Dry Deck Over Living Space

by Bill Leys

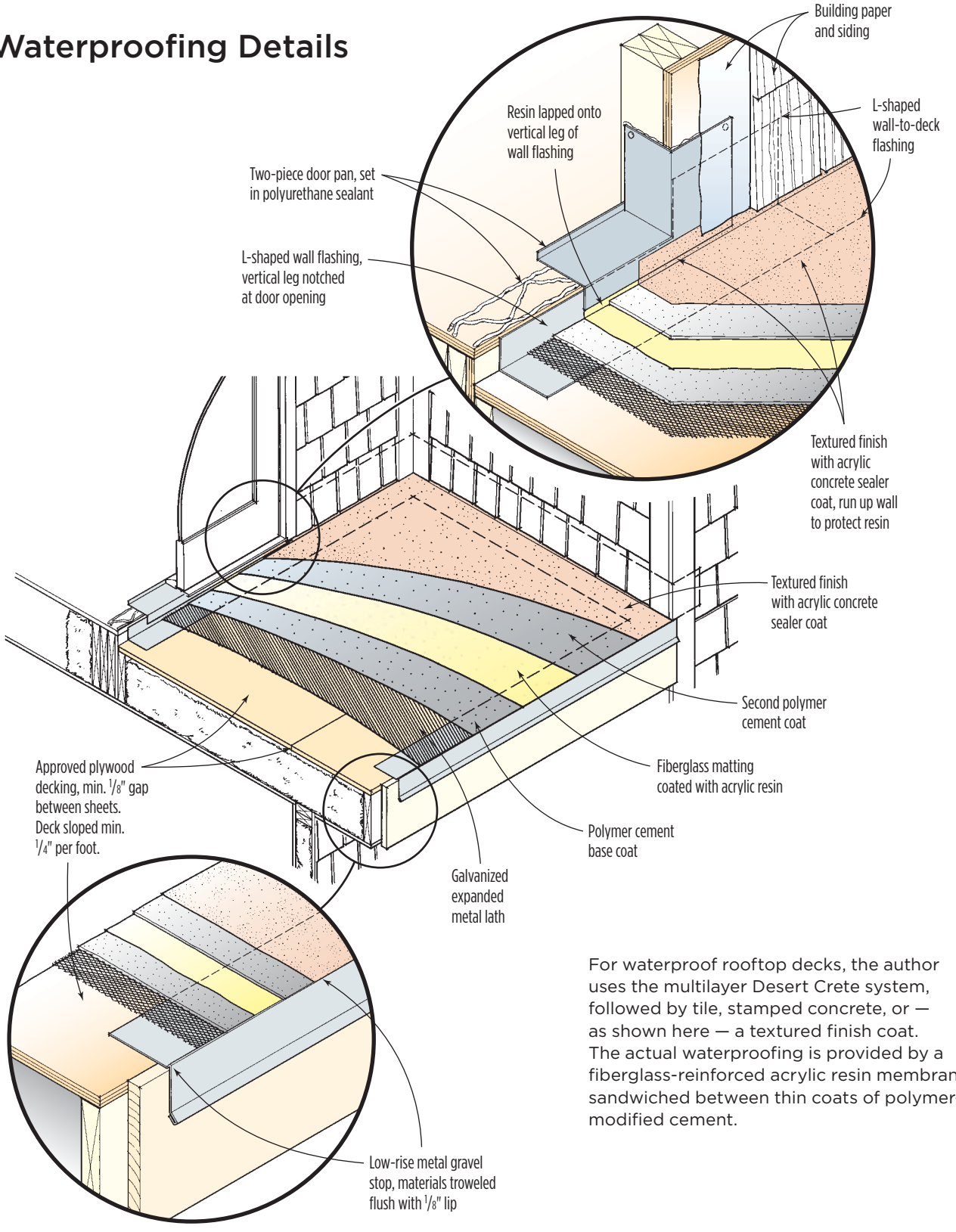
A multilayer cementitious coating provides a walkable waterproof surface with a Class A fire rating

In a past job managing condo associations, I spent a lot of time dealing with damage caused by leaks in decks over living spaces. The damage was often quite spectacular. In one case, a seemingly minor flashing error led to rotted framing below eight decks. It cost $114,000 to repair the decks and structural members. That episode convinced me there was a future for contractors who knew how to properly waterproof decks, so I went to work for a coating company. A few years later, I opened my own deck waterproofing business in Arroyo Grande, Calif.

There are about a dozen cementitious waterproofing systems that can be applied over wood framing. They are distributed primarily in the West, a region where there is significant demand for fire-rated waterproof decks. We use a product called Desert Crete (Hill Brothers Chemical Co., 800/994-8801, desertbrand.com), because its maker has been in business for 80 years and its products have a good track record.

Desert Crete is a multilayer cementitious system whose main components are polymer modified cement

Waterproofing Details



For waterproof rooftop decks, the author uses the multilayer Desert Crete system, followed by tile, stamped concrete, or — as shown here — a textured finish coat. The actual waterproofing is provided by a fiberglass-reinforced acrylic resin membrane sandwiched between thin coats of polymer-modified cement.

and a fiberglass-reinforced acrylic resin membrane. The waterproof membrane is sandwiched between layers of the cement, which provides a tough and durable Class A and one-hour fire-rated traffic surface when installed to the manufacturer's specifications.

That three-layer sandwich is then covered with a suitable finish material. If the framing below is sufficiently stiff, Desert Crete can be used as waterproofing under tile or stamped concrete. More typically, though, we apply a colored textured coating. Although the project described here involved new construction, we frequently install the product on existing decks provided that the framing and sheathing are in good condition.

Use the Right Substrate

The deck joists should be sized and spaced to carry the expected load and installed in such a way that the surface slopes at least 1/4 inch per foot toward where it is supposed to drain. I prefer to see 3/4-inch plywood on my jobs, although 5/8-inch plywood is also acceptable. Either way, the sheathing must be blocked at the edges and have a minimum 1/8-inch gap between sheets. If the sheets are not properly gapped, we ask the contractor to saw a kerf between the pieces. Oriented strand board (OSB) is not an acceptable substrate for a waterproof deck — it will void the manufacturer's warranty and negate the fire rating of the assembly.

There's a saying in this business: "If you cover it, you own it." To avoid taking ownership of bad work, I carefully inspect the deck and surrounding walls at the start of every job, using a printed checklist to ensure that all the existing work is up to standard. Occasionally a GC will ask me to waterproof a deck after the doors are installed and the weather-resistive barrier and siding are on. There is simply no way to properly flash such a deck, so unless the GC is willing to remove the doors and strip off some of the siding, I leave those jobs to someone else.

Metal Flashings

A correctly waterproofed deck requires at least three types of flashing: L-shaped metal at the junction between wall and deck, a gravel stop drip at the edge, and pan flashing under any doors. Decks that are entirely enclosed by pony walls will also require floor drains or scuppers (or both).

Code-approved metal deck flashings include 16-ounce copper and galvanized steel of at least 26 gauge. Standard galvanized metal must be cleaned and primed before use, so we prefer bonderized steel, which is galvanized material that has been factory treated for improved adhesion of paint and other coatings. We get our flashings from a sheet-metal shop that specializes in scuppers, drains, and other types of deck flashing.

All flashings must lie tight to the substrate and have continuous support from behind. If the house isn't sheathed — a common detail on older homes in this area — I'll ask the GC to install horizontal blocking at the level of the wall flashing. Galvanized flashings are fastened with galvanized ring or roofing nails. Copper flashings can be fastened with copper nails or stainless steel ring nails. We prefer stainless fasteners because they are available for use in coil guns.

Door pans. Our first step is to install an L-shaped wall flashing below door openings and lap a sill pan over top. The horizontal leg of the wall flashing is 4 inches wide, and

Sources of Supply

AVM System 100
AVM Industries
818/888-0050
avmindustries.com

Desert Crete
Hill Brothers Chemical Co.
800/994-8801
desertbrand.com

Enduro-Kote
Enduro Products
714/526-5898
Endurokote.com

Excellent Coat F/S
Excellent Coatings Intl.
800/473-3817
excellentcoatings.com

Shur Deck
Mer-Ko Parex
714/778-2266
parexmer-ko.com

Miraflex II Decking System
Miracote
310/886-9100
miracote.com

Life Deck AL Series
Life Paint Co.
562/944-6391
lifepaint.com

ICC-ES ESR-2097
Pli-Dek Systems
800/364-0287
plidek.com

Westcoat ALX
Westcoat Specialty Coatings
800/250-4519
westcoat.com

the 6-inch vertical leg is notched at the door opening so it finishes flush with the interior subfloor (**see Figure 1**).

Although the sill pan could be made as a single piece, that would involve expensive custom work. Instead, we have the sheet-metal shop provide us with a simpler two-piece pan that can be adjusted to fit the opening. The two halves of the pan are installed over continuous beads of polyurethane caulk, such as Moistop Sealant (Fortifiber Building Systems Group, 800/773-4777, fortifiber.com), Sikaflex-1a (Sika Corp., 800/933-7452, sikaconstruction.com), or RainBuster 900 (Top Industrial, 800/473-1617, topindustrial.com). The pieces overlap one another near the center of the opening, and are fastened in place with nails driven through the vertical flanges and into the trimmers on either side of the opening, so there are no penetrations in or near the bottom of the pan.

Flashing the perimeter. Once the door pan is in place, we install L-shaped flashings over the remaining joints between walls and deck (**Figure 2, page 5**). The horizontal leg is slit at inside and outside corners to permit the

Figure 1. After installing an L-shaped flashing under the door opening, a waterproofing specialist applies polyurethane sealant to the lip of a two-piece door pan (above left). The first piece is installed in the opening and nailed to the trimmers (above). A second piece laps onto the first near the center of the opening. The lap won't leak, because it contains beads of sealant (far left). To avoid penetrations through the bottom of the pan, the crew uses a sprung board to clamp it in place until the sealant below it cures (left).

Figure 2. L-shaped flashings are installed at the transition between deck and wall. A slit in the bottom leg of this piece allows it to be folded into the corner (above left). All laps are sealed with double beads of polyurethane caulk (above right), and the flanges are nailed to the deck and wall (right). When the building paper is installed, it will lap the flashing shingle-style.

required bend in the vertical leg. All laps are sealed with double beads of polyurethane caulk.

The vertical leg of the flashing is fastened to the wall with a line of nails on about 8-inch centers, which are positioned just below its top edge to prevent leaks. Nails in the horizontal leg are placed 3 to 4 inches apart in a W-shaped pattern. Leaks in this area are not a concern because the nail penetrations are covered by the waterproof coating.

Finally, the open edge of the deck is covered with a low-rise gravel stop, which is a drip flashing that extends 3 or more inches onto the deck sheathing and 2 or more onto the fascia below (**Figure 3**). A 1/8-inch lip on top of this stop allows us to trowel an even thickness of the coating material all the way out to the edge.

Figure 3. Since the deck slopes to the exterior, the gravel stop is installed from low to high so that the pieces lap shingle-style. Where the deck meets the wall of the building, the gravel stop butts the L-shaped flashing and laps the Z-flashing below (inset).

Applying the Lath and Base Coat

To provide a mechanical bond between the polymer base coat and the deck, we then cover the deck with 2.5-pound galvanized expanded metal lath, which is fastened to the plywood with one-inch crown staples (**Figure 4**). Adjoining sheets of lath should overlap one another by 1 to 2 inches, with at least a 2-inch overlap between the lath and the horizontal legs of any flashing. We use staples a minimum of 5/8 inch in length, spacing them about an inch apart at lath edges and making sure to use at least 24 staples per square foot in the field. It's important to avoid spanning sheathing joints with staples, because if the plywood moves, the fastener will flex and heave or crack the coating.

Bring on the mud. At this point, we're ready for the first layer of base coat. Poly Base — as the Desert Brand base-coat material is called — is a blend of polymer, cement, and sand. We mix the Poly Base with water in a 5-gallon plastic bucket. Although the manufacturer recommends using one gallon of water for each 50-pound bag of the product, we may increase that to as much as 1 1/4 gallons to retard setting in hot weather. Once we've mixed the mud, we pour it onto the deck and screed and trowel it into the lath. Each bag covers about 50 square feet of deck at a thickness of 1/8 inch.

The coating must be thick enough to completely cover the lath. If there are any low spots or lath showing through, we apply a second layer of Poly Base to those areas. When the base coat is dry, we use a mason's stone to grind off any rough spots and then sweep or blow the surface clean.

Waterproof Membrane and Top Coat

The middle layer of the three-coat system provides the actual waterproofing. It consists of a layer of 3/4-ounce chopped mat fiberglass — which is a loose nonwoven fabric — saturated with acrylic resin (**Figure 5, page 7**). The material comes in 4-foot-wide rolls and can be cut with

Figure 4. The author installs galvanized expanded lath on the deck, lapping it onto the flashings and fastening it down with closely spaced staples (above). Polymer cement is troweled over the lath (above right). Once the cement has set, the crew uses mason's stones to grind off any high spots and lap marks in the finish (right).

Figure 5. When the first layer of cement has cured, it is covered with overlapping sheets of fiberglass matting (left) and then coated with acrylic resin (right). The resin soaks through and bonds the mat to the substrate, then cures to form a continuous waterproof membrane. It's important to lap the resin onto the vertical leg of the wall flashing.

scissors or a utility knife. As with fiberglass batts, it's a good idea to wear long sleeves, gloves, and a dust mask. We lay the fiberglass on the deck and use a paintbrush and standard 3/8-inch paint roller to coat it with Bonder 480 resin. We ordinarily start at the drip edge and work back toward the door.

Spreading the resin. Whether the mat is rolled out from side to side or front to back doesn't matter, but it's important to fray the edges where they overlap so there are no hard seams to telegraph through the finish. The mat need not turn up at the flashing — it laps over its horizontal leg and terminates within a half-inch of the bend — but we carefully brush the resin an inch or more onto the vertical leg. The resin soaks through the fiberglass, bonds it to the substrate, and cures to form a waterproof membrane that also functions as an anti-crack membrane.

This part of the project goes quickly. It generally takes us less than half an hour to place the mat and spread resin on a deck the size of the one shown here.

Adding a second base layer. Once the resin has set up overnight, we trowel on a second layer of Poly Base, this one about 1/16 inch thick (**Figure 6**). The additional layer of base material protects the glass and resin layer from sunlight and mechanical damage. This type of polymer cement is actually stronger when applied thin, so it's a

Figure 6. Long exposure to sunlight will damage the acrylic resin membrane, so it is protected under a thin layer of the same polymer cement that was used to cover the lath.

Figure 7. After the second layer of polymer cement cures, the deck can be finished — in this case with a spray-applied texture (left) troweled flat shortly after application to leave a knockdown finish (above).

very tough wear layer. In fact, we'll often leave the deck in this condition until the trim carpenters, plasterers, and painters are done with the exterior, eliminating the need to protect a finished surface from construction damage. If the outer base coat and membrane are damaged somehow, the affected area can be cut out and patched before the final finish goes on.

The protective layer can be covered with tile, stamped concrete, or some kind of textured finish. On this project we used Desert Brand's Texture and Liquid Polymer to create a low knockdown finish. The texturing material is mixed with polymer to the consistency of thick pancake batter and then splattered onto the surface with a pneumatic hopper gun (**Figure 7**). When the sprayed material begins to set, the applicator runs a trowel across its surface, thereby creating a knockdown texture.

After the texture has cured — the manufacturer says it takes 24 to 48 hours — we sweep and blow off the surface and then apply two coats of Desert Brand Concrete/Masonry Floor Paint and Sealer (**Figure 8**).

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Figure 8. The texture is coated with pigmented concrete sealer, which dries to form a tough walkable surface. Because this deck (above) was finished before the exterior trim was complete, it will require protection while the building paper and siding are installed. More typically, the texture and sealer are applied at the very end of the project (right).