake boards; for these we used clear vertical-grain 5/4 western red cedar.

Figure 2. Following the shape of the band-sawn rafter tail, the author used a bottom-bearing bit (above) to profile the end of the attached rake frieze (right), which was glued to the tail with two-part epoxy. Once in place, the rake board looks like a full-dimension timber rafter (far right).

Figure 3. Top-bearing bits came in handy for following plywood and MDF templates — for cutting mortises (far left), for shaping a tenon on the end of a rafter tail (above), and for routing an angled pocket (left).

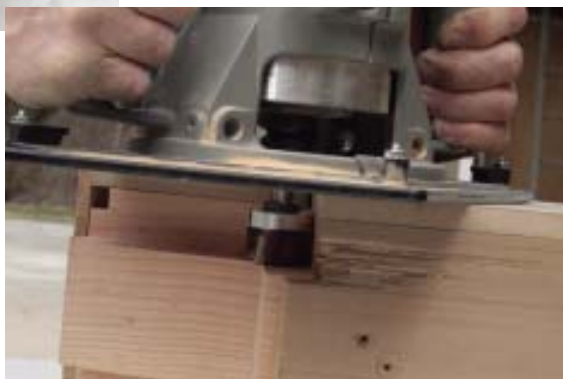

Figure 4. Two-sided "saddle" templates allowed the author to work from both sides of thick stock to cut a tenon using a top-bearing bit.

Router Work

While the shorter tails were small enough to be cut out on the band saw, the larger ones, plus the various mortises and tenons, required lots of router work. We use top-bearing (or bearing-over) and bottom-bearing (or bearing-under) pattern bits, depending on what we're cutting.

For example, after epoxying 22-inch tails to the rake boards, I used a bearing-under bit that followed the tail's contours to remove the waste from the rake board (Figure 2, previous page). This creates the impression that the entire rake board is a full timber rafter.

To cut profiles on the long tails or the stub tenons on the back ends of the tails, I used a bearing-over bit that followed a 1/2-inch-thick MDF template tacked to the fir stock. Templates ensure

Hiding Wood Shrinkage

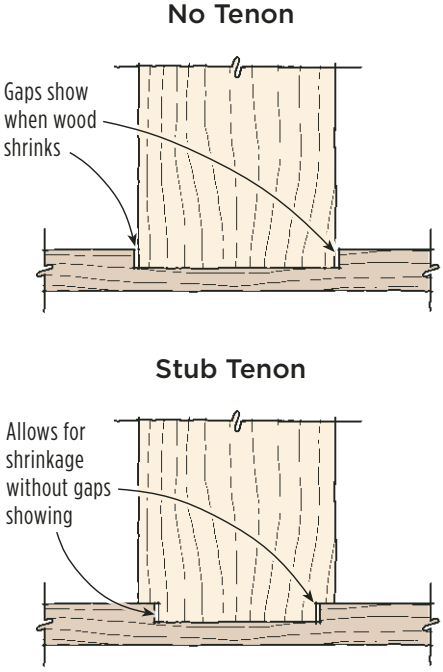

Figure 5. The stub tenons used to attach the tails to the frieze are stepped in so that any shrinkage of the tail does not leave an unsightly gap in the joint (left). Structural screws hold the tails to the 5/4 frieze board; any butt joints are mostly concealed behind the corbels (above).

that every piece is uniformly identical (Figure 3, page 3).

Occasionally I'll make a saddle jig, which is two identical templates separated by a piece of stock equal to the thickness of the beam I'll be cutting. I slip the jig over the end of a beam and tack or clamp it in place; then I rout one side, flip the beam, and finish the cut on the opposite side without touching the template (Figure 4, previous page).

If you have to make repetitive profiles on thicker stock, making a saddle jig is well worth the effort.

Some Site Assembly Required

We sent the shorter rafter tails to the site loose, along with the frieze board. We figured it would be easier and more accurate for the site crew to lay out the exact spacing.

Each of the 22-inch-long tails had a stub tenon on the end, which would fit snugly into a matching mortise cut into the frieze board on site. We provided the framers with the necessary router template for cutting these recesses.

Although the tails could have been recessed at their full dimension into the frieze, the stub tenon — a standard joint in timber framing — allows for wood shrinkage without a gap showing up (Figure 5, previous page).

Long Tails With Concealed Gutter

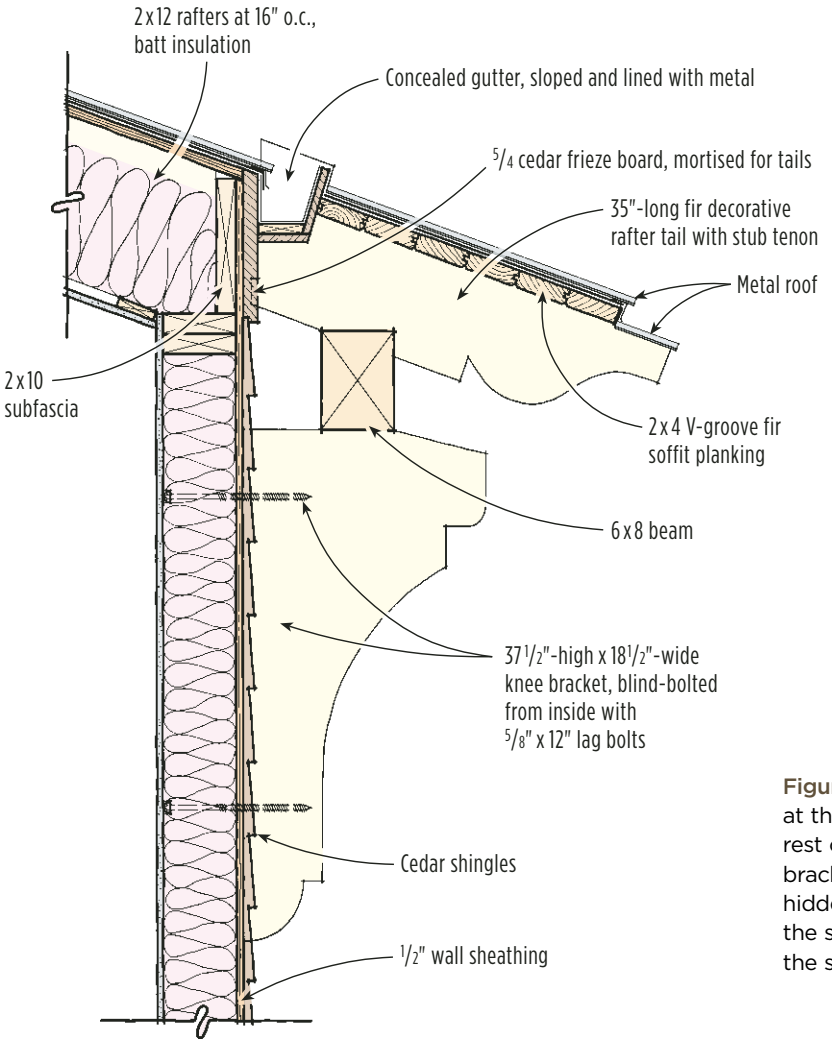

Figure 6. The overhangs at the garage doors rest on massive knee brackets and include a hidden gutter, lined with the same metal used on the standing-seam roof.

Installation. After cutting the mortises, the crew used TimberLok screws to fasten the tails through the back of the frieze. We installed wall brackets and planks at a comfortable working height below the eaves and raised the assembly into place with a material lift. The rake boards with attached tails went on last.

The plans called for 2-inch button vents through the frieze to provide ventilation for the roof. In addition to these, we installed the frieze assembly over spacer blocks to allow for airflow behind the frieze board, filling the gaps between the blocks with Cor-A-Vent, for a bug screen. We screwed the assembly through the frieze board and blocks into solid framing, then plugged the screw holes.

We set the top of the assembly 3/4 inch lower than the tops of the rafters to account for the thickness of the 1x4 V-groove soffit. After installing the soffit planks, with butt joints over the tails, we set the last course of roof sheathing, gluing it to the tops of the soffit boards (to avoid nailing through the soffit) and securely nailing it to the rafters and tails.

Figure 7. To make a 42-foot-long carrying beam, the author joined two pieces with a locking scarf joint, using the same router template to cut the identical profiles (left). The two pieces are forced tightly together by a pair of opposing wedges at the joint's center (above). While such lap joints are strong even when assembled dry, the author applied two-part epoxy to prevent water entry and further increase the joint's strength.

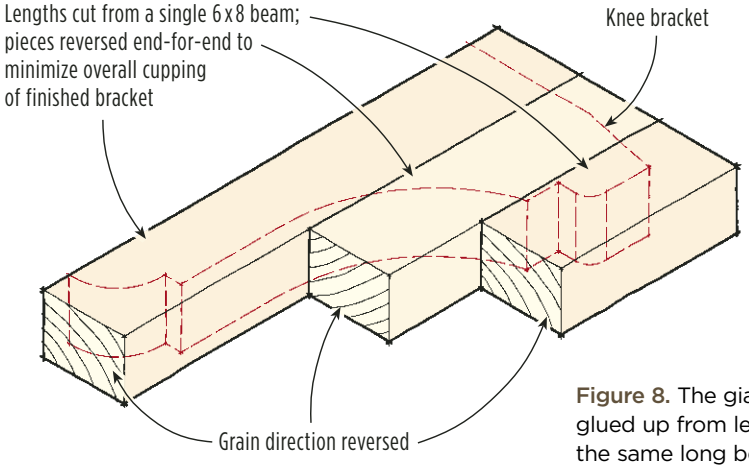

Figure 8. The giant knee brackets were cut out of large slabs, glued up from lengths of fir 6x8. The author used pieces cut from the same long beam and reversed the growth rings of every other one to cancel out the tendency of the wood to warp and cup.

A Really Big Beam

The rafter-tail assemblies at the garage and entry were larger and more complicated. For one thing, they included a concealed gutter (Figure 6, page 5). They also required large carrying beams (42 feet long, in the case of the garage overhang) resting on massive knee brackets. These giant assemblies were fabricated and put together in the shop, then shipped to the site for installation.

I inquired about ordering a single-piece 42-foot-long beam, but it would have taken three months and was too expensive. Instead, I joined two shorter lengths together, end-to-end, using a traditional pegged scarf joint made permanent with two-part epoxy (Figure 7, previous page).

Without epoxy, this method can also be used to make a strong joint that can be taken apart. The joint requires only one router pattern to make both interlocking ends, and the pattern ensures an exact fit the first time, every time.

A pair of wedges driven against each other in a pocket provided at the joint's center force the interlocks tightly together.

Figure 9. After wrestling the knee bracket into place on temporary supports (left), one carpenter stabilized it (below, left) while the other attached it with lag screws through the framing inside (below).

Knee Brackets

To make the blanks for the knee brackets, we used stepped lengths cut from a single beam and reversed every other piece end-for-end for epoxy glue-up. This reverses the direction of the growth rings and helps ensure that if one piece wants to twist in one direction as it dries, the piece next to it will likely be twisting in the opposite direction, so they cancel each other out (Figure 8, page 6). The final blanks measured about 30 by 60 inches and weighed about 150 pounds each, too heavy to manhandle through a band saw. Instead, I made a single-sided MDF router template to contour the brackets and worked the stock from both sides to complete the shaping.

Installation. To help position the knees in the proper attitude on the wall, I made a set of guide blocks that would be tacked to the wall to define the necessary vertical and horizontal offsets. We used a man-lift to help raise and hold the brackets in place while we drilled and blind-bolted them from inside the wall, using 5/8-inch by 12-inch lag bolts passed through the wall framing (Figure 9, previous page). Once the brackets were installed, we lowered the main assembly in place with the lift and bolted it down (Figure 10).

The whole process — for both the entry and garage overhangs — took two men a couple of hours to complete. The framing crew followed up with the soffit planking, making it ready for the metal roofer.

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Figure 10. Resting on shop dollies, the 42-foot beam and rafter-tail assembly awaited transport to the site (left, top). On site, the heavy lifting was done by a material handler as a carpenter guided the assembly into place on the knee brackets (above and right).