Framing Doghouse Dormers

Two ways to frame a basic gable dormer

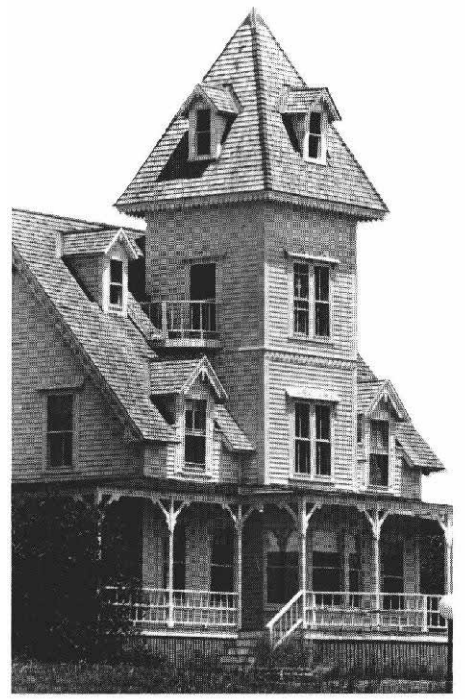
by Scott McBride

I think of the dormer as one of the more playful aspects of a house. It wants to poke its head up and make a little mischief with the roof. The design of a dormer should echo the house's main roof in spirit, but not necessarily in detail. The Victorians enjoyed punctuating their roofs with all sorts of crazy outcroppings, and their adventurous spirit seems sadly missing from much of today's architecture.

The word "dormer" comes from the Latin verb *dormire,* to sleep. But while this suggests the dormer's function inside the house—to admit light and air into an attic bedchamber—it gives no indication of the aesthetic possibilities of this versatile architectural feature.

Dormers have been adapted for use on just about every style of house with a pitched roof. Although a few miss the mark, most succeed in lending some measure of character and charm to a home's appearance.

Gable dormers, because of their small scale, represent a microcosm of roof-framing theory and practice. And as such, they provide a good opportunity for novice carpenters and builders to study this complicated subject.



Walls—The basic gable dormer has a rectangular face wall and two triangular sidewalls, also known as "cheeks." The face wall is usually built up from the attic floor, or from an outboard header in the main roof, and the sidewalls are framed up from trimmer rafters in the main roof. (For more on dormer wall framing, see *FHB* #35, pp. 46-50.)

As a general rule, the face wall of a gable dormer should be mostly window, with little or no siding on either side. A dormer should wink at you—not sit on the roof like a refrigerator with a mail slot. Bring the window rough opening right out to the corner posts. Since the gable end is non-bearing, you can usually omit the window jacks, and let the top plate define the height of the rough opening. Frequently, the corner board and exterior window casing are one piece, with solid trim covering the gable as well. This eliminates any siding on the face wall.

The triangle above a gable dormer window is traditionally a place where carpenters love to flaunt their woodworking skills. Applique, fancy-cut shingles and decorative truss work (stick style) are just a few of the treatments found here. Houses in the more formal Georgian and Adam styles often use the gable to field an elegant half-round fan window.

The exterior finish of the sidewalls can be either siding material or roofing material, according to taste. Slate looks exceptionally good here, as do handsplit shakes.

Gable-roof styling—Getting the right pitch on the dormer roof is essential. You can do your planning on paper, but it's a good idea to mock up the roof lines after the walls are framed, either with 1x4s or by cutting out the dormer profile in a sheet of plywood. Since the dormer will usually be viewed from below (not straight on) elevation drawings are of limited value in judging its appearance. Whenever possible, use the main roof pitch for the dormer roof as well. This saves a lot of headaches in the framing.

Roof framing—The trickiest part of dormer construction is framing the intersection (valley) of the dormer roof and main roof. The type of ceiling inside the dormer determines which framing method to use. There are two choices.

The simpler approach, which I call the valley-board method, is to build the dormer roof on top of the main roof (drawing, facing page, left). Doing it this way means having a flat ceiling below the dormer because the main-roof cripple rafters cut off the dormer roof space from the rest of the attic.

I call the second approach the valley-rafter framing method. It has the inboard header set at the elevation of the dormer ridge, rather than at the level of the wall plates (drawing, facing page, right). This allows for a cathedral ceiling inside the dormer. It is more trouble than the valley-board method, and requires a more thorough knowledge of roof-framing geometry.

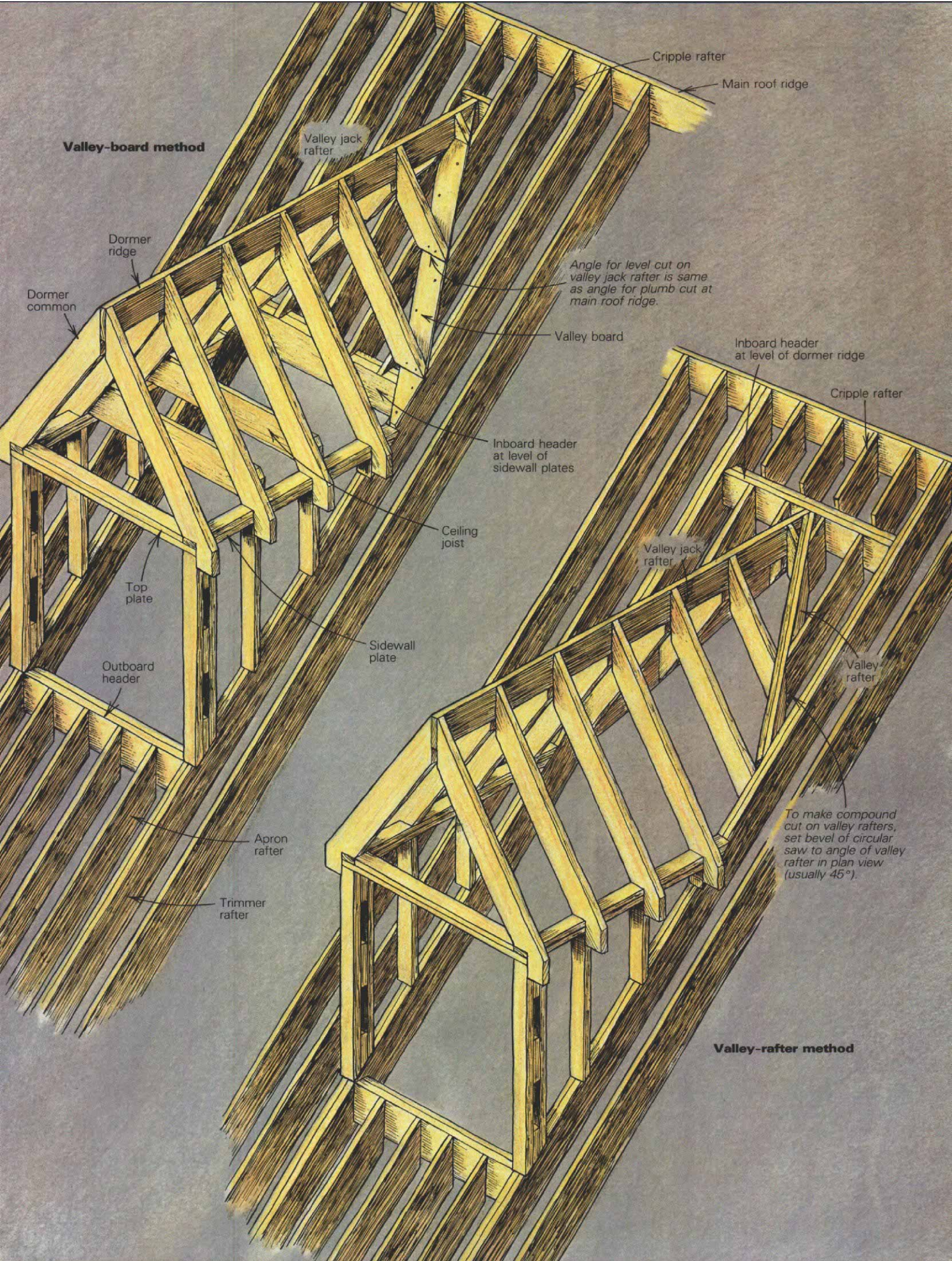
Valley-board method—I'll begin with the simpler of the two approaches. After framing the dormer walls, set the inboard header (usually a pair of 2x6s or 2x8s) between the trimmer rafters with its bottom edge flush with the top of the dormer sidewall plates. This way the dormer ceiling joists will line up with the header.

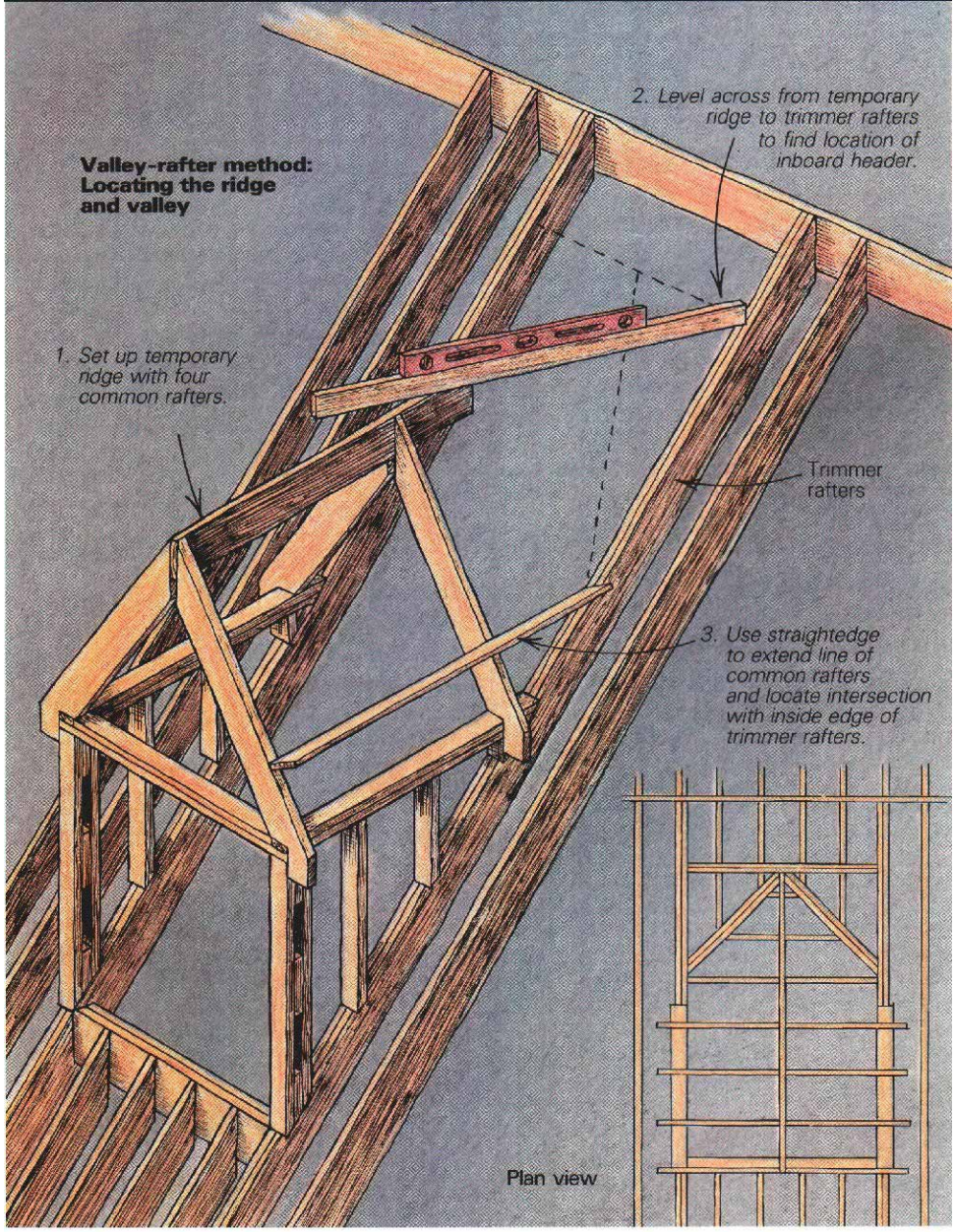
Next, fill in the main-roof frame between the trimmer rafters by installing the cripple rafters, which extend from the inboard header up to the main roof ridge. These cripples have a plumb cut on both their upper and lower ends. If the cripples are long, it's a good idea to notch the lower ends so they hook over the header. This brings the weight of the cripple to bear on the top of the header. Otherwise, the strength of the joint depends solely on nails in shear. Metal framing connectors (sloped-seat joist hangers) can also be used to reinforce this connection.

If you sheathe the main roof before framing the dormer roof, you'll avoid the difficulty of cutting plywood around the dormer later. But you may want to leave the framing open to the dormer attic space in order to ventilate the roof bays and keep the insulation dry. In this case, go ahead and sheathe the roof, but don't nail off the plywood in the area of the dormer. After you've snapped the lines establishing the location of the valley, adjust the depth on your circular saw and cut out the plywood just inside the chalk lines.

The best way to lay out the dormer common rafters is to draw the elevation of the dormer gable full scale on the plywood subfloor (for more on rafter layout, see *FHB* #10, pp. 56-69). Then you can establish the particulars of the cornice construction at the same time, and simply transfer the cutting angles to your rafter stock with a T-bevel.

Cut out four common rafters and use them to prop up a temporary ridge. With a straightedge, extend the line of the ridge over to the main roof. This will give you the location of the inboard end of the ridge and a point from which to measure the length of the ridge. If the ridge lands on a cripple rafter, its inboard cut will be at the same angle as the level cut of a main-roof common. If the dormer ridge falls between


Cripple rafter
Main roof ridge
Valley-board method
Valley jack rafter
Dormer ridge
Dormer common
Angle for level cut on valley jack rafter is same as angle for plumb cut at main roof ridge.
Valley board
Inboard header at level of dormer ridge
Cripple rafter
Inboard header at level of sidewall plates
Ceiling joist
Valley jack rafter
Top plate
Sidewall plate
Outboard header
Valley rafter
To make compound cut on valley rafters, set bevel of circular saw to angle of valley rafter in plan view (usually 45°).
Apron rafter
Trimmer rafter
Valley-rafter method



rafters, you will either have to install an extra cripple, or nail a block between two neighboring ones. In the latter case, the ridge would be cut square to fit against the block, as shown in the drawing at left on the previous page.

Cut the permanent ridge and nail it in place, along with the four common rafters, one pair at the gable end and the other pair at the inboard end of the plate. Leave the rest of the commons out until you've finished cutting and installing the valley jack rafters (the commons will just be in the way otherwise).

Placing a straightedge across the common rafters near the eaves, project the dormer roof plane onto the main roof frame or sheathing. Mark the point of intersection with a pencil. The exact location of this mark isn't critical, as long as it's in the dormer roof plane toward the bottom of the proposed valley. Snap a chalkline over the tops of the rafters from where the upper corner of the dormer ridge strikes the main roof down to your pencil mark.

If the layout of the dormer valley jacks is coordinated with the main-roof cripple rafters, each jack can bear directly over a cripple. In this case, the valley board can be 1x stock, or eliminated altogether. As long as you have direct bearing on the cripple rafters, you can nail the jacks directly on the main-roof sheathing. If the bottoms of the valley jacks don't line up with the cripples, use 2x stock for the valley board to distribute the load. With a T-bevel, measure the angles for the ends of the valley board, which will be nailed to the main roof.

Since the valley board has thickness, it must be nailed back from the chalkline a bit so that its top outside corner will fall in the dormer roof plane. To determine the offset for the valley board, first take a scrap of 2x4 and put the jack-rafter seat cut on one end. To make this compound angle cut, lay out the level cut used for the dormer common on the face of the 2x4, and cut with the skillsaw set to the plumb-cut angle of the main-roof common rafter.

Tack the 2x4 to the valley board as if it were a valley jack and hold the valley board parallel to the chalkline on the main roof. Now extend a straightedge along the top of the 2x4 down to the chalkline. This will tell you how far to offset the valley board from the chalkline.

Lay out the jacks along the valley board by measuring 16-in. increments off the dormer common rafters closest to the main roof. As you measure, hold the tape or folding rule more or less parallel to the dormer ridge, and perpendicular to the commons. Lay off the same spacing along the dormer ridge to correspond with the marks on the valley. Now you can directly measure the lengths of the jack rafters, from the uppermost point of the plumb cut on the top end to the toe of the seat cut on the downhill side. This is the longest dimension of the jack. Draw up a list of the lengths.

For each pair of jacks, you need to make only one compound-angle cut, or cheek cut; making the cheek cut on the end of one piece leaves the cheek cut for the opposing jack on the off-cut. Start with a board that is more than twice as long as the rafter you're cutting. After making the plumb cut on one end, measure off the rafter length and mark a level cut on the face of the rafter. Now tilt the circular saw to the plumb-cut angle of the main roof, and make the cut. It saves time to hook up two circular saws—one tilted for the cheek cuts, and one set square for the 90° cuts.

After installing the jacks, put in the remaining common rafters. Then install the ceiling joists and sheathing.

Valley-rafter method—Start by cutting out four common rafters and setting them up with a temporary ridge, just as you would for the valley board method. Extend a level line across from the ridge to the trimmer rafters (drawing, left). Nail the inboard header between the trimmers at this point, and install the main-roof cripple rafters above the header. Just be sure that their top edges are in line with the main-roof rafters.

Now measure for the dormer ridge, and cut and install it along with the four commons. Here, too, it's best to leave out the rest of the commons while you're working on the valleys.

The top of the valley is determined by the intersection of the dormer ridge and the main roof. It's a common mistake to think that the bottom of the valley will be where the sidewall plate strikes the trimmer. I've seen more than one textbook that shows it this way. In fact, that point will end up well below the surface of the dormer roof.

To locate the bottom of the valley, lay a straightedge across the two common rafters and project the line of the dormer roof onto the main roof. You have to find the point where the dormer roof plane intersects the inside edge of the trimmer rafter. This is where the centerline, along the top edge of the valley rafter, will meet the trimmer (drawing, left).

Although in terms of strength, dormer rafters usually need be no wider than 4 in., it's necessary to use stock the same width as the main-roof rafters if you want the dormer and main-roof ceilings to come together in a neat corner. This gives a cleaner look to the interior finish.

The rise of the valley rafter is the same as for the commons (think about it). But the run, on the other hand, is longer, just as it is for a hip rafter. If the pitch of the dormer roof is the same as the main roof (both are 7-in-12 in our drawing), and since they intersect each other at a right angle, the valley between them runs at a 45° angle to the common rafters in plan. This means the valley rafter runs 17 in. for every

12 in. of a common. Therefore, the pitch of the valley rafter is 7-in-17. Using these numbers (7 and 17) on a framing square, you can lay out the plumb-cut angles on the valley rafter. Then cut along the line where the 7 is.

Backing—Now we must determine the width of the valley rafter, and the bevel to be used for "backing" its top and bottom edges. Backing is the process of beveling a hip or valley in the same planes as the adjoining roofs, so that its thickness will not interfere with the sheathing. Hip rafters are usually dropped rather than backed. For the dormer valley rafter, you can skip the backing bevels on the top edge if you wish, by raising up the lower ends of the valley jacks a bit. This will cause the projection of their top edges to strike the centerline of the valley. If the dormer has a cathedral ceiling, however, backing is at least advisable on the bottom edge of the valley rafter. The attic and dormer ceilings will come to an outside corner here (photo next page), and the backing bevels will provide good seating for the drywall and sound nailing for the corner bead.

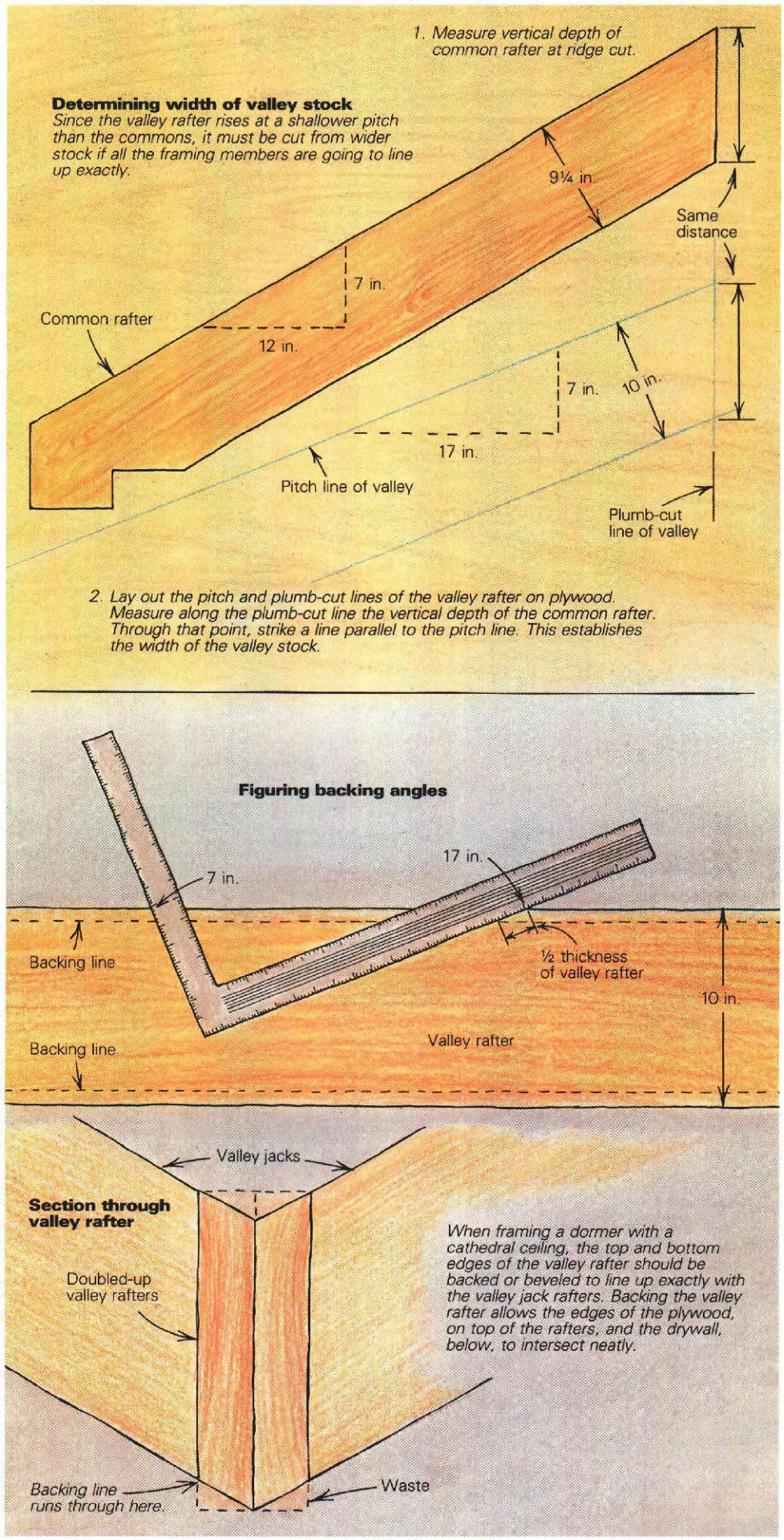
Backing hips and valleys also clarifies things when lining up the different members in the frame. Since a circular saw will handle the beveling without much trouble, I've found backing to be less bother than the guesswork involved in not backing, especially on tricky roofs.

To simplify the process, I often double the valley and hip rafters, even when doing so is not necessary for strength. This allows me to rip one bevel on each piece before assembly. When the two pieces are nailed up, the opposing bevels form either a concave V-trough or a convex ridge, which are the ideal forms for valley and hip rafters respectively.

Normally when you frame a roof you're concerned with lining up only the top surface of the framing members. The bottom doesn't matter because it's usually an unfinished attic. But when framing a dormer with a cathedral ceiling both the tops and bottoms of the rafters have to line up. The critical dimension is the vertical depth of the rafters measured along a plumb line. But since the valley rafter is rising at a shallower pitch than the commons, you need to cut it from wider stock than you used for your commons (drawing, top right).

To calculate the width you need for your valley rafter, first measure the vertical depth of a common rafter (the length of the plumb cut at the ridge is the easiest place to find this dimension). Then, using a framing square held at 7-on-17, draw lines that represent the pitch and plumb cut of the valley rafter on a sheet of plywood. Measure along the plumb-cut line the vertical depth of the common rafter and strike a line through this point, parallel to the pitch line. The distance between these lines is the width of your valley stock.

To calculate the backing angles for the valley rafter, start by laying the framing square on the face of the rafter stock, as in the drawing at middle right, with the tongue on 7 and the blade on 17 (the pitch of the valley). Now measure along the blade half the thickness of the valley stock, and mark this point on the rafter. Since I



Although this dormer has a hip roof, it was framed with the valley-rafter method and illustrates the clean, geometric ceiling lines that make the complexity of this framing worthwhile.

use a separate 2x for each side of the valley, half the valley stock is 1½ in., but normally it's ¾ in. Strike a line through this point, parallel to the edge of the rafter. This is called the backing line, and the angle between it and the centerline on top of the valley rafter is the backing angle. (This rule holds only for "regular" hips and valleys, meaning those formed by roofs of equal pitch that join at right angles.)

Edge bevel and shortening adjustment— As we have already seen, when equal-pitch roofs intersect at right angles, the resulting run of the valley (plan view) lies at 45° to both ridges (the main-roof header in this case is acting like a ridge). Therefore, making a cheek cut with the circular saw tilted to this angle will produce the correct bevel on the edge of the valley to fit the ridge.

Before it will fit though, the theoretical length of the valley must be shortened to allow for the thickness of the dormer ridge. Since the valley rafter is doubled, we will make the shortening adjustment on each half separately.

In order to fit against the ridge and inboard header, the valley rafter on the main-roof side of the valley gets two cheek cuts (see plan view, drawing at right, p. 62). First, make the cut that will fit against the header through the unadjusted length. No shortening adjustment is made here, because the theoretical layout line coincides with the face (not the centerline) of the header.

For the second cheek cut, measure back from the long point of the first cut, along a horizontal line, one-half the 45° thickness of the ridge (1 1/16 in. for 1½-in. thick stock). Mark a plumb line through this point and make the cut with the circular saw still set at 45°, beveling in the opposite direction to the first cut. If you wanted, you could make the double cheek cut here symmetrical by bringing the header out more to begin with. This would place the theoretical layout line down the middle of the outboard half of the header. But as a result, the header would have to be beveled where its corner protruded above the main-roof surface.

The ridge cut for the other half of the valley rafter simply gets shortened one-half the 45° thickness of the ridge. But if you put the first board in place, it will give you the point from which to measure the actual length of the second valley rafter board.

All these cuts are laid out using the same plumb-cut angle on the face. Shortening adjustments are always made horizontally—that is, perpendicular to the plumb cut.

Jacks—A gable dormer may be so small that it doesn't require any valley jack rafters. If it does require them, lay out the position of the jacks on the top edge of the valley rafter just as you would for the valley board. In this instance, however, the bottom end of the jack will be marked with a plumb cut on its face, instead of a level cut, and the circular saw will be set to 45°, instead of the main-roof plumb-cut angle. The top end of the jack will be cut the same as before—use the plumb cut of the dormer common, with the circular saw set square. □

Scott McBride is a carpenter and contractor in Irvington, N. Y.

Dormer crown molding

Crown molding is often used to trim gable dormers. Its curves and shadows add an elegant flourish to the dormer's overall composition. There are two basic applications. The first has one piece of crown molding along the eaves mitered to another along the rake, with very little overhang on either the eaves or the rake (figure 1, facing page).

The second application, which I call pedimented, continues the crown molding horizontally across the front of the gable, along with the rest of the cornice trim (frieze, bed, soffit and fascia). This forms the base of the pediment (figure 2). A sloped and flashed water table caps the cornice across the front to keep out rainwater. Two additional pieces of crown molding are run along the rake and die into the water table.

This type of pediment is traditional over entries and windows, as well as dormers, in the classically derived styles. Sometimes the cornice turns the corner and extends only a foot or so onto the gable end—just enough to provide a neat terminus for the rake crown. This is called a cornice return (see *FHB* #15, pp. 38-41). Pedimented gables are a lot of work, but their sharp appearance usually justifies the effort.

Turning the crown molding directly up the rake might seem the simpler of the two applications, but it isn't because of the miter. The crown molding changes planes as it turns upward, so if it's set in the usual way along the eaves, it won't match up with the molding along the rake. There are two ways to deal with this problem.

The first is simply to tilt the crown molding down at the eaves, so that its top edge lies in the roof plane, as shown in figure 3. Tapered blocking nailed to the fascia will give proper bearing for the back of the eaves-crown molding. It can then be mitered to the rake crown with a regular 45° miter.

You can get away with this approach on most low-pitched roofs. As the roof pitch of a dormer increases, however, this method forces the face of the crown molding to lie flat, contrary to its original intent.

The "correct" way to handle the situation is to have milled a molding with a slightly different profile just for the rake return, called a "raking molding" (not to be confused with the standard "rake molding" sold at lumberyards). This modified crown molding will have the same horizontal depth, front to back, as the crown molding at the eaves, but its vertical height will be stretched out a bit, depending on the pitch. The development of the rake crown's profile is shown in figure 4. The depth of the eaves crown at different points, front to back, is transferred to the rake crown unchanged, using arcs and parallel lines. Notice how the *diagonal* distances between points on the *face* of the eaves crown have become *vertical* distances between points on the *back* of the rake crown. When further projected onto the face of the rake crown, the diagonal distances between corresponding points increase. Note that the run of the eaves crown, shown in figure 4 as

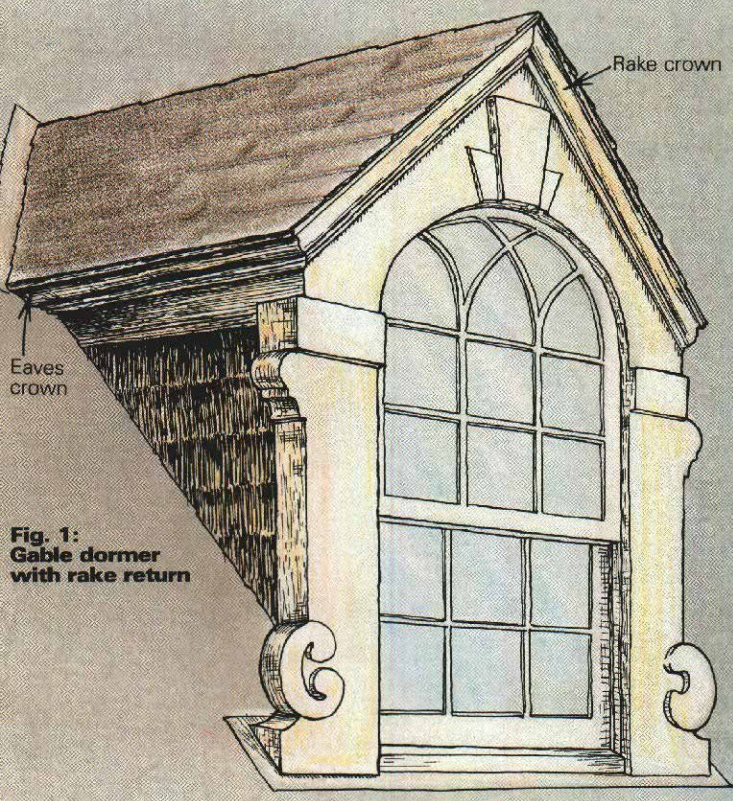


Fig. 1: Gable dormer with rake return

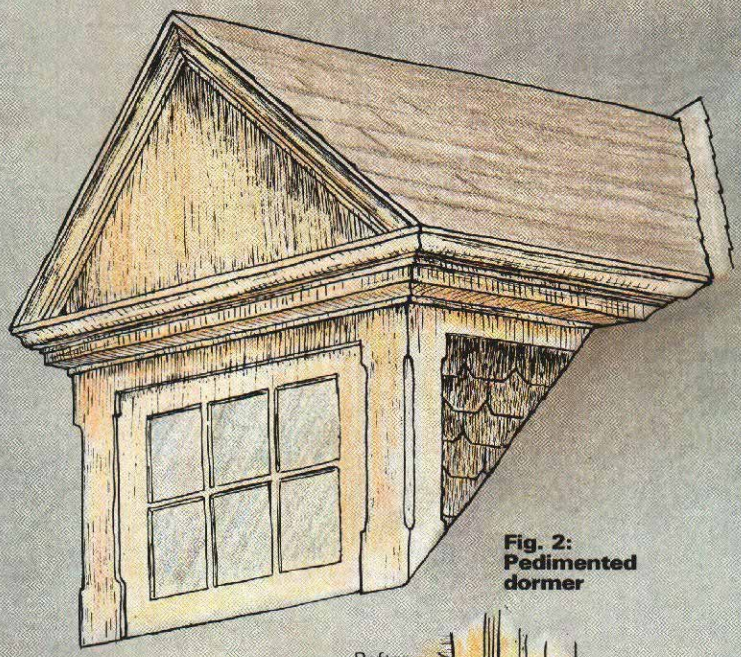


Fig. 2: Pedimented dormer

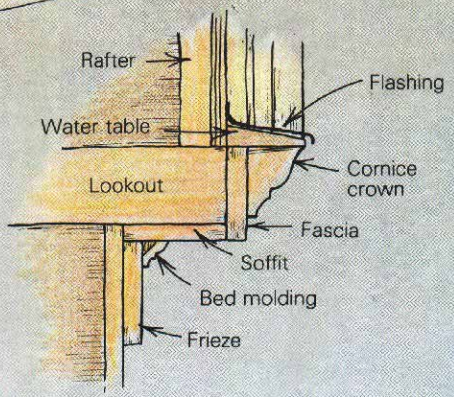


Fig. 3: Simplified crown molding: rake return

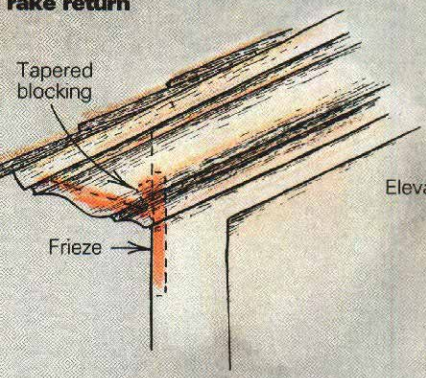
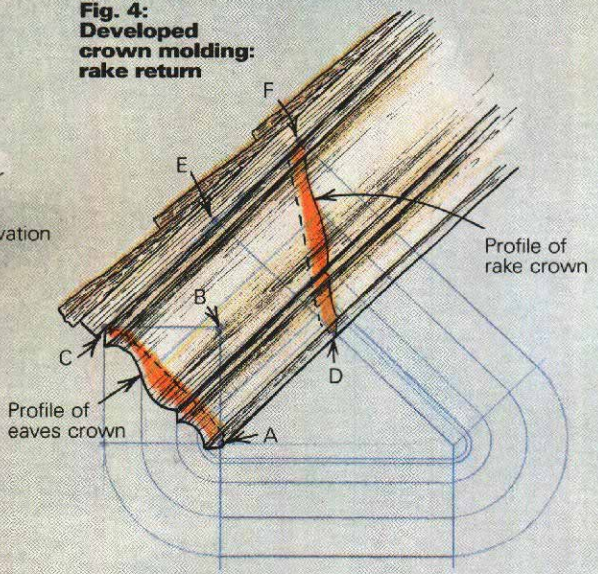


Fig. 4: Developed crown molding: rake return



BC, equals the run of the rake crown, EF; but the rise of the eaves crown (seen in elevation), AB, is less than the rise of the rake crown, DE. As a result, the profile of the rake crown must differ slightly from that of the eaves crown for the two pieces to meet properly.

The difficulty doesn't end with making the molding; you also need a special miter box to cut it (figure 5). The layout lines on the top and sides of this miter box are the same as the edge bevel and plumb cut of a regular valley jack rafter with the same pitch as the rake crown (for one method of edge-bevel layout see *FHB* #28, p. 37). The jack rafter is oriented in the same relative position as the rake crown, and the face of the valley rafter is oriented like the miter cut on the end of the eaves crown. You can also make such a cut on a compound-angle miter box or on Rockwell's Sawbuck, using trial-and-error.

If you can't afford custom-ground shaper knives to make a few pieces of molding, there's an easier way out. Most lumberyards stock a standard crown profile in several face widths. So, depending on the pitch, if you use, say, 3½-in. crown at the eaves, and 4½-in. crown on the rake, your joint should come out fairly close. The discrepancies can be worried away with a half-round file, and from 30 ft. it'll look just fine. You'll still have to make the miter box, but that's no big deal—as long as you know how to lay out the cuts. —*S. M.*

Fig. 5: Miter box for rake crown