Getting Started With TPO Roofing

This tougher alternative to rubber membrane can be installed without adhesive

by Emanuel Silva

Over the years, I've installed quite a few low-slope EPDM rubber roofs with good results. But the adhesive is messy stuff to work with, and it's difficult to apply when the temperature falls below 45°F or so. So when I knew I'd be installing membrane roofing as part of a recent porch project, I decided to try TPO roofing instead, which can be heat-welded without any adhesive.

TPO Basics

TPO stands for thermoplastic polyolefin. It's a fabric-reinforced plastic that's much tougher and more resistant to punctures than EPDM. The company I worked with, Flex Roofing Systems (flexroofingsystems.com), offers the material in white, tan, or gray. White is a popular choice in hot climates because it reflects light and minimizes solar heat gain.

To make sure I got started on the right foot, I made contact with a manufacturer's rep

Figure 1. Using a membrane on all three decks ensures that water from rain or snowmelt will drain away from the house. On the ground-floor deck, the membrane keeps water away from the foundation, protects the underlying framing and connections, and allows for dry storage underneath.

Figure 2. To protect against fastener show-through, the author added a layer of wood-fiber recover board, fastened to the structural deck with the same reinforced galvanized screw plates and 1⅝-inch screws used to secure the TPO membrane.

who was doing a demonstration at my local materials supplier. After coming to my job site to help draw up a stock list, he recommended that I use .045 material. It's more flexible and much easier to work with than the heavier .060 or .080 membrane used on many commercial jobs, and carries the same warranty.

A Three-Level Porch

The project was a three-level porch on an older multifamily house just outside Boston. All three levels would have floating decks, with the TPO membrane acting as the waterproof layer beneath (**see Figure 1**).

The framing was straightforward. I sloped the floor joists away from the building at ¼ inch per foot to provide drainage, and fastened the pressure-treated 4x6 posts for the railings to the joists with bolts and steel brackets.

The structural decking is ¾-inch AdvanTech, and according to the TPO rep, it's acceptable to install the membrane directly over the AdvanTech. But to be on the safe side, I decided to put down an additional layer of ½-inch wood-fiber recover board — the same material that's ordinarily used under rubber membrane — just in case any of the fasteners holding the AdvanTech to the joists backed out in response to lumber shrinkage or changes in temperature (**Figure 2**).

TPO roofing that isn't ballasted in some way is ordinarily cemented to the underlayment to keep it from tearing loose in high winds. But because the porch roofs would be held down by the floating decks, I was able to eliminate that step. Fitting the membrane was just a matter of taking accurate measurements and allowing the correct amount for overlap at the seams, a turned-down strip at the fascias, and a turned-up section for flashing where the material meets the building (**Figure 3**). The membrane is fastened through to the deck with the same screws and plates used to install the recover board. The 3-inch strip of membrane that turns down at the outside edges of each deck — and the wider strips that are turned upward and flashed against the building — were adhered with double-sided Eternabond tape recommended by the TPO rep (eternabond.com).

Materials Compatibility

According to the TPO rep, the membrane is compatible with all nonbituminous flexible flashing materials. But when I double-checked with W.R. Grace, the rep there told me that regular Ice & Water Shield shouldn't be used in direct contact with TPO. He recommended a different product, Grace Ultra, for this application. My regular lumberyard didn't stock it, so I had to get it from a nearby commercial roofing supplier. It cost almost twice as much as standard Ice & Water Shield and is slightly thinner and more flexible, but is handled and installed the same way (**Figure 4**).

Figure 3. Cutouts in the membrane (A) allowed it to slip over the tops of the posts, minimizing seams; an open cutout at the outside corner column accommodates the membrane turn-down along both edges. The upper edge of the first sheet of membrane is screwed to the deck at 12-inch intervals. A preprinted line 4 inches from the edge marks the correct overlap for the next sheet (B). Turned-down membrane edges are secured to the PVC fascia with double-sided tape approved by the TPO manufacturer (C).

Figure 4. Because seams at inside corners leave a potential pinhole leak where the deck and walls intersect, a prefabricated corner piece is heat-welded to all three surfaces (A, B). Peel-and-stick membrane flashing adhered to the sheathing (C) will later be covered with housewrap.

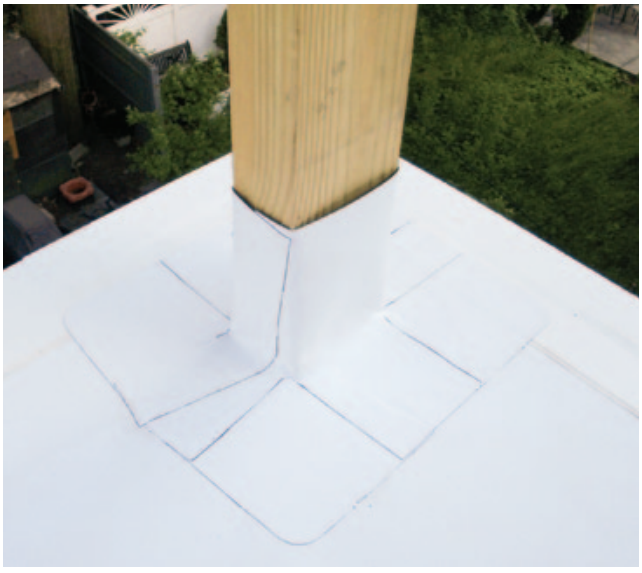

Figure 5. Square-sectioned flashing boots are temporarily secured with provided band clamps before being welded to the deck with the heat gun and roller (top). The orange-handled tool next to the post is a pointed probe that's run carefully along welded seams to pinpoint any missed areas. The boot's overlapping split side — which allows it to be wrapped around a continuous column — is welded closed (see photo on page 59). The open top of the finished boot (above) will be covered with flexible flashing.

Heat Sealing

After rolling out the membrane on the decks, fitting it over the posts, and screwing it down at the required spacing, I was ready to heat-weld the seams. On large commercial jobs, long straight seams are sealed with a wheeled hot-air welding machine, but that would have been unwieldy for such a small project.

Instead, I used a hand-held heat gun designed for use in obstructed areas. This is a specialized commercial tool, and because it retails for about $700 I was glad to be able to borrow one from the roofing rep.

It has a narrow tip designed to fit between the overlapping sheets of material, and 10 different temperature settings that let you choose just the right heat level for the prevailing conditions — up to 960°F for cold weather, or lower settings when it's warmer. After practicing on some scrap material, I quickly became comfortable with the process of heating the material and working the roller against it to produce a good seal. The resulting seams are very strong — there's no way to pull them apart without tearing the material itself.

I was able to move ahead at about a foot per minute on the straight laps between sheets, but the flashing boots were relatively slow going (**Figure 5**). It took me almost an hour to seal the first one, although I soon managed to cut that time in half.

Finishing Up

After sealing all the seams and flashing the inner edge of membrane to the wall of the house, I wrapped all the deck posts with Grace Ultra and lapped it down over the flashing boots. I then gave all three levels of the deck a water test to make sure I hadn't missed anything.

Figure 6. Once the completed membrane had been flashed and leak-tested, mahogany decking was fastened to tapered pressure-treated sleepers (left). The finished porch was trimmed out with PVC post and column wraps, moldings, and balusters, combined with mahogany stair treads, fascia trim, and railings (below).

I ran water over each of the boots with a hose, then worked my way across the floor toward the house wall while watching carefully for any drips below. I did find a small leak at the base of one boot, which was easily fixed by wiping it dry, reheating the seam, and going over it again with the roller.

The posts themselves were later boxed in and capped with PVC trim, which prevents any water from soaking into the structure through the end grain of the posts (**Figure 6**). To further protect the TPO membrane where it's in contact with the sleepers that support the deck boards, I placed an additional 3-inch-wide strip of material under each sleeper. These extra strips aren't cemented or heat-sealed, but are held in place by the weight of the floating deck above.

Labor and Materials

Because this was my first time with a new material, I didn't try to hurry the job. Working with one helper, it took me about 10 hours to install, seal, and flash the membrane on each of the three decks, not counting the time to put down the underlayment. The total cost for materials came to about $2,500, with the flashing boots accounting for almost a third of that (we used 15 4x6 boots, which cost $45 apiece, and two larger custom-made ones for the corner column at $75 each). In all, the cost was pretty comparable to what it would have cost to do the same project with black rubber roofing. Although material costs were about 20% higher, labor costs were reduced because we didn't have to spend time spreading adhesive or standing around and waiting for it to set up.

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