Torchdown Roofing Basics

Single-ply modified membranes provide durable protection for low-slope roofs

As a long-time metal roofer, I was always skeptical about flat roofs. I had an attitude change about low-slope applications, though, when I started using modified bitumen roofing a few years back.

by Rick Palmer

Commonly referred to as "torch-down," thermally fused single-ply asphalt bitumen membrane was developed in Italy during the mid-1960s as a lining for underground fuel and water tanks. Roofing was a logical next step, and torch-applied roofing systems began to be installed in Italy in the 1970s. Because rooftop conditions are much harsher than those underground, however, those early systems often failed

prematurely. The addition of specially formulated polymers gave the original membrane much better resistance to heat, cold, and UV, as well as improved elasticity, which is why you'll also hear this material called "single-ply modified." Modified membrane became available in the U.S. in the late 1970s.

Torchdown Anatomy

Torchdown roofing consists of three parts: a base sheet, a waterproof membrane, and a protective coating.

Base. The non-flammable base sheet can be either asphalt-saturated fiberglass (ASTM D-2178) or organic heavyweight felt (ASTM D-2626). It can be mechanically attached if the deck surface will accept nails or screws, or if not, it can be fully adhered (to a concrete deck, for example). The base sheet provides for attachment of the roofing material to the building while simultaneously creating an isolation layer that protects the waterproofing membrane from normal structural movement and other stresses.

In residential construction, it's usually secured with ring-shank or roofing nails driven through metal caps ("shiners") into an OSB or CDX plywood deck. Nails should be spaced on about 9-inch centers at seams, with two rows on 12-inch centers down the middle. We use a coil roofing nailer loaded with 1 1/4-galvanized nails. The shiners we use are 1 3/4 inches in diameter, although shiners as small as 1 inch are permissible (see Figure 1).

Membrane. The waterproofing membrane (sometimes called the "top sheet" or "cap sheet") is a 4mm polymer-modified polyester-reinforced asphalt membrane that has been engineered to resist all of the challenges faced by roofing materials, including physical damage from light foot traffic, normal building movement, temperature extremes, severe weather, and the application process itself. The last property alone makes it a superior product to hot-mop roofing, which is often badly damaged during application because of overheating.

We use Uni-Shield tri-polymer (Southwestern Petroleum Corp., P.O. Box 961005, Fort Worth, TX 76161; 877/585-5588; www.swepcousa.com) for all of our work. The membrane blends three different polymers for good performance in all types of weather. The chemistry must work, because we have a history of successful performance under a variety of temperature conditions in challenging low-slope applications.

Uni-Shield seems to be a little thicker than other brands of modified, and is a little more forgiving in how much heat it will take before burning through. The material changes appearance as the proper temperature is reached, so with due attention it's easy to prevent burnthroughs (Figure 2). You also get visual confirmation of a watertight application: When the molten asphalt evenly squeezes out of the seam about 3/8 inch, you can be sure that the seam is fully fused.

The product is also excellent for flashing penetrations such as skylights,

Figure 1. The base sheet is fastened to the deck with roofing nails and metal cap plates called shiners (right). Nails are spaced every 9 inches at edges and seams and on 12-inch centers in the field. Heated with the torch as it unrolls, the membrane fuses to the base sheet and to itself at seams (far right).

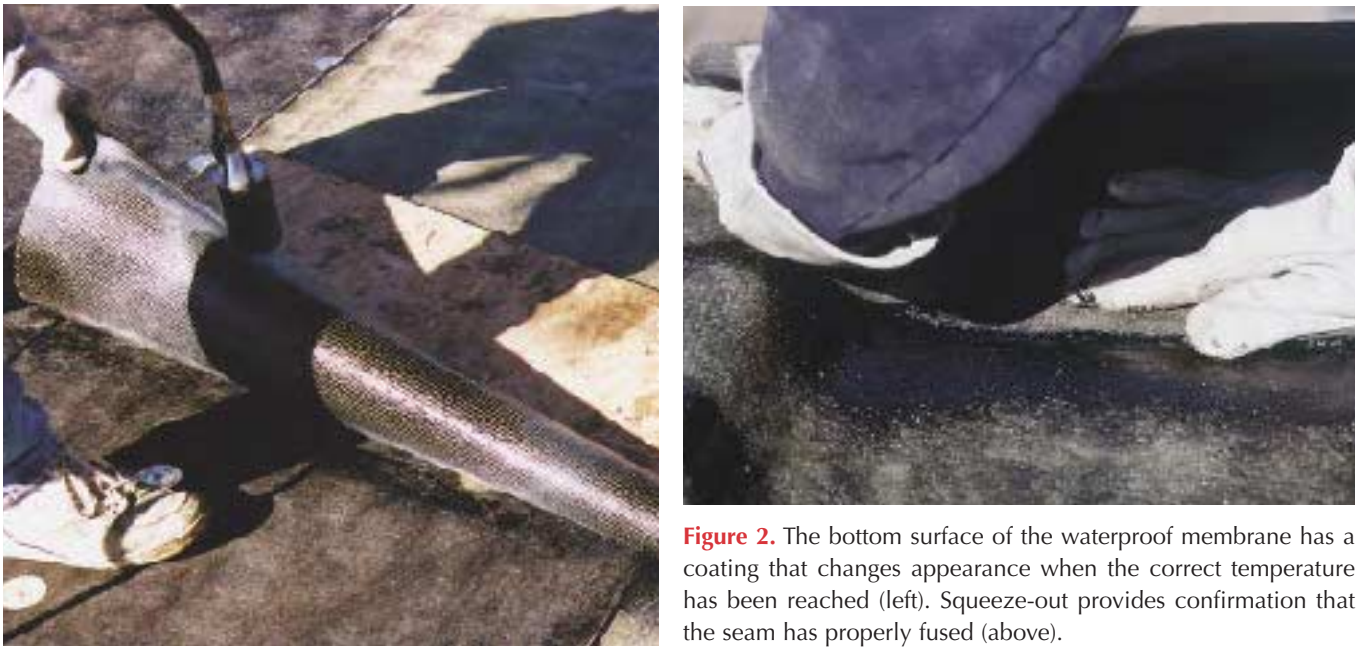

Figure 2. The bottom surface of the waterproof membrane has a coating that changes appearance when the correct temperature has been reached (left). Squeeze-out provides confirmation that the seam has properly fused (above).

which can be a problem on low-slope roofs. And Swepco provides a patching compound for use around PVC plumbing stacks and other small penetrations.

Coating. The membrane, like any other asphalt roofing product, must be protected from the destructive effects of ultra-violet radiation. Some modified systems have granules, just like on shingles, that act as a protective layer. On a smooth (non-granulated) modified, you need an applied UV coating.

When deciding on coatings, part of the decision is aesthetic, and part is practical. If you use the granulated membrane, you apply loose granules on the seam while you're torching and you're done. Granules come in different colors; a roof can be recoated to change the color.

With a non-granulated product, you have to come back after installation to coat the entire roof. Despite the extra step, we prefer the non-granulated product in our work because it allows us to see and repair any damage done by other trades before we put down the final coating. Applied reflective coatings have other advantages as well. Because we work in a hot, sunny climate, we normally use an asphalt-based aluminum coating, also from Swepco, that reflects over 55% of the radiant heat that strikes it. According to the manufacturer, the coating will last up to 12 years, and then require recoating every 4 years after that. Applied reflective coatings are also available as a tintable water-based acrylic (rather than aluminized), so just about any color is possible.

If you're roofing a decked area or a commercial building where foot traffic might be likely, I'd definitely recommend the coated over the granulated. For residential work, it doesn't matter as much and either works well. U.S. Intec (1361 Alps Rd., Wayne, NJ 07470; 800/231-4631; www.usintec.com) makes a good granulated product.

Installation Basics

One of the big advantages to torchdown is that there are no solvents, adhesives, or glues. Basically, all you need to do is fasten the base sheet and then attach the waterproofing membrane by

Figure 3. The large cricket in this parapet corner directs rainwater toward the roof drain. Note how the torchdown membrane runs up the side of the skylight well.

heating it with a torch as you unroll it. Properly welded membrane is virtually seamless — when you're done, it's actually one big continuous piece of roofing.

I've learned that in winter it's best to lay the base sheet and torch down the membrane right away. If the ice gets on the base sheet, you can melt it with the torch, but it just freezes again a few feet down the roof. Best to take care of both steps at one time. In non-freezing conditions, it's acceptable to install the base sheet and come back later to torch down the membrane.

Substrate. A good job begins with sound sheathing and strong framing (L/240 maximum deflection). I like to see at least 5/8-inch-thick CDX plywood, but many manufacturers will accept 15/32-inch sheathing with 16-inch on-center framing. To meet the warranty standards, the manufacturer may require roof framing plans and photographs of the job.

Drainage. We use modified only on slopes of 4/12 or less. The minimum slope recommended by Swepco is 1/4 inch per foot for new construction, but I try not to go below 1/2 inch per foot so there's no chance of ponding. On low-slope roofs, we have the framers build long crickets to move rainwater toward the canales, or roof drains (see "Flat Roof Framing Options," 7/96). The longer the cricket, the more overall rise it will have, and the better the roof will drain (Figure 3, previous page).

Instead of roof drains, it's also possible to run the membrane right onto a drip-edge and into a gutter. The underlayment goes down first, then the metal details at the edges, then the membrane. Metal details should be secured well, because the metal will expand and contract with the heat of the torch.

I've seen large ice dams accumulate on top of torchdown roofs where the drains were placed in shaded areas on the north side of the parapet. Although there were no leaks in these cases, I would still recommend that flat roofs be designed so that the drains end up in sunlit areas.

Figure 4. Fire-retardant cant strips ease the transition of the membrane up this short parapet, and also help prevent any sawdust inside the parapet wall from igniting during installation.

Penetrations & Terminations

Ideally, we run the field of the torchdown, and the plumbers drill their penetrations with a hole saw, leaving as small a gap as possible. Tight holes mean that no additional reinforcement is necessary. For me, the maximum permissible gap is 1/8 inch all the way around. If the gap is bigger than that, I cut a metal plate exactly to the hole size and place it over the stack. Either way, we cut a finger-flashing and torch it to the penetration if it's metal or use Swepco's patching compound in the case of PVC stacks.

Skylights. We prefer to cut skylights in after installing the roofing. The carpenters frame the rough opening and deck right over it. We roof over that, then go back and cut out the opening. We then set the skylight well and run the torchdown flashings up the side of the well and out 4 to 5 inches onto the deck. Finally, we set the skylight, apply the weatherstripping, and it's a done deal. The building stays dried in the whole time.

Parapets. Flat roofs typically have parapets. We run the torchdown up the sides of the parapets, and the stucco stop gets applied over the torchdown. We use cant strips (Figure 4) at the junction where the parapet meets the plane of the roof. Cant strips are made of a thick fiber material like the stuff concrete expansion joints are made of. Besides preventing water from puddling in a vulnerable area, the non-combustible cant strips keep the torch from igniting loose sawdust that may have accumulated inside the parapets.

Corners. Torchdown works especially well in corners. We use extra nails and shiners to get secure attachment, then cut and layer the membrane as needed to make the corner watertight (Figure 5).

Limitations

When potential customers ask about the limitations of torchdown roofing, I'm hard-pressed to come up with an

Figure 5. Because it can be cut and folded (far left), then heat-fused (left), torchdown is well suited for typically troublesome flat roof details like this inside parapet corner.

answer. We're very competitive with the hot-moppers in price; we're faster, cleaner; and we provide a better product. In my opinion, EPDM can fail because it's a chemically glued joint. Torchdown, once it's heat-fused, is seamless.

Torchdown has a long service life. If properly maintained, the coated material is warranted by the manufacturer for up to 30 years, while uncoated roofing carries up to a 5-year warranty. In the unlikely event that it ever needs to be repaired, it's a whole lot easier to work with than hot mop. The bottom line is that if I do a flat roof, I use torchdown.

Fire risk. Some customers worry about the danger of fire during installation. You would really have to get carried away with the torch to light solid OSB or plywood on fire, but accumulated sawdust in the parapets or crickets will ignite quite easily. To address this, I inspect the roof as it's being framed and make sure the framers understand the importance of removing sawdust, rather than sweeping it into an empty cavity.

Even so, this takes some diligence. We always stop torching an hour or more before quitting for the day, which gives us time to make sure that nothing is smoldering before we leave. It's time well spent, because it gives us a chance to clean up the site and do prep work for the following day. We always have a fire extinguisher handy (as OSHA requires) and, most of all, pay attention at all times. If we detect a fire inside a parapet wall, we bang a hole through the sheathing with a hammer and use a dry chemical extinguisher. I've had three or four fires, and every single time it's resulted from sawdust inside the parapet wall cavity.

Worker safety. Modified bitumen has a melting point of about 400 degrees, so you want to avoid getting it on your skin. Long-sleeved shirts, long pants without holes, and thick leather gloves are mandatory. We also hold regular safety briefings.

In the unlikely event of skin contact, don't attempt to pull the molten or hardened material back off, because the skin will come with it. Seek medical attention immediately. More to the point, stay out of trouble in the first place. Getting burned by this stuff is about as bright as sticking your hand on the burner of your kitchen stove. We move the hot rolls with a framing hammer, as the rip claw works well to control the roll and the long handle keeps gloved hands out of harm's way.

Do It Yourself?

Unlike installing asphalt shingles, which many builders and remodelers do for themselves, working with torchdown is not for everybody. For one thing, to meet the warranty requirements, manufacturers require the site foreman to be a certified applicator. Swepco sells its materials only to experienced and properly trained installers. To get the training, you have to attend a manufacturer's seminar. You can buy somewhat inferior materials at home centers, and you could probably figure out how to install them on your own, but the seminar is really a good idea. You get a thorough understanding of the product and its proper use. Otherwise, the only special equipment needed for residential-scale work is a torch and a tank, which can be had for under about $200.

Rick Palmer *owns Palmer Construction and Metal Roofing Specialists in Santa Fe, N.M.*