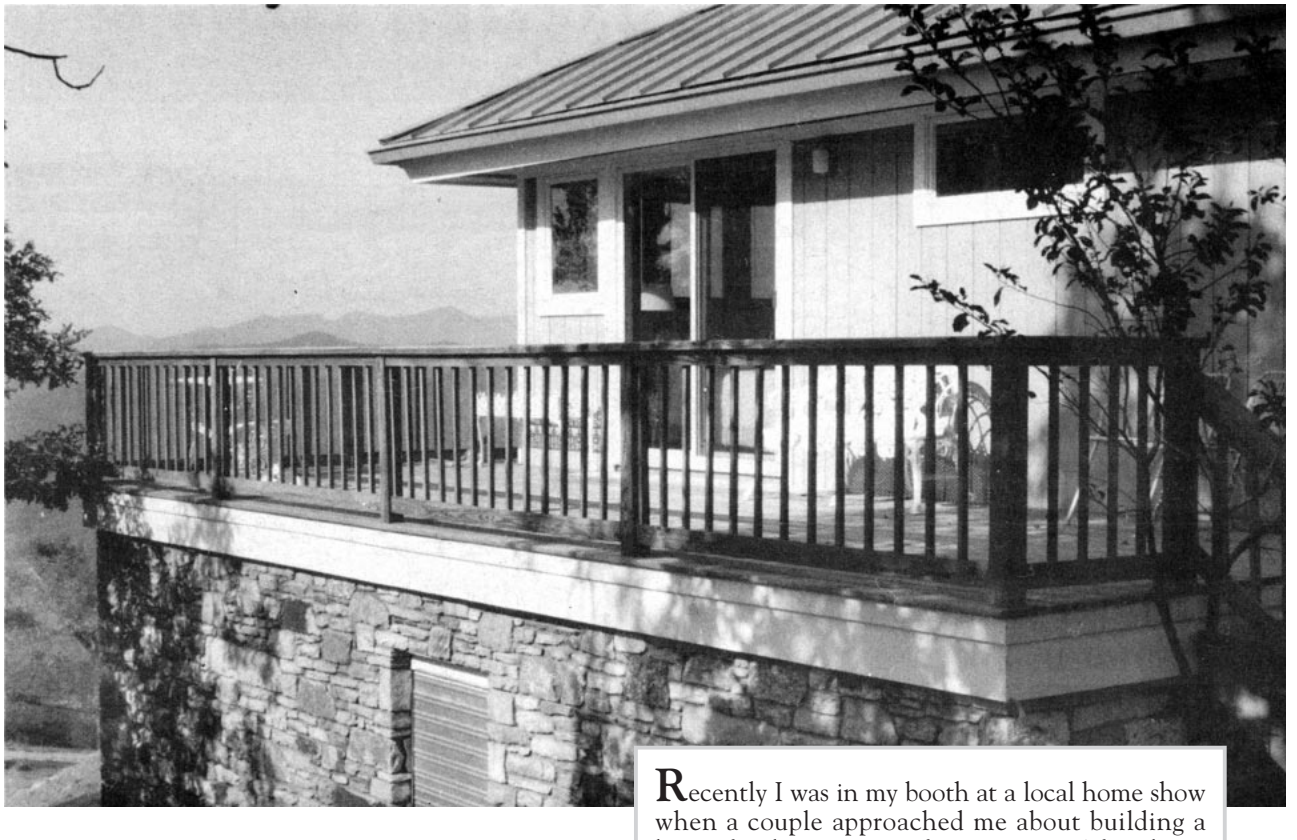


Building a Rooftop Deck

Careful detailing and an innovative single-ply membrane solved a common construction problem

by Bill MacCurdy

Recently I was in my booth at a local home show when a couple approached me about building a house for them on top of a mountain. After showing them some of my work and visiting the steeply sloped site, I was given the job. The plans called for the foundation to be excavated, for block walls to be layed and the cores filled, and then for the entire excavation to be backfilled and compacted, with concrete slabs poured on top.

There were eight level changes in the house, and the owners had decided to use hardwood floors throughout. I felt the filled block walls and slabs were an expensive and poor choice, particularly with the steep site and the addition of oak flooring. I suggested a grade beam foundation poured with the slope of the land. We could frame crib walls on top of the grade beam that would support the floor joist system. This would save money and make a much better underlayment for an oak floor. In addition, I told my customers, this would create some "storage space" under the house.

The idea of storage space really appealed to the owners, so we decided to put in a full basement. But this created a new problem: The decks outside the first floor were now over living space. We sent the plans back to the architect to redraw the deck details, and he sent them back with a section drawing showing half-lap roll roofing over the flat

roof underneath the deck.

I didn't like this for several reasons. The house was being built at an elevation of 4,000 feet in the mountains of western North Carolina. In that climate there can be a 20-inch snowfall one day and rain a week later. The idea of roll roofing having to survive that kind of freezing and thawing did not appeal to me.

Also, since the house was a vacation residence, there would be nobody there for most of the winter. If a leak did develop, the drywall ceilings under the deck could be ruined before anyone knew about it. And I couldn't see having to remove the deck to repair the roof.

I called a roofing supplier for information on alternative products. He suggested a single-ply product called Hypsam, manufactured by the Hyload Corporation (1006 McKnight Park Dr., Pittsburgh, PA 15237; 800/457-4056). It's a self-adhering EIP (ethylene interpolymer) membrane, and it comes in 36-inch- by 50-foot-long rolls. Hypsam was originally developed as a waterproofing material for bridges. It is non-compressible, meaning it won't stretch and get thinner. It is also fire resistant and chemically resistant to acids. Best of all, it requires no volatile adhesives, and you don't have to use a torch to install it.

Hypsam sounded like a vast improvement over asphalt-based roofing. Its chemical- and fire-resistant qualities mean that hamburger fat or cigarette butts won't harm the roof if they drop down through the deck boards. And the cost — about $100 for a 36-inch-wide by 50-foot-long roll — was within the budget for the job.

According to the manufacturer, the weakest link with Hypsam is that the adhesive grows soft under ponded water. So we had to have a design that would ensure that no water would stand on the roof.

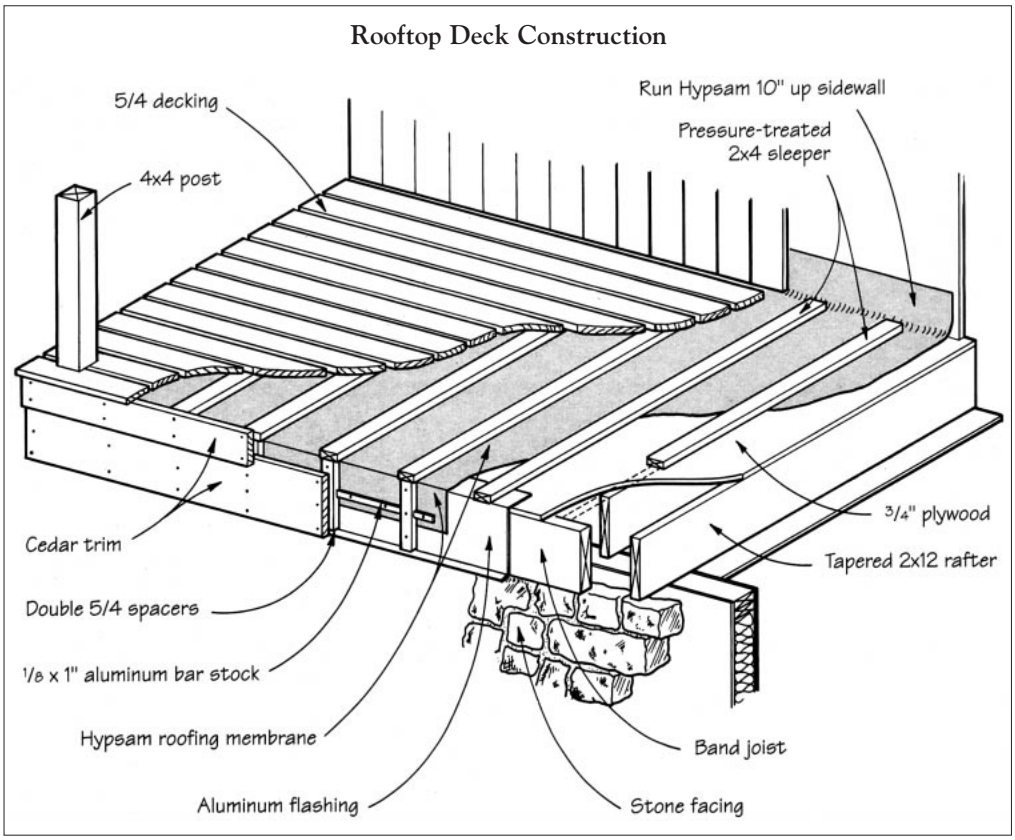


Figure 1. *The author's rooftop deck design solves two problems: protecting the living space below and getting water off the roof. By attaching the 2x4 sleepers with construction adhesive, he avoids puncturing the Hypsam roofing membrane. The tapered rafters and edge details ensure that water will not pond on the roof.*

Roof Construction

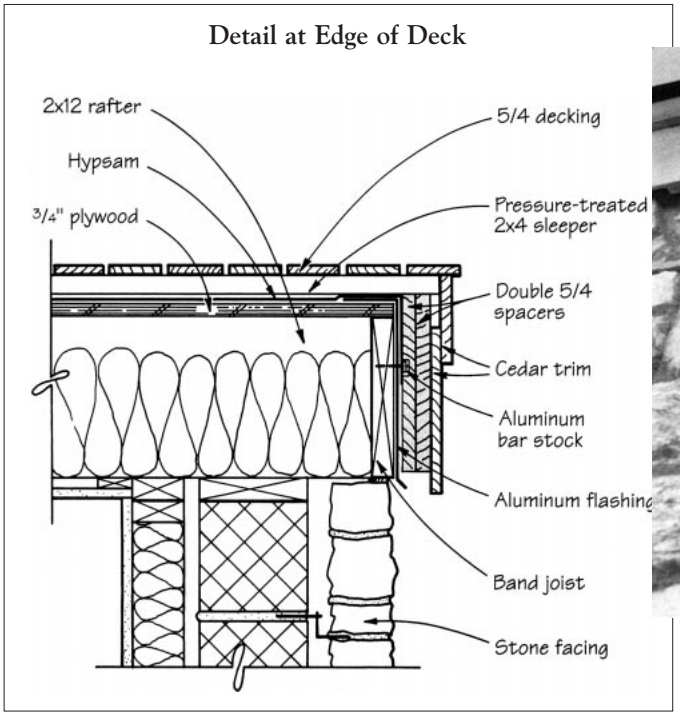
The decks were about 12 feet wide. We used 2x12 rafters, 16 inches on-center (see Figure 1). I wanted the roof surface to end up with about a 1/2-inch slope in 12 feet. Since I wanted the ceiling in the room below to be flat, rather than pitch the rafters, we cut a taper on the top of each rafter. This gave us the slope we needed.

We then put down a 3/4-inch exterior plywood deck, fastening it with screw-shank nails so they wouldn't back out.

Using The Hypsam

The next step was placing the roofing membrane. I'm always uncomfortable and a little nervous using a new product and a new technique. I like to guarantee my work, and doing the unfamiliar can be nerve-wracking, as well as costly, because of the trial and error involved. But the supplier said he would come to the site and show us how to install the Hypsam. The description of the process sounded easy enough, but having somebody show us was great.

Everybody has probably had an experience when a seemingly complex or unfamiliar task turns out to be quite easy, utilizing skills you use every day. This was the case here. We popped a chalk line and the expert began to roll out the Hypsam. In 3 feet he was off the line by 3/4 inch. The good thing about Hypsam, he said, is that you can pull it up and just put it down again. Of course, the bad thing is, if you are not careful pulling it up it folds over on itself, just like duct tape does. We thanked him for the demonstration, cut off the folded section, and proceeded to put down the Hypsam as if we were rolling out roofing felt — something we do all the time.



Installation. We first swept the

Figure 2. *The author detailed the edge of the roof so that water runs off behind the trim boards. The gap behind the trim (above) is hardly noticeable.*

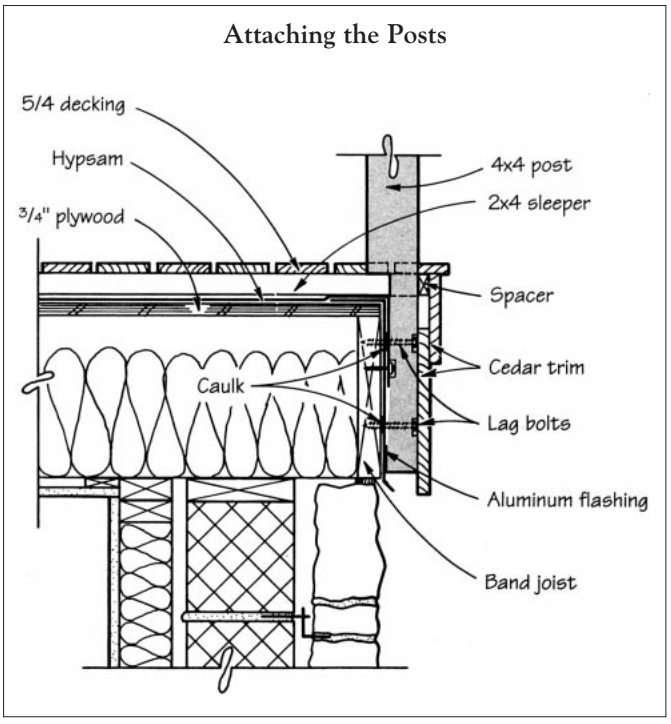


Figure 3. *The posts for the deck railing are notched over the 2x4 sleepers and securely fastened to the band joist with lag bolts. Caulking the lag-bolt penetrations with urethane caulk effectively keeps moisture out.*

roof deck clean and checked for protruding nail heads. We then installed aluminum flashing at the downhill edge of the roof, bringing it all the way to the bottom of the band joist.

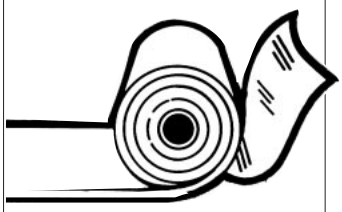
We then installed the Hypsam, starting again at the downhill edge. We let the Hypsam hang over the edge, bringing it down about 4 inches onto the aluminum flashing. Working up the roof deck, we lapped the seams 3 inches, according to the manufacturer's instructions. The manufacturer also recommends pressing the seams with a 70-pound linoleum roller.

When we reached the sidewall of the house, we ran the Hypsam up the sheathing about 10 inches. It would be easy to counterflash the Hypsam with aluminum flashing or another strip of Hypsam, but in our situation we thought 10 inches up the sidewall was adequate.

After the Hypsam was in place, we wanted to test the seams. So we dammed up the edges, ponded the entire roof with 3 to 4 inches of water, and left it overnight. There were no leaks.

At the bottom edge of the roof deck, where the Hypsam hung over, we used 1/8 x 1-inch aluminum bar stock to secure it to the framing. We screwed through the bar stock, Hypsam, and flashing into the band joist. Before installing the bar stock at outside corners, we first had to slice the Hypsam to form a lap seam, which we also caulked with a urethane caulk.

Hypsam Physical Properties



Roll Size*	50' x 3'
Thickness*	60 mil
Tensile Strength*	650 lbs/in²
Elongation*	170%
Tear Strength	135 ppi
Low Temperature Flex**	Pass
Water Absorption**	≤ 0.1%
Coverage	135 sq. ft.

*ASTM D412
**37-GP-56M

Source: Hyload Inc.

Building The Deck

We placed the deck on pressure-treated 2x4 sleepers, which we placed directly above the rafters. That way, any water that came through the deck boards would follow the sleepers to the edge of the roof.

It's possible to design a modular deck over a flat roof so that it can be lifted up in sections in case the roof needs repair. But I was confident enough in the Hypsam that, in this case, I didn't do it that way. Still, I didn't want to puncture the Hypsam in any way while installing the sleepers, so we set them with adhesive. I called the manufacturer to determine chemical compatibility, and they advised me that either roofing mastic or construction adhesive would work. We did an experiment with both adhesives. They both performed well, so we chose construction adhesive for its ease of use.

Detail for shedding water. We ran the sleepers long, bringing them 2 3/4 inches past the edge of the band joist (see Figure 2). That way we could nail the top cedar trim board into the ends of the sleepers, creating a 2-inch gap for water running off the Hypsam roof. To give good nailing for the lower part of the fascia board, we ripped 1 1/2-inch-wide by 8-inch-long blocks from the 5/4 PT decking and nailed two of these under the ends of each sleeper.

This detail allows water to follow the sleepers and run off the roof behind the trim boards. The gap behind the trim is hardly noticeable.

The 2-inch space behind the trim boards gave us an ideal way to secure the posts for the deck railing. By notching the posts over the 2x4 sleepers, we were able to attach them to the band joist with lag bolts without having to penetrate the Hypsam on the roof's surface (see Figure 3).

We installed the 5/4 deck planks perpendicular to the sleepers, using 6d screw-shank nails. We then ran the decking over the top trim board.

Ceiling

On the inside, under the roof, we installed 9 inches of fiberglass-batt insulation between the 2x12 rafters, leaving an air space above. Then we installed a carefully sealed vapor barrier and a drywall ceiling. We didn't really allow for any ventilation across the top of the rafters. If I built this deck again, I might add 2x4s perpendicular across the tops of the rafters to create an air space, and screened ventilation at the ends of the deck. But thanks to the carefully sealed vapor barrier, we haven't had any moisture problems in the ceiling.

Conclusion

Hypsam was easy to use and was the right product for this particular application. I'll probably use it again in the future. In the meantime, I've been able to make use of the remnants from this job. Recently I was installing a skylight on a 2:12 roof. The skylight cost about $250 and the flashing kit was another $250. So instead of buying the flashing kit, I used the Hypsam, and it worked fine. ■

Bill MacCurdy is a builder in Fairview, N.C.