A Gable-Dormer Retrofit

Framing around an existing roof requires different skeletons for two similar structures

BY SCOTT MCBRIDE

Carol and Scott Little's home draws its inspiration from the cottages of colonial Williamsburg and the one-and-a-half story homes of Cape Cod. Both styles typically feature a pair of front-facing gable dormers. But for some reason, the builder of the Littles's house put only one dormer on the front, leaving the facade looking unbalanced. I was hired to add a new dormer on the front of the house to match the existing one and, for more light, added a scaled-down version of the same dormer on the back of the single-story wing.

As the crew set up the scaffolding and rigged the tarps against the possibility of rain (sidebar facing page), I crawled under the eaves to study the existing roof. I soon realized that framing the sidewalls of the two dormers and directing their load paths would require different strategies, as would the way the dormer ridges would be tied to the main roof.

The first consideration in a retrofit is the location of the dormers, and the second is their framing. The existing front dormer fit neatly into three bays of the 16-in. o. c. main-roof rafters. These main-roof rafters

PROTECTING THE ROOF

To protect the exposed roof against rain, we rolled up new poly tarps around 2x4s and mounted them on the roof ridge above each dormer. The tarps were rolled down like window shades each evening, with some additional lumber laid on top as ballast. The ballast boards were tacked together as a crude framework so that they would not blow away individually in high winds.
—S.M.

(or commons) were doubled up on each side of the dormer, creating the trimmer rafters that carry the roof load for the dormers. Full-height dormer sidewalls stood just inside these trimmers, extending into the house as far as the bedroom kneewalls. Additional in-fill framing completed the dormer walls that were above the sloped bedroom ceiling.

Fortunately, three rafter bays at the other end of the roof landed within a few inches of balancing with the location of the existing dormer. Consequently, I had only to sister new rafters to the insides of the existing ones to form the new trimmers, and I could match the framing of the existing front dormer, leaving a uniform roof placement, appearance and size.

Cut the opening and shore up the main-roof framing first

After laying out the plan of the front dormer on the subfloor, I used a plumb bob to project its two front corners up to the underside of the roof sheathing. Drilling through the roof at this location established the reference points for removing the shingles and cutting the openings.

The tricky part was establishing how far up the slope to cut the opening. To play it safe, I first opened just enough room to raise the full-height portion of the sidewalls (drawing p. 78). With those walls up and later with some dormer rafters in place, I could project back to the roof to define the valley and then enlarge the opening accordingly.

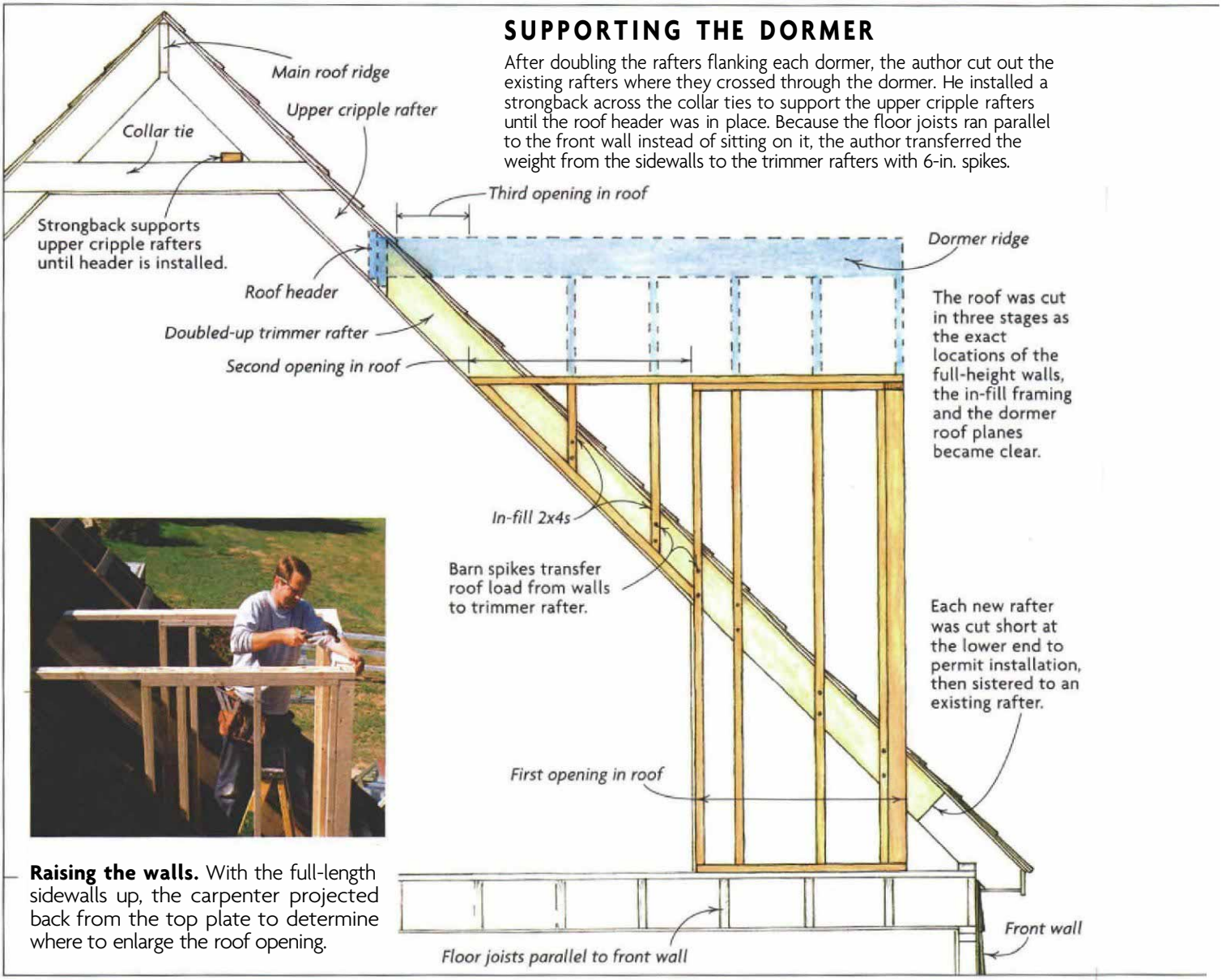
Inserting new rafters into an already-sheathed roof can be problematic because of the shape of the rafters. They are much longer along the top edge than along the bottom, so there's no way to slip them up from below. A standard 16-in. bay doesn't afford nearly enough room to angle them in, either. To form the new trimmer rafters, we cut the new members about 6 in. short of the wall plate before we secured them to the existing rafters.

When faced with this situation, I normally use posts to transfer the load from the trimmer rafters to an above-floor header. In fact, I did follow this step with the smaller rear dormer (sidebar p. 80), but that would not work in this case. Here, the floor joists ran parallel to the front wall, instead of perpendicular to it, and so could not transfer the load to the wall.

I decided simply to let the existing single rafter carry the load for the last 6 in. to the front wall plate. This situation is not the ideal solution, but the weight of the dormer is not great enough to overtax the rafters over such a short span, and doubling up the new trimmer rafters would at least stiffen the existing rafters considerably.

With the new trimmer rafters in, the existing main-roof rafters falling between them were cut and partially torn out to make room for the dormers. The portions above and below the dormer would remain as cripple rafters. The lower cripple rafters were plumb-cut in line with the dormer front wall where they would be spiked to cripple studs. Rough cuts were then made at the top, leaving the upper cripple rafters long. These rafters would be trimmed back further only later, after we established the precise location of the dormer-roof header.

To support the upper cripple rafters temporarily, I climbed up into the little attic above the bedroom. There I laid a 2x4 strongback across four collar ties, including the collar ties connected to the recently doubled trimmers. This strongback would support both the collar ties and the upper crip-



Raising the walls. With the full-length sidewalls up, the carpenter projected back from the top plate to determine where to enlarge the roof opening.

ple rafters until we could install the dormer-roofheader.

Dormer sidewalls can be framed two ways

With trimmer rafters installed and cripple rafters secured, I could proceed with the walls. I know two common ways to frame dormer sidewalls: You can stand a full-height wall next to a trimmer rafter, or you can build a triangular sidewall on top of a trimmer rafter, which is how I framed the rear dormer. To match the new front dormer to the existing one, I used full-height studs 16 in. o. c. only as far in as the kneewall.

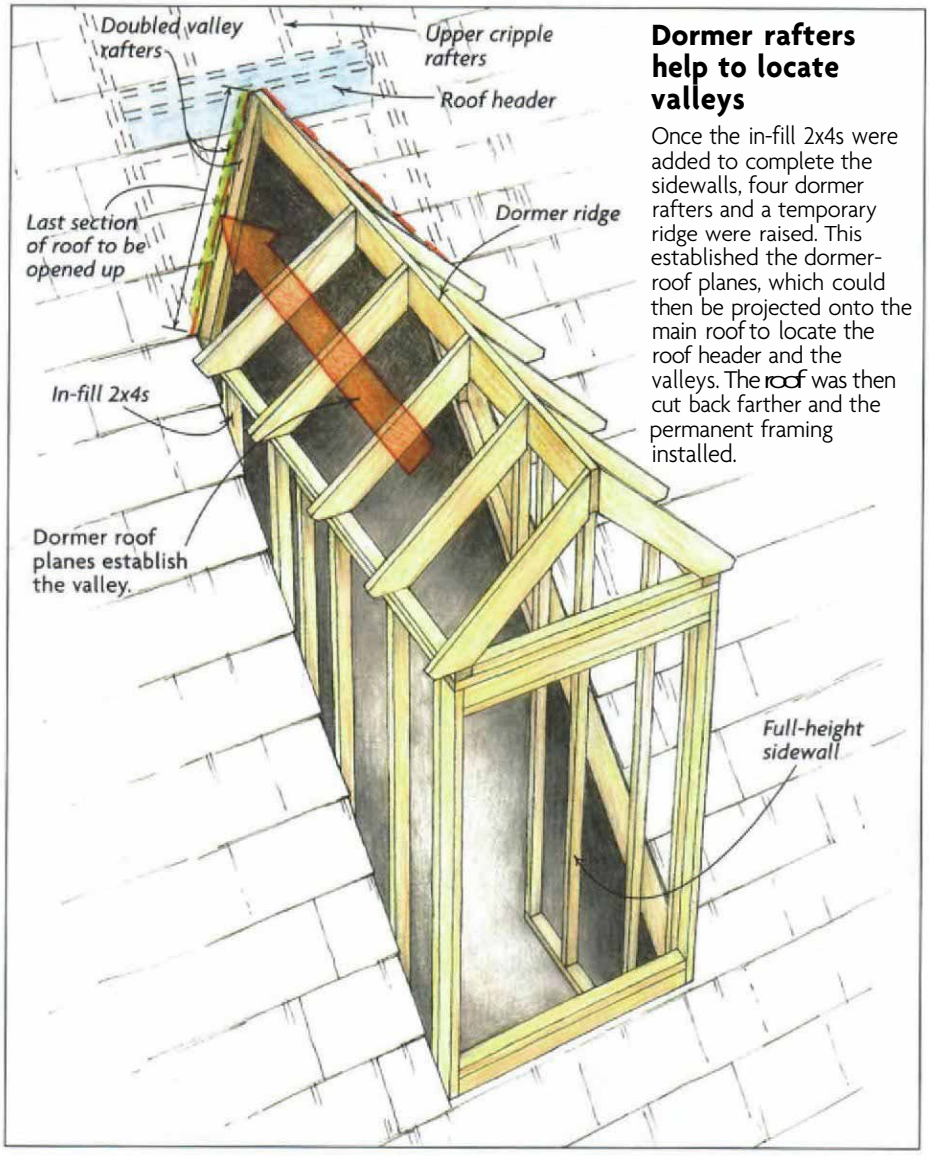
This type of dormer sidewall normally delivers the weight of a dormer to the floor. In new construction, this weight is taken up by doubling the floor joists under these walls. I didn't want to tear out the finished floor, however, so I joined the full-length sidewalls to the trimmer rafters by predrilling and pounding two 6-in. barn spikes through each stud. This transferred the load to the trimmer rafters rather than placing it on the floor framing. I've seen barn spikes withstand tremendous shear loads in agricultural buildings, so I felt confident they could carry this little dormer.

Plan the cornice details before framing the roof

With the walls up, the roof framing, which is the most complicated, came next. Before cutting any dormer rafters, though, I drew a full-scale cornice section, using the existing dormer as a model. Worrying about trim before there is even a roof may seem like the tail wagging the dog; but it makes sense, especially in a retrofit. The existing dormer featured a pediment above the window. The eaves had neither soffit nor fascia, just a crown molding making the transition from the frieze board to the roof (photo right, p. 81). That detail reduced the dormer rafter tail to a mere horn that would catch the top of the crown molding. The eaves section drawing helped to establish the cuts for the rafter tails and trim details.

Along the rakes, the crown molding was picked up by the roof sheathing, which was beveled and extended out past the gable wall. Using a short piece of molding as a template, I worked out the amount of the overhang and the correct bevel for the edge of the sheathing in the rake-section drawing. Juxtaposing the drawings ensured that the

Drawings: Christopher Clapp



Dormer rafters help to locate valleys

Once the in-fill 2x4s were added to complete the sidewalls, four dormer rafters and a temporary ridge were raised. This established the dormer-roof planes, which could then be projected onto the main roof to locate the roof header and the valleys. The roof was then cut back farther and the permanent framing installed.

rake crown, the eave crown and the level-return crown would all converge crisply at a single point.

Framing the roof defines the valleys

Ready to proceed with the roof framing, we set up two pairs of common rafters with a temporary ridge board between them. Then we used a straightedge to project the outline of the dormer roof planes onto the main roof and cut back the main-roof sheathing accordingly (drawing above). Having established the elevation of the dormer ridge, we trimmed back the upper cripple rafters and then installed the roof header to carry the permanent dormer ridge board. The roof header spans between the trimmer rafters, carrying the dormer ridge and the valley rafters. (On the rear dormer, the ridge was level with the main-roof ridge, so no header was necessary there.)

When the dormer common rafters and ridge were installed permanently, we used the straightedge again to find the intersection of the dormer roof planes and the inside face of each trimmer rafter (photo bottom right, p. 80). This point is where the centers of the valley rafters would meet the trimmer rafters. At their tops, the valley rafters would nuzzle into the right angle formed between the dormer ridge and the main-roof header.

I like to "back" my valley rafters, a process of beveling them so that they accept the sheathing of each adjoining roof on its respective plane. Because a cathedral ceiling was to wrap under the valley, I backed the lower edge of the valley as well, giving a nice surface for attaching drywall. (For more information on backing valleys and on gable dormers, see *FHB* #41, pp. 60-65, or view this article on-line at finehomebuilding.com.)

In addition to backing, I double valleys, even when not structurally necessary, because it gives ample bearing for plywood above and drywall below. Doubling valley rafters also simplifies the cheek-cut layout at the top and bottom of the valley because a single compound miter is made on each piece instead of a double compound miter on a single piece.

Because of the dormer's diminutive size, valley jack rafters weren't required. Consequently, with the valleys in place, the framing was complete, and we could dry it in.

Careful sheathing and flashing combat wind and water

We sheathed the front of each dormer with a single piece of plywood for maximum shear strength (photo bottom left, p. 80). With so little wall area next to the windows, I was concerned that the dormer might rack in high winds. The small back dormer was especially worrisome because it had no full-length sidewalls to combat racking, but the single piece of plywood on its front stiffened the whole structure. We extended the roof sheathing past the gable wall and beveled it to receive the rake crown molding.

Flashing work began with an aluminum apron flashing at the bottom of the dormer front wall (photo center left, p. 81). The downhill fin of this flashing extends a few inches beyond both sides of the dormer, and its vertical fin was notched and folded back along the sidewall. Then the first piece of step flashing had its vertical fin folded back along the front wall to protect the corners where the apron flashing had been notched (photo bottom left, p. 81). Step flashings march up along both sides of the dormer, with the uppermost pieces trimmed to fit tightly beneath the dormer roof sheathing. It was tough work weaving step flashings into the existing cedar-shake roof. Hidden nails had to be extracted with a shingle ripper, a tool with a flat, hooked blade. If I had it to do over, I would sever these nails with a reciprocating saw before the dormer sidewalls were framed.

The valley flashing was trimmed flush with the dormer ridge on one side of the roof, and the opposing valley flashing was notched so that it could be bent over the ridge. We protected the point where the valleys converge at the dormer ridge with a small flap of aluminum with its corners bent into the valley. This approach is more reliable than caulk.

The last piece of flashing to go on was the gable water-table flashing (photo top left, p. 81). Its front edge turns down over the re-

Back dormer demands different strategies

Unfortunately, when it came to the smaller dormer in back, the existing rafter layout did not match where the dormer needed to be, as was the case in front. Here, I had to build new trimmer rafters in the middle of the existing rafter bays.

The attic space differed, too. Whereas the front dormer served a bedroom, the back dormer was in a storage room. Because the owner wanted to maximize floor space in this storage area, I built the sidewalls on top of the rafters, which pushed the kneewall back and allowed the ceiling slope to extend all the way to the dormer's gable wall (drawing right).

As in the front dormer, we cut the new trimmer rafters short. This time, however, the floor joists ran perpendicular to the front and back walls, which meant that I could use posts to transfer the load from the trimmer rafters to an above-floor header (photo top left). The header distributes the weight over several floor joists, and the joists carry the weight back to the wall. The additional strain imposed on the floor joists is minimal because the header is so close to the wall.

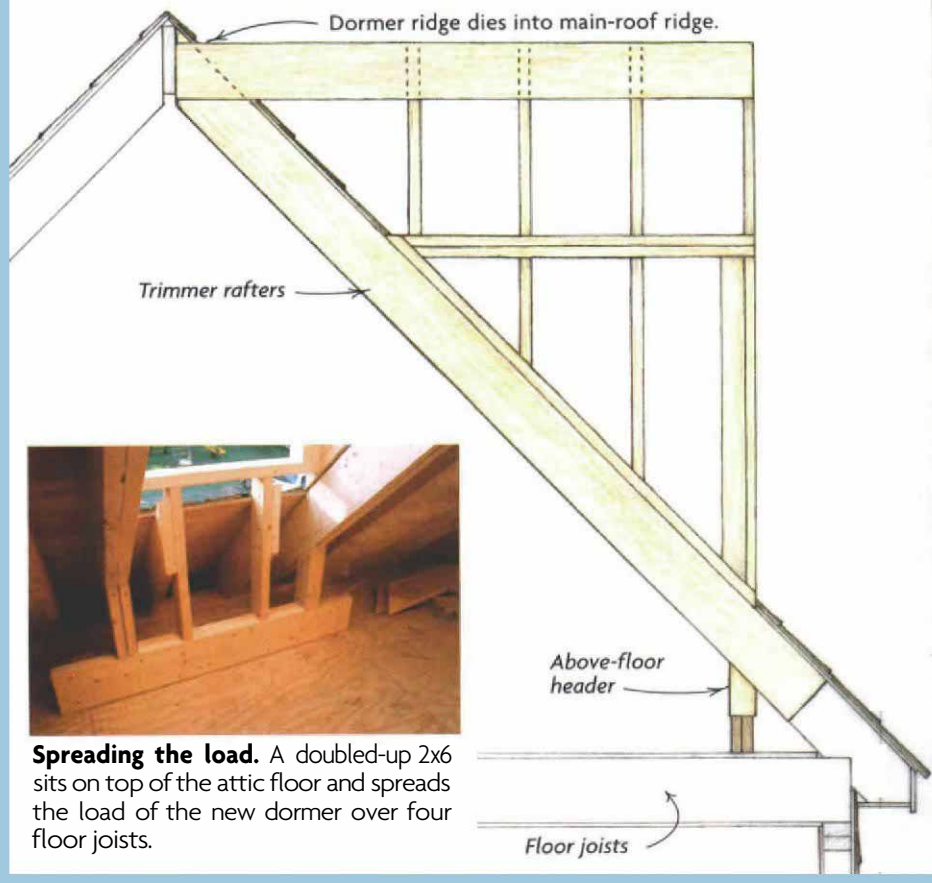
The location of the back dormer's roof ridge altered another aspect of the framing. Because this dormer's roof ridge was at the same elevation as the main-roof ridge, I tied the dormer ridge and the main-roof ridge directly together instead of building a separate dormer header.

Measuring and cutting the valley rafters was the same for the back as for the front with the exception that at the bottom of the back dormer's valley rafters, the compound miters did not need a level seat cut because the valley rafters would not sit on top of 2x4 wall plates. Instead, the valley rafters were simply nailed to the face of the trimmer rafters.

—S. M.

Above-floor header distributes weight of the dormer

There wasn't enough room in the existing roof structure to install full-length trimmer rafters that would bear on the exterior wall. Instead, the trimmers were cut short, and an above-floor header was used to transfer their loads to the floor joists and to the exterior wall.



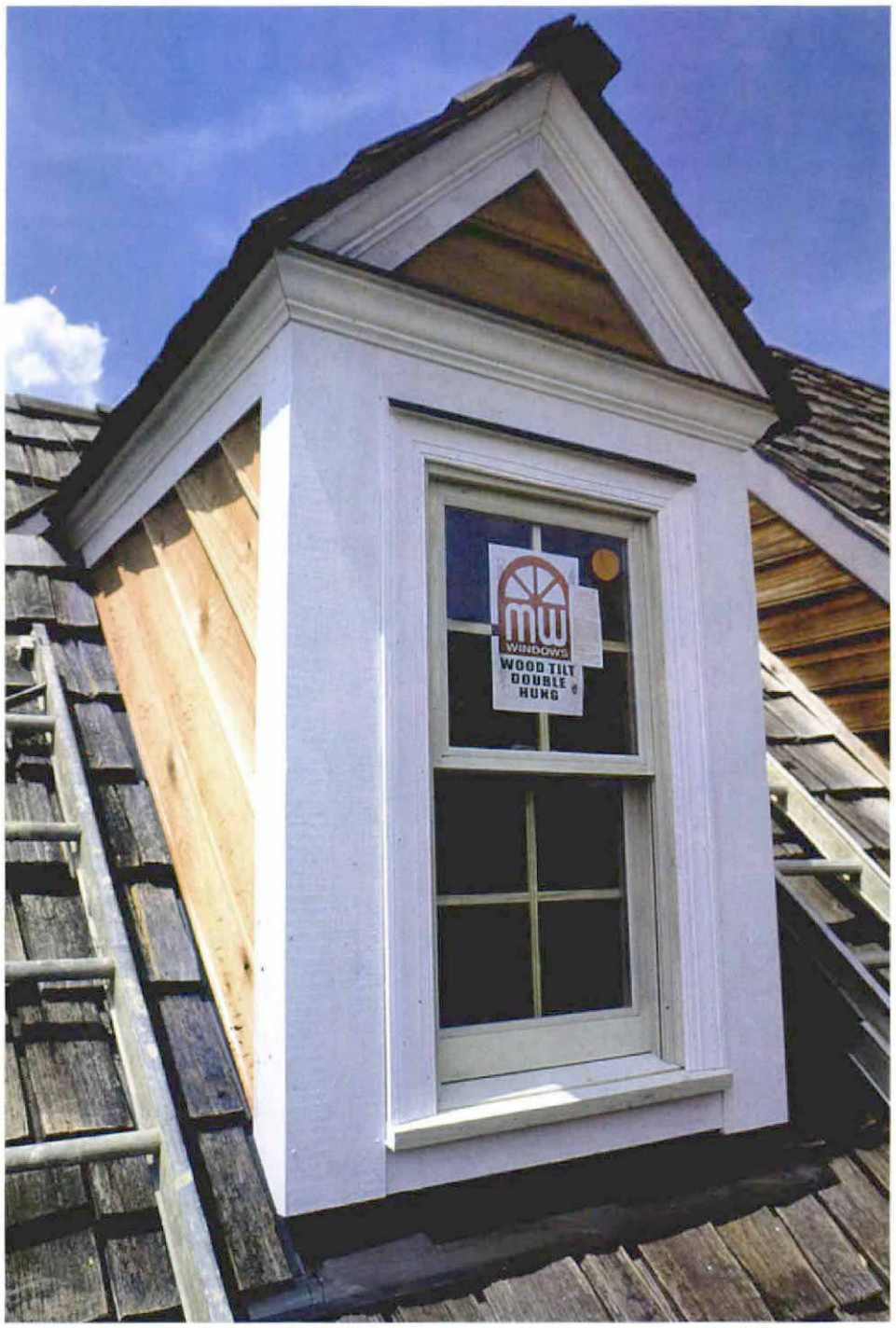
Spreading the load. A doubled-up 2x6 sits on top of the attic floor and spreads the load of the new dormer over four floor joists.

In the doghouse. Narrow dormers are prone to racking. To stiffen this one, the author sheathed the front wall with a single sheet of plywood.

Finding the bottom of the valley. A straightedge is laid across the dormer rafters to project the roof surface to the inside of the trimmer rafter.

Water-table flashing protects window and trim. The crown that forms the bottom of the pediment will go below the flashed water table and miter with an eave crown (seen poking out past the corner).

Keep the water moving down. An apron flashing seals the front wall with its ends bent around the corners (center photo). Then the lowest step flashings have their vertical fins bent over to cover the notches in the apron (bottom photo).



A crowning moment. Three pieces of crown converge at the bottom corners of the pediment. Trim, casings and sills, primed on every side, resist rot.

turn crown molding, and its rear corners fold up under the extended roof sheathing to repel wind-driven rain.

Finish trim improves on weather performance of existing dormer

The house is just a few years old, but the existing front dormer had suffered extensive decay. In the worst shape were the finger-jointed casings and sill extensions that the original builder had used. To avoid a repeat of this calamity, I used only solid moldings and bought cedar for the trim boards. Everything was primed, especially the ends. To promote air circulation, the ends of corner boards and rake boards were elevated an inch or so above nearby flashings.

We wanted the new cedar shakes on the dormer to blend in with the existing weathered roof. I asked around for a stain recipe, but the only response I got was from an old farmer standing at the lumberyard counter. He insisted that horse manure was the ticket. To my great relief, we hit upon a more savory alternative. We brushed on an undercoat of Minwax Jacobean, followed by a top coat of oil-based exterior stain in a driftwood-type shade. The undercoat added a nice depth to the gray top coat. □

Contributing editor Scott McBride is a carpenter and architectural woodworker in Sperryville, Virginia. Photos by the author.