Reroofing With Concrete Tile

Double-layer asphalt felt underlayment, sealed-down flashing systems, and firm tile attachment are the keys to an effective tile roof in hurricane country

by Pat Hogan and Bill Moore

We're roofing contractors (and also licensed general contractors) in Palm Beach County, Fla. In our environment, buildings take a beating from hot sun, frequent rain, and the occasional hurricane. So roofs have to be tough, they need maintenance, and they often need to be replaced.

Both concrete and clay tile roofs are popular in our market. As with other types of roofing, the codes for tile roofs are relatively strict in South Florida because of the intense coastal climate. Over the years we've replaced hundreds of tile roofs; in this story, we'll explain how it's done, focusing on a concrete tile reroof.

Evaluating an Existing Roof

The job starts with a careful inspection to find out whether the roof needs spot repairs or a full tear-off and replacement. In a tile roof, underlayment is the ultimate weather protection — aside from looking good, the tile's main job is to protect the underlayment. So what really determines the choice between repair and replacement is the condition of the underlayment.

Most of the underlayments we encounter consist of layers of asphalt felt paper with various cap sheets. Typically, the cap sheet is hot-mopped asphalt felt, but it could also be some sort of bitumen-backed synthetic membrane. Sometimes leaks and wear are limited to a few spots — such as points where a loose tile has been moving from expansion and contraction and wearing on the underlayment, or at valleys and around pipe and vent penetrations. In those cases, we may be able to just make local repairs. But if the membrane has dried out with age, it will crack as we lift it up to lap in the new underlayment, making spot repairs difficult.

If the estimate for repair work is a big percentage of the cost of a complete reroof, we'll ask the customers to decide whether they want to replace everything at once — with the latest tested materials, over decking that has been replaced where necessary and is newly reinforced with extra nailing. In coastal Florida, an

Figure 1. For convenience, the authors use dump trucks for roof tear-offs, backing them as close to the house as feasible (A). Old tiles are typically set in mortar and are soft and fragile, so they are easy to remove (B). After the roof has been scraped clean, the crew renails the sheathing to meet new high-wind codes (C). A site supervisor photographs the nailing pattern as evidence for the building department — a requirement on every job (D).

updated roof is less expensive to insure, which also weighs on the side of replacement.

In this area, a basic tile roof costs anywhere from $550 to $700 per square for tear-off and replacement (compared with $350 to $450 to tear off a basic composition roof and replace it with lifetime dimensional shingles).

Tear-Off and Disposal

Once the owners have decided on a full replacement, we educate them about what to expect when we start working. They need to understand that we'll be removing a lot of material — tile roofs weigh about 1,000 pounds per square — and the house may shake a bit. We ask them to take down any lightweight items hanging on the walls, and we warn them that the commotion on the roof may cause some dust to fall from the ceilings inside.

We cordon off the work area, during both tear-off and installation. We have to work fast to remove the existing materials and get the new underlayment dried in before the next rain. Besides moving heavy debris, we'll be firing up propane-fired kettles of hot asphalt, which can be dangerous for bystanders or passers-by.

Waste management is a big part of the job. We prefer dump trucks over dumpsters (**see Figure 1**). For one thing, truck tires are less likely to crack driveway pavement the way a big dumpster can. Also, you can control when the trucks come and go, instead of having to work around the dumpster company's schedule.

Occasionally, when the tile is in good enough shape, we try to save some — especially if it's a particular style that matches other houses in the neighborhood. It's nice to have a variety of tile in stock at our yard, for small repairs. But saving tile slows down the process, so we usually recycle the material instead,

Tile Roof Details

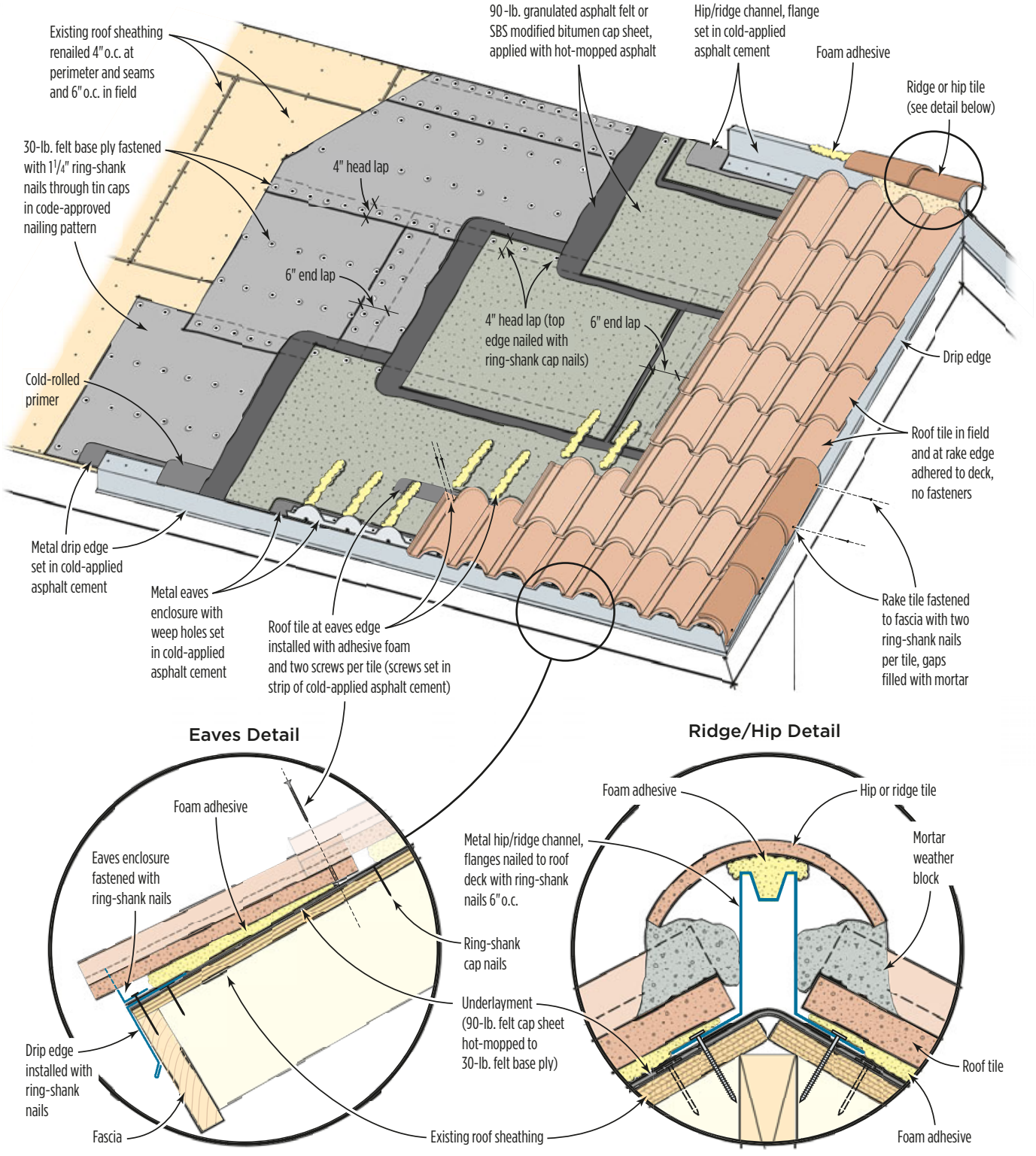

Figure 2. Fresh courses of 30-pound asphalt felt, attached with ring-shank nails driven through metal disks, replace the 15-pound felt the crew has just torn off (A). A roofer slips the new felt under the existing sidewall flashing, which has been scraped clean (B). He then applies cold asphalt cement under the flashing (C) and nails the flashing down to the tar with ring-shank nails (D).

separating out any copper or aluminum flashing for the metal yard. The tile goes to a recycling center where it's crushed and sold as clean fill for roads and site work.

We always tear off the roof and cover it up again within one day — it's not unusual to have an evening thunderstorm even after a sunny day. In theory, we could tarp the house, but that's taking a big chance of water damage if there were to be a heavy thunderstorm with high winds.

Our typical job is around 40 squares. That adds up to about one-and-a-half truckloads of scrap tile and a partial truckload of underlayment. We can remove that much material in a day and still have time to dry the roof in again before quitting time. We'll do larger projects — ones with 50 or more squares — in sections.

This work takes careful planning: We don't want to go out on a job if the odds of being rained out are high, because setup and take-down are expensive. For a 40-square roof, we may field a 10-man crew — and we'd rather not bring all those people back for an extra day if we can avoid it. So if the morning weather report predicts a 60 percent or higher chance of rain, we'll call the job off and wait for better weather.

Repairing Structure and Sheathing

Once the existing roof has been torn off, we have to do some structural work. At a minimum, we have to ensure that the roof sheathing nailing schedule complies with the new, tougher codes. To resist the uplift force of hurricane winds, sheathing has to be nailed with 8-penny ring-shank nails at 6 inches on-center in the field and 4 inches on the perimeter. We use nail guns to drive the nails and have a second worker follow with a hammer to drive the heads flush to the plywood as needed. Otherwise, protruding nail heads will make holes in the tar paper. We also replace any rotted sheathing with sound plywood.

In rare cases, a reroof requires beefing up the attachment of the roof framing to the support walls. On any house valued at

Figure 3. A reroof job usually includes new self-flashing skylights with integral curbs. A roofer applies cold asphalt cement to the new asphalt felt paper (A), sets the skylight into the tar, and secures it with ring-shank nails (B). Vent stacks are sealed with prefabricated lead flashings (C), which are set in asphalt cement, nailed off, and bent around the top of the pipe (D).

more than $300,000, we're required to bring an engineer on site to inspect wall-to-truss or wall-to-rafter connections to make sure they meet code. If they don't, we retrofit metal hold-downs, as specified by the engineer. But most of the houses we work on are new enough that they pass the engineer's inspection.

Dry-In

There are two stages in the underlayment installation — a base layer of 30-pound felt applied with cap nails, then a top layer of 90-pound granulated asphalt felt or modified bitumen membrane applied with hot-mopped asphalt. By the end of the first day, we'll have the 30-pound felt down, along with any flashing needed to make the roof watertight (**Figure 2, previous page**).

We install the 30-pound felt with 4-inch overlaps on the horizontal joints and 6-inch end laps at vertical joints. We fasten it with 1¼-inch ring-shank cap nails with tin caps (plastic caps aren't allowed in high-velocity hurricane zones). The idea is to make sure that the underlayment can't blow off no matter how high the winds get. Our code authorities have beefed up the nailing patterns, and recent storms have shown that it's working.

Flashing

Metal flashing is required at junctures between the roof and sidewalls, at roof edges, in valleys, and around skylights, plumbing stacks, and other penetrations. We apply the flashing at the dry-in stage, placing it over the 30-pound felt and sealing it with cold-applied asphalt cement and a 4-inch or 6-inch cotton mesh reinforcing fabric.

At sidewalls, we clean up the existing flashing and inspect it for holes to see if it's still serviceable. If it has deteriorated, we replace it — even though this may require stripping off a few inches of stucco or siding to expose and remove the metal. Of course we have to replace and blend in any siding we remove.

In our part of Florida, nobody uses step flashing at wall-to-

Figure 4. Before hot mopping begins, a roofer coats metal valley flashings with asphalt primer (A). The hot tar is spread one course of asphalt roofing at a time (B), and then the 90-pound membrane is quickly applied before the tar cools. A row of metal cap nails along the top edge holds the felt in place while the asphalt cools and cures (C).

roof intersections. Instead, we use long lengths of 4-inch-by-5-inch L-flashing, sealing the bottom leg to the felt with asphalt cement. That's enough to keep the roof dry temporarily. When the 90-pound felt or modified membrane is hot mopped on top, the flashing joint is fully sealed.

Roof edges receive drip edge. Again, the upper edge of the flashing is sealed to the 30-pound felt with asphalt roofing cement.

Valleys get special treatment. We lay down two layers of 30-pound felt — the usual horizontal courses, plus a course running down the center of the valley. Then we place a 16-inch-wide piece of metal flashing along the valley on top of the felt, to protect the felt against pinching or wear as the roof components inevitably expand and contract from temperature changes in service. Finally, the flashing is sealed to the tar paper with cement. Just before the hot mop goes on, we apply a cold-rolled asphalt primer to all the metal flashings to ensure a good seal.

Most reroofs include skylight replacement. We prefer self-flashing skylights with an integral flashing built into the frame, such as the dome skylights from Texas-based Maxim (maximskylights.com). These units mount directly on top of the 30-pound felt and bolt down through the felt and roof sheathing into the framing. The worker applies the cold asphalt cement to the underside of the skylight, sets the skylight on the felt, and nails the flange down with ring-shank nails (**Figure 3, previous page**).

We also replace all the vent pipe flashing and install new gooseneck attic exhaust vents. Again, these elements are cemented down to the asphalt felt and fastened through the felt and sheathing into the framing.

Figure 5. At roof edges, the crew attaches the cement tiles using redundant methods: a thick dab of two-part polyurethane adhesive foam (A), plus two galvanized screws per tile (B), driven through a strip of cold-applied asphalt cement. In the field, only the foam is used (C, D), to avoid screw holes in the newly applied hot-mopped underlayment.

The Hot Mop

Once the dry-in is complete and all skylights, vents, and flashings have been installed and sealed, we can go home for the day. The next day we do the hot mop.

Actually, hot-mopped felt isn't the only alternative for this second stage of the job. Some roofers use a peel-and-stick modified-bitumen membrane. It's an easier method because there's no kettle of molten asphalt at 475°F to deal with — you just peel off the release sheet and roll out the membrane. But our workers, who have applied both systems, trust the hot-mopped approach more because the molten asphalt fuses everything together.

There are a few cases where we use modified bitumen — on the flat roof of a bump-out, for example. In that situation, customers may choose a reflective white-coated membrane to keep the roof cooler on sunny days.

It takes at least three men to apply the hot-mopped asphalt (**Figure 4, previous page**). One man runs the mop, spreading the viscous asphalt over the 30-pound felt. Co-workers then roll out the 90-pound felt or SBS modified bitumen over the hot asphalt and nail the sheet along the top edge with ring-shank cap nails. Those fasteners will be covered by the next course's 4-inch overlap, so there are no exposed fasteners in the finished installation.

The kettle has to be constantly monitored, both for safety and to make sure that the asphalt stays at the right temperature, so

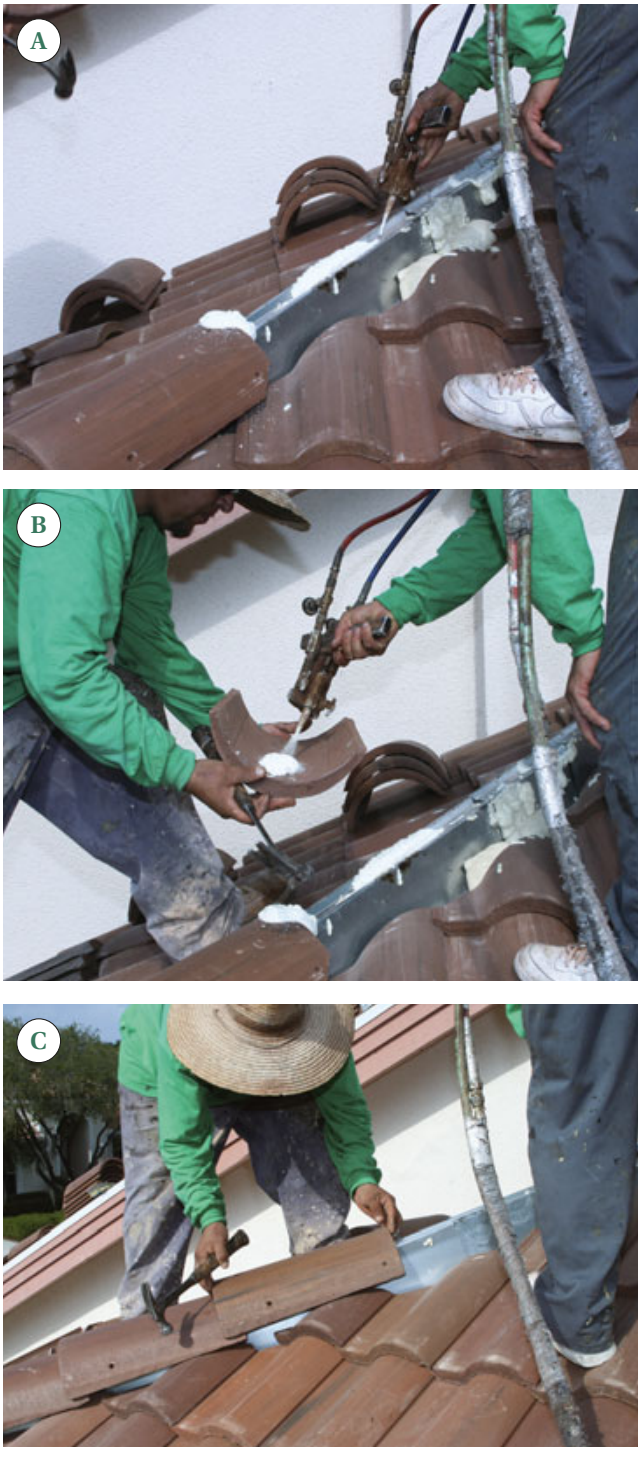

Figure 6. Under South Florida's upgraded codes, hip tiles must be attached to a metal reinforcing channel, which is nailed to the deck. The roofers apply foam adhesive to the channel (A) as well as to the tile (B), then set the tile gently in place on the channel (C).

we assign workers to this task. Fire code requires that we keep two extinguishers handy.

Installing Tile

With the hot mopping done, the roof is weatherproof; it's time to install tile. Our supplier stocks the roof, distributing the tiles to spread out the weight.

At roof edges, code requires two screws per tile. In the field, we're allowed to use either screws or an adhesive foam. Our preference is to use both adhesive and screws at the edge but adhesive alone in the field **(Figure 5, previous page)**. Testing has shown that the adhesive holds better than screws in a high-wind situation; and after doing all that work to apply the underlayment, we don't like putting a lot of screw holes in it.

We use a two-part foam from Polyfoam (www.polyfoam.cc). Our crew are certified installers; they've been trained to calibrate the applicator guns, because the foam won't perform properly if it's not mixed in the right proportions.

Hips and ridges require special treatment under the new codes. Research done after several severe storms showed that hip tiles were likely to get pulled loose and fly off the roof. So now, hips and ridges have to be reinforced with a metal channel — basically an upside-down "U" with flanges on the bottom. We nail the flanges to the roof deck with ring-shank nails and glue the tiles on top with the foam **(Figure 6)**. Ridges are installed the same way.

Selling the Job

Even though the tile is not the primary means of water resistance, it's what the homeowners and neighbors will see, so we pay attention to the way it looks. When we sell a roof, we give the customers an array of choices and help them select a color and style that fits their house and the neighborhood. There's a wide range of solid colors available, as well as some popular blends where the color varies slightly from tile to tile. With the blends, the crew has to pay attention so that the roof doesn't end up with "hot spots" — areas with too much of one color. We've been lucky in that respect: Besides being highly skilled at the technical aspects of tile setting — including dry-in and hot mopping — our crew is gifted at the visual part. (They were awarded "best distribution of a blend" from Eagle Roof Tile, an award we're proud of.)

In fact, our crew is one of our company's biggest assets. Their efficiency and good humor on the job make it a lot easier for us to sell our services in this tough market.

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