Building a Deck Over a Living Space

If you don't want the roof to leak, careful flashing details and a watertight membrane should be your primary concerns

BY KEITH J. MAZZARELLO

Everyone thinks that roofs are pitched to shed water, but they're also pitched to shed people. Walking on roofs can ruin the shingles, so flat roofs tempt fate in two ways: They give water a better chance to leak into the house, and they tempt homeowners to build rooftop decks. If not built properly, these decks can cause water problems galore.

When Marie called me over to check out her rooftop patio, I expected the worst. And that's just what I found. Built over the family room, the deck consisted of a thin concrete slab poured over 2x8 rafters that leaked sideways and down. All in all, it should never have been built, but Marie didn't want to lose the convenience of the deck. My suggestion was to replace the slab with a leakproof membrane followed by a wooden deck on sleepers. I also wanted to build the deck in sections so that it could be removed easily if anyone needed to repair the roof.

To anchor the railing posts, you have to open the roof

After my crew and I stripped off the slab, I was surprised to find the sheathing and framing underneath in relatively good shape. The same was true of the adjacent gable wall (drawing p. 106); the leaks had started recently but hadn't caused any permanent damage.

Before applying the new roof, I needed to anchor the 4x4 cedar railing posts to the existing rafters. We cut oversize openings in the plywood at the posts' approximate locations, making it easier to determine exact locations. I set the corner and end posts first and spaced the intermediate posts later. Locating the intermediate posts was difficult because rafter layout was not consistent, so I put them as close to regular intervals as I could.

I wanted the posts to be rock solid (a shaky post could stress the flashing and cause a leak), so I anchored them to the joists with counterbored 3½ by 5/16-in. lag bolts and construction adhesive. I screwed and glued 2x blocking (drawing p. 107) to lock the posts in place and patched the roof openings with ¾-in. plywood, making sure the seams had plenty of backing.

Flames seal the membrane and make the roof impervious to water. After dry-fitting each piece, a worker rolls out the rubber membrane while melting the underside's leading edge with a propane torch. A fire extinguisher is mandatory during this phase of roofing.

The roofers shimmed up the plywood to the level of the old sheathing with felt and roofing cement. The cement also sealed the plywood seams, and we hoped it would keep later applications of hot tar from running into the joist bays.

A new one-piece gutter was mounted to the roof and set into roofing cement. The two rake ends of the roof received a custom drip edge that extended 4 in. down the fascia. This flashing allowed the water a wide face to run off and also hid all the telephone wires that were attached to the fascia.

Deck flashing must be deep, wide and flexible

Next, the roofers added the first layer of roofing, a combination of hot-mopped tar and type-4 fiberglass-reinforced felt. This newer felt costs more than #30 felt (about $24 for a 5-square roll), but it's much stronger and even lies flat. The hot tar actually bleeds into the felt, making it into a monolithic piece. (You need to be careful when you're working with hot tar. At 450°F, the tar will remove skin if you touch it, and if you spill it, the mess is incredibly difficult to clean up.)

When the tar cooled, we installed the 12-in. wide copper flashing against the house. The flashing could be made only in 10-ft. lengths; transporting lengths any longer would be like handling a wet noodle. I soldered two lengths together on site to make a continuous run.

Four of us raised the long piece of flashing to the roof to make sure that we didn't kink it; at about 15 per ft., I didn't want to buy more of this flashing than I actually needed. I made clips from scrap copper to hold the flashing to the gable wall, nailing it to the roof with copper nails (drawing p. 106). I've found that it's important to let flashings float. Thermal expansion can make one or both surfaces pull away from the fastening

Photo this page: Keith J. Mazzarello

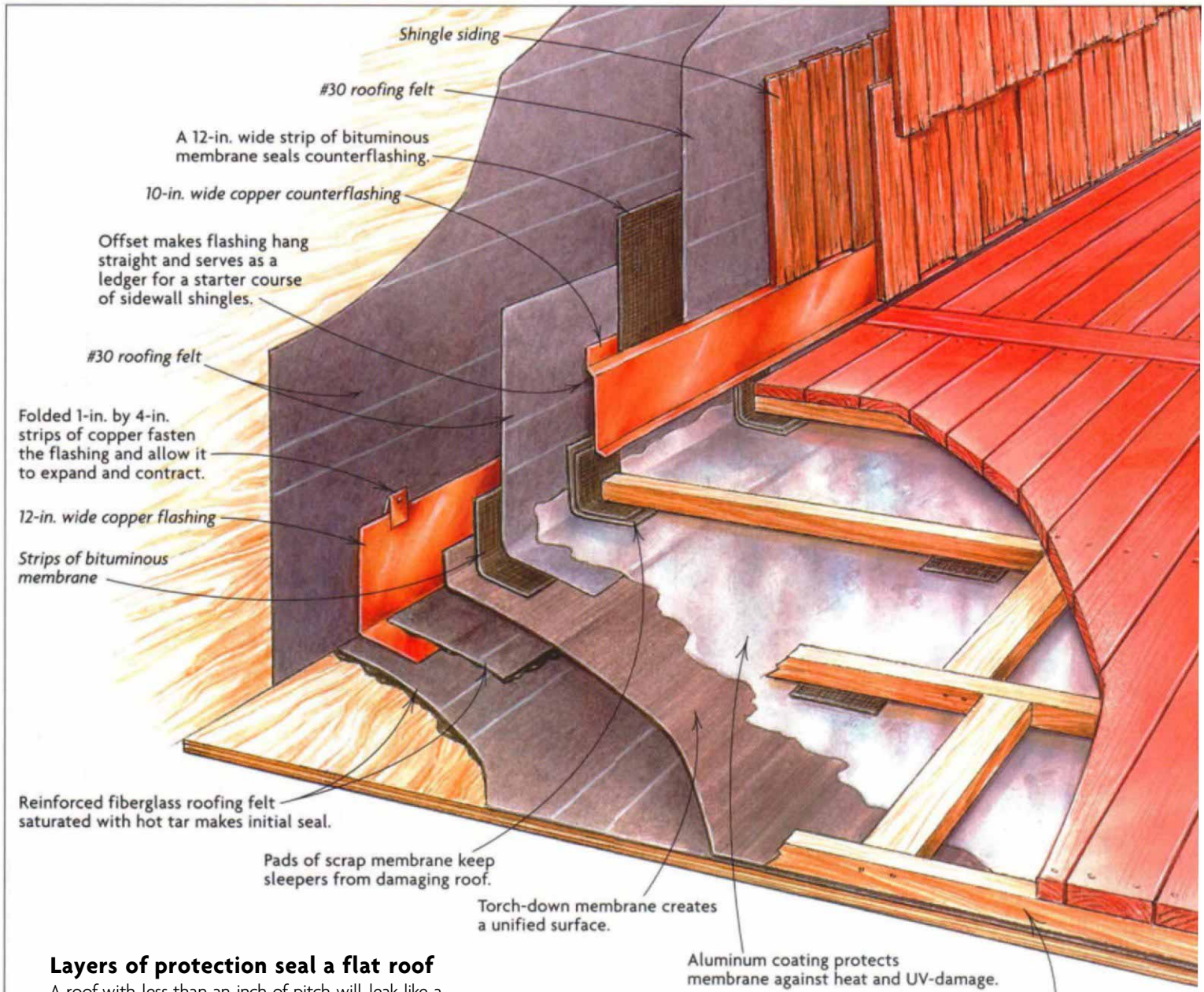
Modular deck framing allows access to the roof. The deck was framed in sections to make future access to the membrane easier. Small pads of bituminous membrane keep the pressure-treated frame from damaging the rubber skin of the roof.

point, leaving an opening for water to penetrate. At this point, we also laid another strip of felt and hot tar over and up to the break in the flashing.

When the tar cooled, we dropped the custom copper post flashings (drawing p. 107) over the posts. These soldered-seam collars, 12 in. sq. at the base and 4 in. high, were set into a layer of flashing cement and nailed down with copper nails. Over the post flashing, we applied another layer of flashing cement and type-4 fiberglass felt that extended about 4 in. beyond the copper. This procedure not only made a better seal but also raised the surface around the post to drain away water.

To make sure nothing leaked, I used counterflashing on the gable wall and over the posts. Over a new layer of #30 felt, I nailed the counterflashing (drawing p. 106); an offset along its upper edge allowed the counterflashing to lie flat and not spring out.

To counterflash the bottoms of the posts, I started by cutting a $\frac{3}{8}$-in. groove into them with my laminate trimmer. Then I had a one-piece copper collar made that fit into the groove and hung over the flashing. I



Layers of protection seal a flat roof

A roof with less than an inch of pitch will leak like a sieve unless it's flashed properly. The addition of a deck requires a resilient roof that will not fail at any point of contact. To make the roof tight, both flashing and roofing must work together, especially where the roof abuts the house and where posts penetrate the roof.

sealed the groove with urethane caulk. Masking tape kept the caulk joint neat.

A torch-down membrane seals the roof

The last layer of the roof was a 4mm thick torch-down membrane. The roofing contractor liked this type of roof because the length and width of the material is bonded to the substrate unlike EPDM, which is often bonded just on the edges. In the roofer's experience, a leak in an EPDM roof can be hard to trace because once past the membrane, water can travel away from the point of entry; a leak in a torch-down roof is contained. Torch-down membrane lasts 15 years to 18 years and costs about $1.40 per sq. ft.

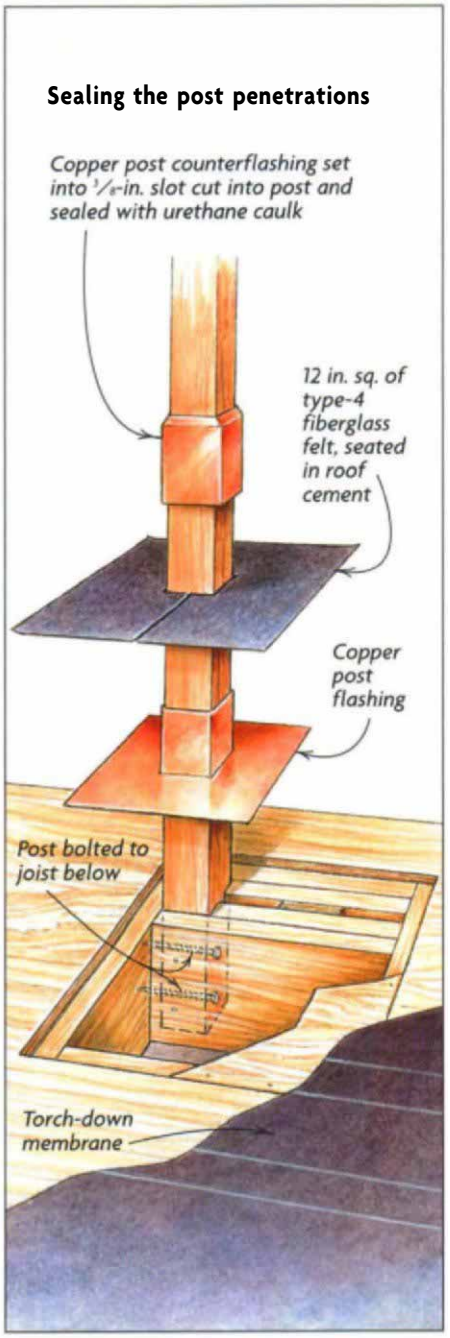
We rolled it out dry, made all the necessary cuts, and rolled it up and back out again while melting the underside with a propane torch (photo p. 104). When torching down a roof, you must avoid heating soldered seams and aluminum edges—they may become unsoldered or burned. It goes without saying that you should keep a fire extinguisher handy.

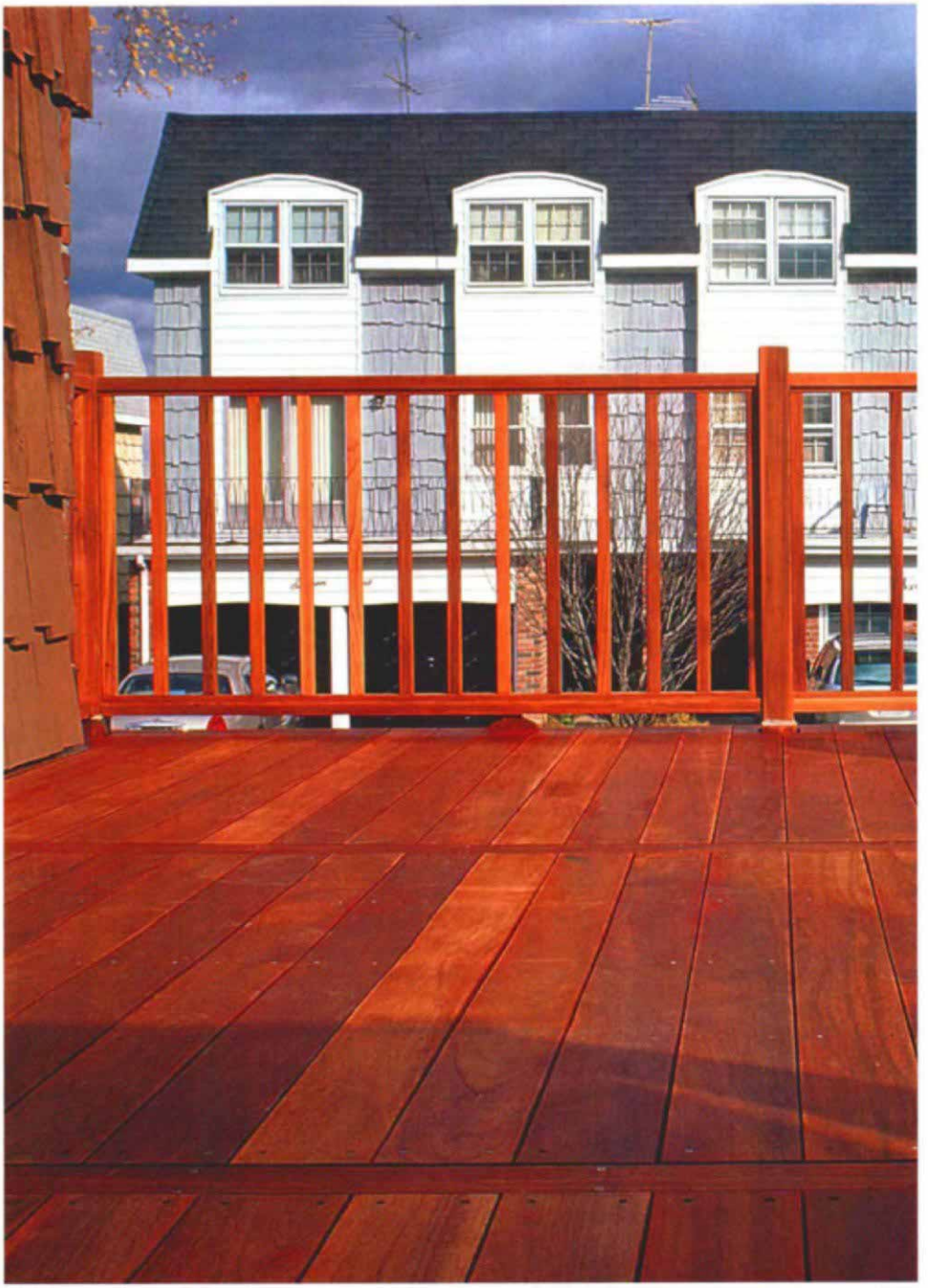
After the membrane was down, we sealed the edges and post locations again with roof cement. We sealed the overlap of flashing and roofing with a 12-in. wide strip of EPDM. To protect the torch-down membrane from heat degradation and to extend the membrane's warranty a couple of years, we rolled on a paintlike aluminum roof coating; I like Bulldog products (Palmer Asphalt Co.; 800-352-9898; about $45 for 5 gal.), but most membrane manufacturers offer similar products. The next day, we inspected the roof and made sure there were no open edges or seams.

Modular frames carry the decking

The deck had to be constructed to allow easy disassembly if the roof needed service. My

Drawings: Don Mannes





A roof deck should be an asset, not a liability. A flat roof can be the perfect place for a deck, but the roof has to be waterproof to protect the house.

plan was to make three independent frames that just sat on the roof; each would be small enough for two people to lift easily but large enough to leave the deck looking unbroken. Fasteners were also important. I'm always frustrated when an assembly requires multiple types of screwdrivers or wrenches. Here, all the parts that would ever require disassembly were fastened with #10 stainless-steel square-drive screws. I used galvanized nails everywhere else.

Because the roof had a consistent pitch of 1/4 in. over 12 in., I scribed the pressure-treated 2x sleepers to make the decking level. I built each frame with a full plate on the outside and two rows of blocking equally spaced between the sleepers. The blocking kept the joists parallel and added strength. Two of us easily lifted each of three sections onto the roof, although a road crew that was watching insisted on giving a hand.

Decking and railings finish the job

Once I had the sleepers set, I laid out the 5/4 mahogany decking. To get a straight, regular pattern of screw heads, I tacked each board in place, snapped reference lines and then finished screwing them down (photo p. 105). I also made sure I primed every cut with clear preservative. To join the three sections together, I screwed a transition piece of 5/4x4 decking that ran perpendicular to the decking. For backing, I just needed to double up the framing where the two sections met.

The last step was to give the deck and railings a final coat of preservative. I told Marie that to get the most out of the deck, the structure should be treated every season. □

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