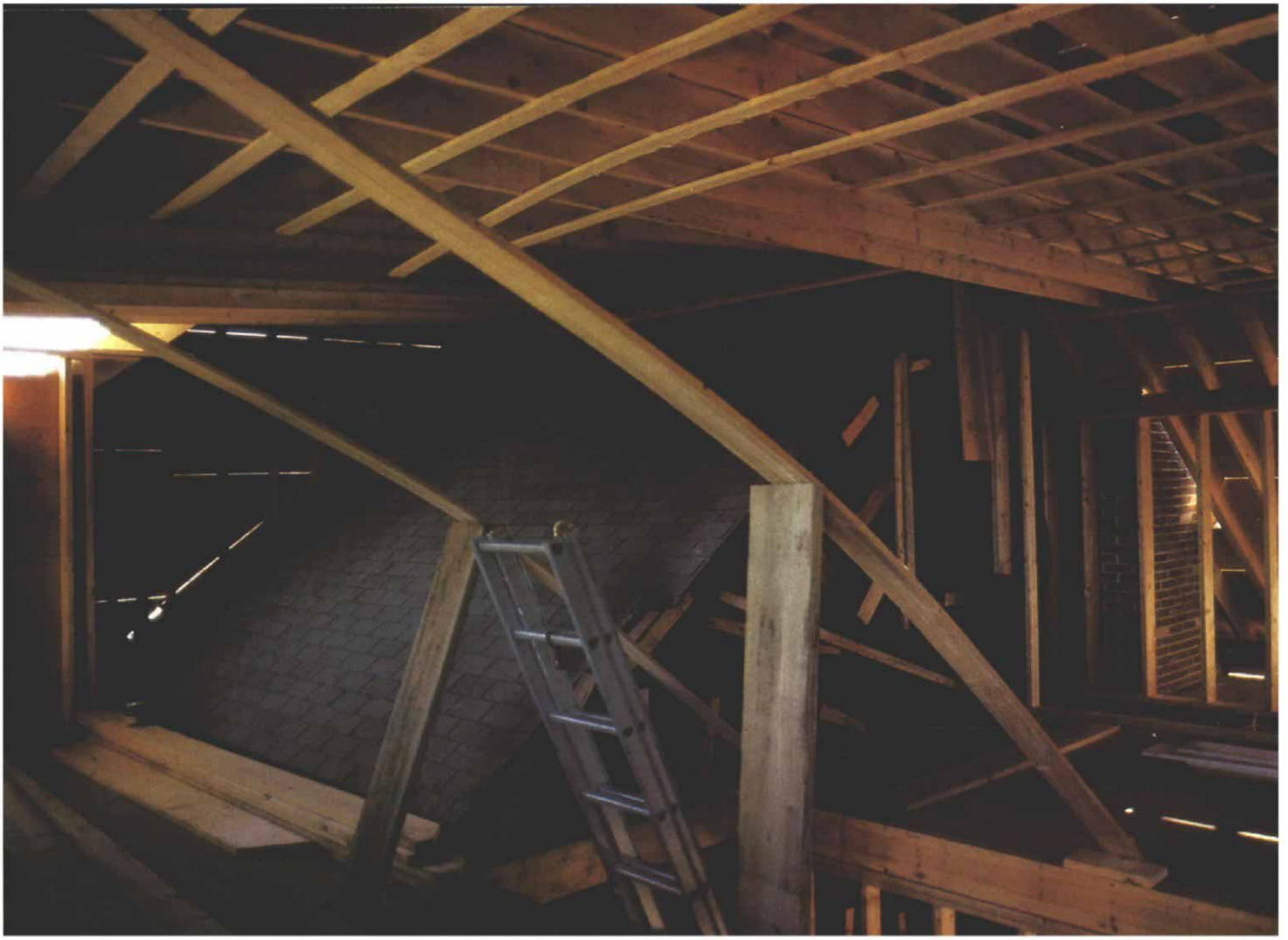


A Shed-Dormer Addition

Extensive remodeling triples the space of a small Cape

by Bob Syvanen

Adding new space to an old house is seldom as simple as it first looks. Getting the end result to look good is demanding and time-consuming, and the problems that invariably crop up add considerably to the headaches. Working out the basic design and particular construction details on paper isn't so hard, but once the actual work begins, leveling and plumbing the new construction to fit the old structure is a big challenge, especially if years of settling have caused walls to lean and beams to sag. Apart from all these difficulties, keeping the house and site relatively clean and orderly during construction so that life can go on for the clients who are putting up with this invasion adds appreciably to the burden and the time spent.

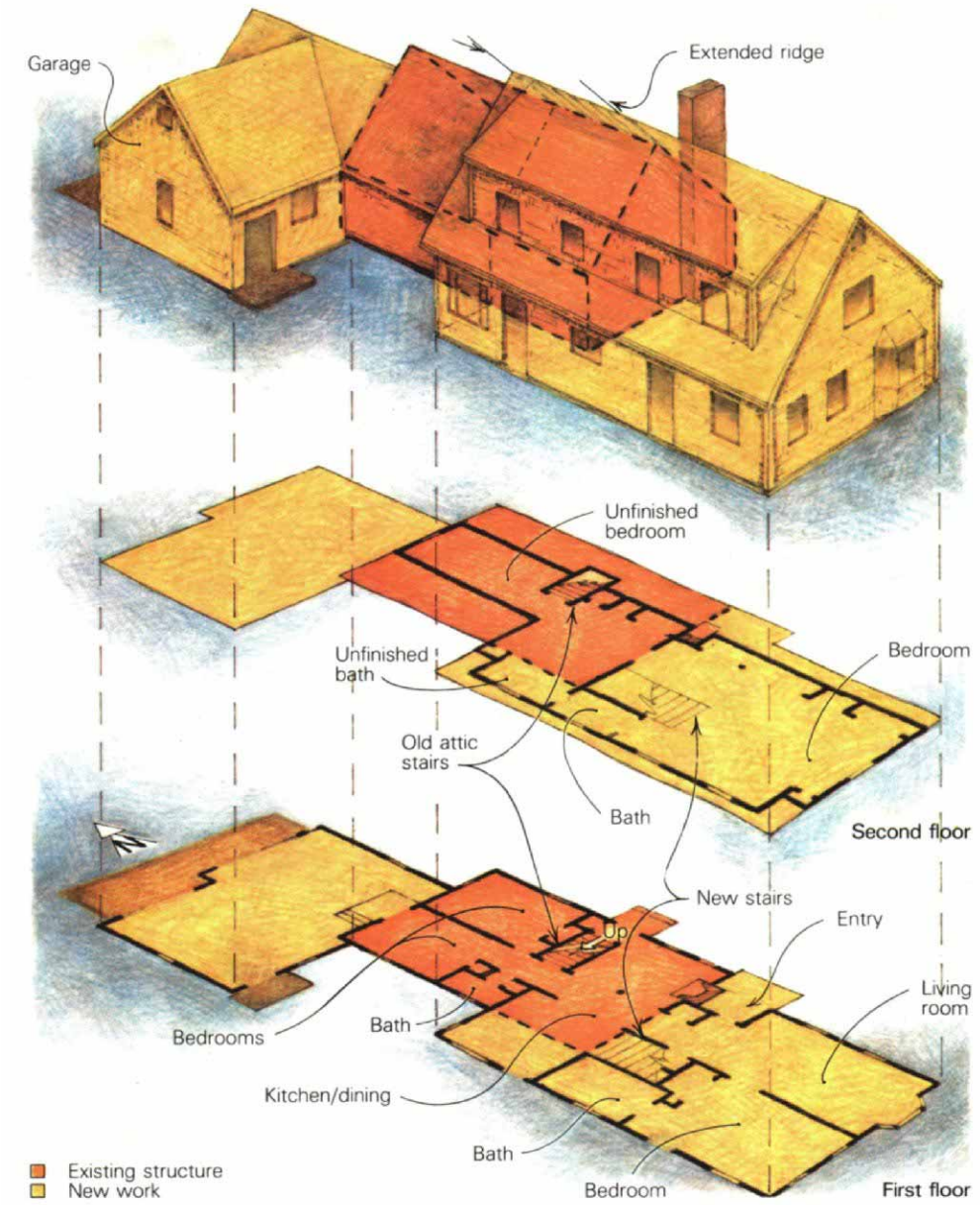
I faced such a challenge on a recent job. My clients asked me to take their plain 864-sq. ft. Cape Cod cracker box and make it over into a not-so-plain 3,300-sq. ft. house. Though I had considerable freedom with the design, the clients made several specific requests. Chiefly, they wanted about 1,300 sq. ft. of the addition to be on the second floor. There they would set up a large master bedroom, something they had missed since moving to the East Coast from California. Since the house would be occupied during construction, I had to keep the old Cape tight to the weather during the entire process of adding on.

I decided to keep the front roof intact and to build the addition at the back and south side of the old house. The floor plan I worked up (drawing, next page) enlarged the old kitchen and added a dining area, a living room, a bedroom, a bath and a foyer—all on the first floor. I added a three-car attached garage on the north end of the house. Upstairs went the big bedroom (about 500 sq. ft.) along with a bath and access to these via a new stairway. The other part of the upstairs (the space directly above the old house) remains unfinished even now, but will eventually become another bath and bedroom.

The owners wanted to keep these two areas entirely separate, thinking that the unfinished area might become an in-law apartment in the future. To this end, each space on the second

While a two-story addition to this small house was being built, the old roof had to be kept intact until the addition was complete. The 2x10 nailed along the ridge of the old roof serves as a plate for the rafters that extend to the new ridge. Kicker braces for plumbing the dormer wall are still in place.

Plan of old house and additions



story has its own way up and down. Excluding the garage addition, remodeling the old house extended the south gable-end wall 30 ft. and added an 11-ft. wide by 18-ft. long section in the opposite direction, along the existing back wall behind the kitchen.

By putting a 40-ft. long shed dormer on the rear of the house, I was able to create the large, open second-story space the clients wanted. Doing this and making the house wider from front to back meant extending the plane of the roof on the front of the house and relocating the ridge so that it would exactly divide the new footprint along its width. The challenge I faced in framing the new roof was to build the dormer big enough for the owners' wants, strong enough for the open floor plan (the ceiling joists had to span almost 20 ft.) and make it look good from the outside. And, of course, I had to do it all without opening the roof to the weather.

Maybe the most trying part of the job was an uninvited but regular member of the crew named Jasper, a kleptomaniac crow. He seemed to like nail sets best and would pick them right out of your tool belt. We must have lost a dozen nail sets. We even had to keep the truck windows rolled up to keep him from flying off with our ignition keys.

The old attached garage had to be removed from the south-end wall to make way for the addition. But before doing that I had to build the new garage at the opposite end of the old house. Tearing away the garage left a wound in the gable end open to the weather. It also exposed the mudsill, from which I would calculate the height of my new floor. The old and new floors would have to match in height. The old mudsill is a 3x6, the floor joists are 2x8s, the subfloor is ⅝-in. plywood, and the finished floor is ¾-in. hardwood, totaling 11⅜ in. For the addition, the mudsill is a 2x6, the floor joists are 2x10s, the subfloor is ⅝-in. plywood, and there is ½-in. underlayment for carpeting, totaling 12⅛ in. All floors would be carpeted, so the ½-in. underlayment in the addition would need to be level with the finished floor in the old house. Adding ½ in. for grout under the mudsill, I knew that the top of the foundation for the addition would have to be 1¼ in. below the old foundation wall.

I like to level and seal my mudsills with a bed of mortar between sill and foundation. It's a big help on remodel work to have this half-inch to play with, and can often make the difference between being able to adjust wall height properly and having to live with roller-coaster top plates.

When I told the foundation contractor to set the new foundation parallel with the front wall of the old house, which is also parallel to the ridge, I was thinking ahead to tying the new roof into the old roof, wanting to avoid any torqued planes and a snaky new ridge. Apparently he misunderstood my instructions (or just ignored them), and instead made the gable-end wall of the new foundation parallel with the gable-end wall of the old house. He then squared up his forms so that the new sidewall foundation was perpendicular to its end wall. Just exactly the opposite of what I needed. The garage gable-end had been built completely out of square with its sidewalls. As a result, the foundations for the new sidewalls were so far out of parallel with the sidewalls of the old house that Jasper the crow might have been able to do a better job.

To compensate for the misalignment without calling for a jackhammer and a new pour, I offset the mudsills on the new foundations. But after cantilevering the sill as far off the foundation wall as I dared, I found that it was still about an inch away from being parallel with the front wall of the old house. So I decided that I would just have to tolerate the error, and cope with the consequences when I framed the new roof.

With this problem postponed, I completed the first floor of the addition with little hassle. I took care to level my mudsills, to square the new floor before nailing down the deck, and to plumb the corners of the exterior walls to maintain alignment with the old house.

The next thing I had to worry about was the framing for the 11-ft. by 18-ft. area that would enlarge the kitchen along the back wall of the house. After the addition was fully enclosed, this section of wall would be taken out, but for the time being I was stuck with it. The ceiling joists in this area run from the new back wall to the old back wall of the house. To carry them, I nailed a doubled header to the top plates along the old back wall. To make room for the header (or carrying beam), a 2-ft. wide section of the eave had to be removed and the rafters cut back (photo facing page, left). This left a gap in the roof open to the weather. To cover the gap, I tucked an 18-ft. long piece of building paper under the roof shingles and lapped it over the header. A 20-ft. length of old gutter, hung below the beam, channeled the water run off from the old roof into a length of PVC downspout angled out a window opening of the addition.

New joists, new rafters. **The addition's second-story floor joists that tie into the old house (above) are attached to a header nailed to the top plates of the existing wall. To make room for the header, the eaves and rafters had to be cut back. Extending the plane of the old roof without opening it up meant framing an 18-ft. long section of roof with a bottom plate on the deck (right), as though it were a wall. Then the section was raised and braced in position alongside the old ridge. The bottom plate was nailed to the old roof at the ridge, with allowance made to let the new roofing work out flush with the old. A layout error in the foundation was compensated for at the peak by sistering a 2x10 onto the new ridge so it would line up with the already installed gable rafters.**

Framing the dormer—With the first-floor ceiling joists and plywood deck in place, I was ready to tackle the dormer framing. I took measurements of the old roof rafters and made a full-size layout on the deck. This layout included the old rafters (many of which would be removed after the framing was finished), new rafters, first and second-floor ceiling joists, the dormer window wall and the interior wall that supports the new ceiling and the old roof. To complete the layout, I added the fascia and soffit. From this layout, I would get the correct angles for making plumb and level cuts on my rafter stock, and the exact lengths for rafters, joists and studs. The full-size layout also let me preview the operations to come and gave me a good sense of how things would go together.

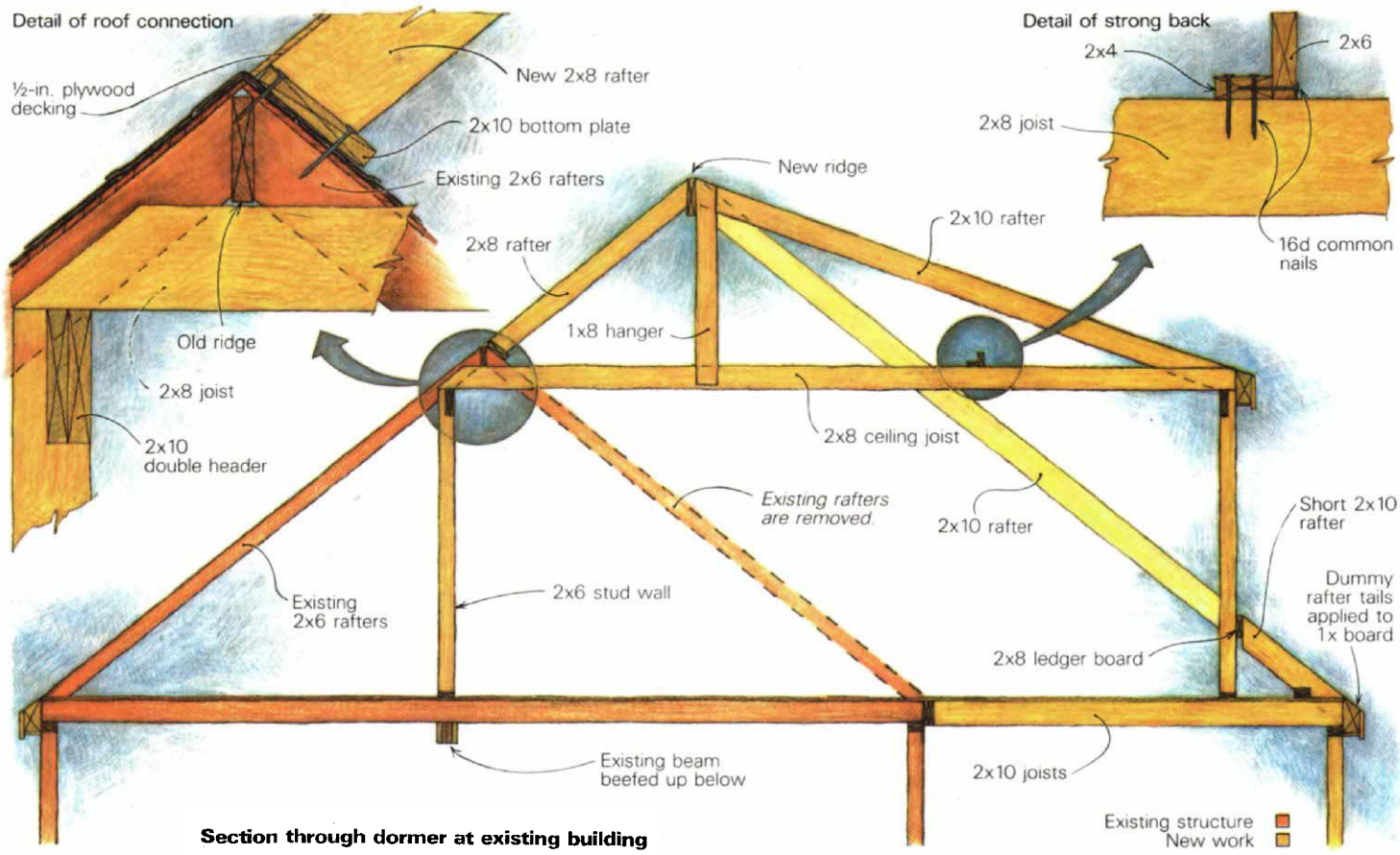
Using the stud height that I had laid out on the deck, I built the 40-ft. dormer window wall with a 6-ft. wide piece of the cheek or end wall at each end (drawing, facing page). This partial return on each side let me brace the new dormer wall at both ends so that it was ready for rafters, and still take my time in filling in the rest of the cheek wall. I set the dormer window wall back 4 ft. from the exterior wall below, and set the dormer's cheeks in 4 ft. from the gable-end walls. To carry the tops of the short rafters, I nailed a 2x8 ledger board to the studs of the window wall 30 in. up from the bottom plate. I think dormer walls look better when they are set back from the edge of the roof. It's more costly to build a dormer this way, but it maintains the integrity of the original roof line, and incorporates the dormer better into the rest of the structure, making it seem less like an ungainly afterthought.

I decided to preserve the plane of the original front roof, and extend it to a new ridge about 4 ft. higher than the existing one (photo above right). This was a practical measure that would let me take advantage of the existing framing without exposing the old house to the elements. The trick here was being able to extend this plane up to the new ridge without sistering new rafters onto the old ones, which would mean cutting into the roof and removing the old ridge.

To accomplish this, I framed a section of roof to come off the old ridge at the original pitch and in the same plane as the front roof. I began by cutting the 7-ft. long rafters from 2x8 stock, taking the lengths and angles from the layout. Next I nailed a 2x10 plate to the bottoms of rafters (which were set out on the deck), just as if I were framing a stud wall with an oddly angled bottom plate. Then I nailed the 2x12 ridge to the rafters. When this was done, I raised the whole thing into position, and braced it with 2x6s from the dormer deck.

Once the rafter section was in place, I nailed the plate to the existing roof next to the old ridge, as shown in the drawing next page, top left. Because the rafters underneath the plate would eventually be cut off, I made sure that I got plenty of nails through the plate and into the ridge itself; otherwise, I'd have to depend on the nailing in the old rafter stubs to hold the new roof sturdily in place. I was careful to locate the plate so that its top edge was in line with the top edges of the rafters on the opposite side. This way the new roof deck would flush up with the existing deck, and there wouldn't be a hump in the shingles.

To brace the unsupported rafters, I nailed a straight 2x6 guide on edge to the old roof at each end of the new rafter section and let the ends run to the new ridge. By deducting the thickness of the decking and the thickness of the shingles on the old roof, and by cutting shims to this thickness and nailing them to the guides, I was able to find the right plane for the new rafters to lie in. Since the old roof would have to be reshingled, I didn't worry



Section through dormer at existing building

much about nailing the temporary guides through the roofing.

Before putting the shed-dormer rafters on, I wanted to be sure the ridge on the extended rafter section lined up with the new gable-end rafters. So I cut a pair of gable rafters, and temporarily set them in place using a 2x4 spacer in place of the ridge. Once again, I got the gable-rafter lengths and angles from my layout on the deck. Then came the moment of truth, the moment I'd prepared for with all the fussing, fudging and plumbing up the frame from the mudsills below. Eyeballing down the 18-ft. length of the 2x12 ridge on the extended rafter section, I was hoping against hope to put the 2x4 ridge block at the new gable rafters dead in my sights. It was a clear miss. The block was 1½ in. off toward the back of the house. The inch I was off at the mudsill had followed me up to the ridge, and it picked up another ½ in. to boot. Not good, but not disastrous either. I had to stick with the gable rafters I'd already nailed in place so I could keep a flat plane on the front roof; I couldn't cheat here. But I could on the dormer side of the ridge. I decided to sister a new 2x10 ridge onto the face of the 2x12 ridge of the extended rafter section and run it all the way to the far gable end. This put the new ridge in perfect alignment with the new gable rafters. Thus, the front rafters all worked out to be the same length, but each of the dormer rafters had to be cut a tad shorter than the previous one as they progressed, toward the gable end.

Framing up a shed dormer and introducing a vertical wall where the rafters ordinarily go means losing the strength and rigidity of a triangulated structure. If something isn't done to compensate for this loss, the ridge will sag and the dormer wall will lean out of plumb—if you're lucky. In the worst instance, the ridge (which, with dormer rafters attached, becomes a structural member) can fail and cause the roof to collapse. I solved the problem in this case by framing up a truss-like arrangement that consists of a long 2x10 rafter, a short 2x8 rafter, a 2x8 bottom chord, which functions as a collar tie and serves as a ceiling joist, and a 1x8 hanger, which supports the joist about ⅓ of the way along its 21-ft. span. This 1x8 looks a little like a king post, but its purpose is not to take any compression loading. This restores the triangulation you lose in omitting the rafters and framing up a dormer wall. (In most shed-dormer situations, where joists aren't spanning long distances, the hanger isn't needed.) The joists sit on the double top plate of the dormer window wall, where they extend to the plumb cut on the rafter tails and are well nailed to each rafter.

So each joist would be at the right height when I nailed it to its hanger, I cut a 7½-ft. long 2x4 for a gauge stick. The joist would sit on top of the gauge stick while I nailed the hanger to the joist. To stiffen the joists and to help keep them from twisting and sagging, I ran a ***strong back*** (detail drawing, above right) across them in the middle of their span between the hangers and the dormer wall.

Because at this point I wasn't ready to remove the old roof under the dormer, I couldn't yet install the 2x8 ceiling joists in the 18-ft. long section of roof that was over the old roof. But that part of the structure did need stabilizing, so I nailed a temporary 1x8 tie to each rafter at the dormer wall plate and angled it upward to catch the extended rafter opposite, just above the plate at the ridge. These ties would be replaced with permanent 2x8 ceiling joists to match those in the rest of the dormer, once I built an interior 2x6 stud wall to support the old ridge. Things were now secure enough for me to remove the ridge supports.

The roof framing on the addition was complete at this point, except for the short eave rafters that would extend from the dormer window wall down to the double top plate of the wall below. Instead of measuring these rafters on my deck layout, I picked the correct length for them by measuring them in place. These short 2x10 rafters, at 16 in. o. c., have the same bird's-mouth cut at the bottom as the full-length rafters. They were nailed at the top to the 2x8 ledger on the face of the dormer window wall.

After all the roof trim was on, I shingled the whole roof with GAP Timberline fiberglass shingles. Their texture doesn't show the imperfections that are bound to occur when a new roof meets an old one. A flat shingle lets every bump and depression from the decking below telegraph through.

The old roof section under the new dormer roof could now be opened without fear of wa-

Illustrations: Christopher Clapp

Framing the dormer. **The long window wall and the dormer cheeks are set back 4 ft. from the walls below, allowing the original roof plane to show on all sides (photos at right). At this stage, the dormer window wall and cheeks have been framed and sheathed. A ledger board along the bottom of the window wall carries the short rafters. The plumb cuts on the rafter tails have been made flush with the plate, and dummy tails applied, first to a long 1x board, and then to the ends of the true rafters. This makes the rafter tails line up, the fascia and soffit easier to apply, and it eliminates tedious blocking.**

ter damage. I stripped the shingles and plywood decking from the old roof section, but left the rafters in place for the time being. Next, I cut and nailed the permanent ceiling joists in this section in place, and took care to level them with the rest of the joists in the dormer. Instead of nailing their inboard ends to an interior wall plate, as I had done with the other joists, I face-nailed them to the existing rafters after mitering their ends at the roof pitch to fit snugly under the deck. Then I reinforced the joists with 1x8 hangers and a strong back, just as I had done in the rest of the dormer. Once these were installed, I removed the 1x8 ties that had held the wall and roof together.

Before removing the old rafters that I had just exposed, I still had to take care of the one disturbing potential weakness in this framing scheme. The juncture at which the 7-ft. extended rafters sit on the plate at the old ridge needed some support, or the roof might sag at that point. I wasn't afraid that the roof would actually collapse, but I did want an extra measure of assurance.

I have taken apart lots of old houses, and my experience and intuition told me that it would be worth the extra time to give this weak link a little extra support against that unpredictably heavy snow load. To do this I built an interior stud wall of 2x6s that sits directly under the ceiling joists where they tie into the old rafters, as shown in the drawing on the facing page. Because this wall had two wide closet doors and a skylight in its 18-ft. length, I notched a double 2x10 header into the 2x6 studs to carry the load of the ceiling joists and rafters above. To get good bearing below, I had to beef up the existing beam that had been installed by a previous remodeler because I doubted its ability to support the increased load.

This framing system had, of course, all been carefully planned out ahead of time, using past experience and common sense. I knew it would work. So when I tore out the old gable-end wall and cut away the old rafters leaving only stubs behind, I didn't bat an eye. Just kept my fingers crossed.

I'm very pleased with the way this job turned out, and as a bonus, Jasper's cache was discovered in a roof gutter across the street. I now have a good supply of nail sets and drill bits, and an extra set of car keys. □

Bob Syvanen is a consulting editor with Fine Homebuilding *magazine. Photos by the author.*

The finished house, seen from the front, appears smaller than it actually is because the extended roofline obscures the new 40-ft. shed dormer at the back of the house.