Roofing with Asphalt Shingles

There's more to laying three-tab shingles than just nailing them on as fast as possible

by Todd A. Smith

I guess I was destined to work for my father's 63-year-old roofing company. I spent a lot of time on the roof learning the trade from several old craftsmen. I learned slate roofing, tile roofing, copper roofing and, of course, asphalt-shingle roofing. The most important lesson I learned was that there's more to installing shingles than just nailing them on fast. As a roofer, I am also charged with preventing leaks, making a house more attractive and remembering that everything a person has worked hard for is under my roof. In this article I'll describe the basics of installing a tight, durable three-tab asphalt-shingle roof.

Tools—You don't need many tools to install a shingle roof. A hammer, tin snips, utility knife, tape measure and chalkline will do it. I use a drywall hammer to nail shingles. Its light weight doesn't tire my arm, and the larger head makes nails an easy target. To carry nails and tools, I wear a leather carpenter's apron, with suspenders to support the weight. Cloth aprons seem to wear out too easily. Besides, I like the extra pockets in my leather apron for different nails.

I prefer the snips when I have to cut shingles that butt into flashing or siding because I can make more accurate and intricate cuts with them. Otherwise, I use a hook blade in

With a column of shingles run up the center of the roof to the ridge, one roofer works to the left of center, the other to the right. This roof is shallow enough to walk on, but the roof brackets and scaffold provide a little extra room to stand and a place to rest bundles of shingles. Looped around the brackets, lengths of chain with hooks on the end make a handy place to hang a nailer or a bucket full of nails.

my utility knife because it's less likely than a straight blade to cut whatever is underneath the shingle. When cutting a shingle on the roof, I use the back of another shingle as a straightedge, which saves me from having to carry a square.

Our company's air-powered nailers speed up production, but they have their drawbacks. Nailers are heavy, and dragging 100 ft. of hose is cumbersome. Our nailers hold only enough nails to install one bundle of shingles, which means we have to keep coils of nails on the roof, and they get in the way. Also, in areas that require lots of cutting and fitting of shingles, power nailers are clumsy and impractical.

To make the nailers easier to handle on the roof, I made some portable utility hooks that attach to our scaffold brackets. This gives me a place to hang my nailer when I'm not using it (photo facing page), as well as a place to hang buckets of nails and coils of air hose. The hooks are made with loops of chain, spring latches and some utility hooks, all of which I got at a hardware store.

Ladders and roof brackets—For us, safety begins as soon as the trucks show up at the job. Roofing can be hard on your back, and you have to be careful just pulling the ladders off the truck and setting them up, not to mention hauling heavy rolls of felt and bundles of shingles up on the roof.

I've become accustomed to setting up extension ladders alone because I have to examine many roofs by myself. I slide the ladder off the back of the truck until its feet touch the ground, then tip it up on one edge. Squatting under the ladder with a little over half its length in front of me, I stand up, placing the ladder on my shoulder, keeping my back straight and lifting with my legs. With the majority of the weight in front of me, I don't have any downward pressure behind me to strain my back.

To stand the ladder up, I set the foot of the ladder against a solid object—usually a foundation, step or tree trunk—and push on the top, walking my hands down the rungs. Once the ladder is straight up, I raise it to the appropriate height, watching out for power lines, phone lines and tree branches.

There are two accessories I use with my ladder when the needs arise. One is a ladder standoff, which is a large U-shaped affair that bolts to the ladder and prevents it from leaning directly against the eaves of the house. The other is a ladder scaffold, which is a platform supported by two brackets that hang over the rungs on a pair of extension ladders.

I use the ladder scaffold to work along the eaves of a house. My steel scaffold platform is 20 ft. long, and to be sure it overhangs the brackets at least 12 in., I stand up two ladders about 17 ft. apart. Once the ladders are up, I set the brackets at the proper working height, which for me is about 3 ft. below the eaves. The brackets are adjustable and can be oriented in a horizontal position no matter what the ladder's angle. Because of its size and weight, getting the 20-ft. scaffold up the ladder and onto the brackets is a two-man job, and once in place, I tie the scaffold to the ladders.

About 90% of the time I'm working on a roof that's too steep to walk on (anything greater than a 6-in-12 pitch), so I set up roof brackets (photo facing page). These are triangular steel brackets, some of which can be adjusted level regardless of the roof pitch. Others are fixed and create a working surface that allows me to walk around on the roof easily (for more on scaffolding see *FHB* #36 pp. 34-38).

The basic materials—Asphalt shingles and fiberglass shingles are the most common roofing materials used today. Both are less expensive than slate, tile or metal roofing and are more fire resistant and maintenance-free than wood. The main difference between asphalt and fiberglass shingles is in the mat, or base sheet, that manufacturers begin with when they make shingles. Asphalt shingles have an organic base, which, like felt underlayment, is composed of cellulose fibers saturated with asphalt. Fiberglass shingles have a base of glass fibers and don't need to be saturated with asphalt.

Beyond that, asphalt and fiberglass shingles are made pretty much the same way. The mat is coated with asphalt on both sides, and then ceramic-coated mineral granules are applied. The granules help shield the asphalt from the sun, provide some fire resistance and add color. The seal strip, applied along the width of the shingle and just above the cutouts, is activated by the sun and seals each shingle to the one below it.

On a standard three-tab shingle, the top edge of each shingle is marked with a notch every 6 in. The notches are used to register the shingles in the next course, since alternate courses are offset from each other by 6 in. Some manufacturers even notch the shingles every 3 in. to allow for a pattern that repeats every third row as opposed to every other row.

Fiberglass shingles are a little more difficult to install than asphalt. In hot weather, they become softer much faster, which makes them harder to handle and cut, and easier to damage.

Fiberglass shingles are lighter in weight, though. A square (100 sq. ft.) of standard three-tab fiberglass shingles weighs 225 lb. A square of asphalt shingles weighs 240 lb.

The two most common types of roofing felt are 15-lb. felt and 30-lb. felt. The designation is based on the weight of a 100-sq. ft. area of felt. Although some people don't bother to install felt under the shingles, we always do. For one thing, felt protects the roof decking from the weather. Even though roof decks are made from exterior-grade plywood, they won't withstand prolonged exposure to the elements. Second, roofing felt helps prevent ice and snow from backing up under the shingles and leaking water into the house.

Installing felt and flashing—Felt is applied in courses, parallel to the eaves. Generally courses overlap each other by 4 in. The rolls are marked with white lines along the edges to help you maintain a consistent overlap. There's also a pair of lines in the center of the felt, in case you want to overlap the courses 18 in. (half the sheet). You might want to do this on a shallow-pitched roof, say 4-in-12, in an area prone to ice damming.

We try to run the length of the roof with a piece of felt, trimming it flush with the gable ends. But if we have to splice in the middle of a course, we overlap the ends 4 in. We run felt 6 in. over all hips and ridges (from both sides). Valleys are lined with a full width (36-in.) piece of felt first, and then the courses are run into it, overlapping the sides of the valley felt by 6 in. Where a roof butts into a sidewall, we run the felt 4 in. up the wall.

When we come to a vent pipe, we cut a 3-ft. piece of felt, make a hole in it the size of the pipe, slip it over and seal around the pipe with roofing cement. Then, we overlap the felt on both sides of this piece. To avoid having to chalk horizontal lines later as a guide for the

Estimating roofing

Roofing shingles are sold by the square: a square of shingles is enough to cover 100 sq. ft. There are 27 shingles in a bundle of standard three-tab shingles, and three bundles to a square. I calculate the square footage of the roof and divide that figure by 100 to determine how many squares of shingles I need. For every 5 ft. of hip or ridge, I need four shingles. I generally figure 30 ft. to 40 ft. of hips and ridges for every square of shingles. When a roof has many hips, valleys and irregular shapes, I figure 10% to 20% extra for waste.

From the blueprint or specs, I also determine if I will need drip edge, flashing or any other additional material. The drip edge and flashing are linear dimensions. I figure 2 lb. of nails for each square of shingles. I use 1¼-in. galvanized nails for new construction. I don't use staples to install shingles because I feel the head of a nail holds the shingle on better. Manufacturers of roofing felt assume a 2-in. overlap, so a roll of 15-lb. felt that will cover 400 sq. ft. of roof has 432 sq. ft. in the roll.

The cost of installing the roof is the sum of the materials, labor, overhead and profit. Most roofers determine the labor cost based on a set price for each square of roofing. The problem with this is that not every square of roof shingles takes the same amount of time to install. A square of roofing material on a shallow-roofed ranch house will take less time to install than a square of roofing three stories high on a steeply pitched Victorian. Instead, I break down the roof into sections and determine the time each one will take a specific roofer or group of roofers to complete. I am always conscious of details that require extra time, like valleys and flashings. —*T. S.*

shingles, we install the felt as straight as possible so that we can measure off of it to keep the shingles straight.

We nail along the seams and edges of the felt. In the center of each course, we nail every 2 ft. or so. Although you can nail by hand, I usually use a power nailer filled with 1¼-in. roofing nails, which are the shortest pneumatic nails I can get. When I need to install a small area of felt quickly and don't want to bother with a compressor and hoses, I use an Arrow Hammer-Tacker (Arrow Fastener Company, Inc., 271 Mayhill St., Saddle Brook, N. J. 07662). It's a staple gun that is used like a hammer, but tends to gum up with felt after a lot of use. When that happens, we soak the heads in kerosene to break down the tar. Then we scrape them clean and spray them with lubricant.

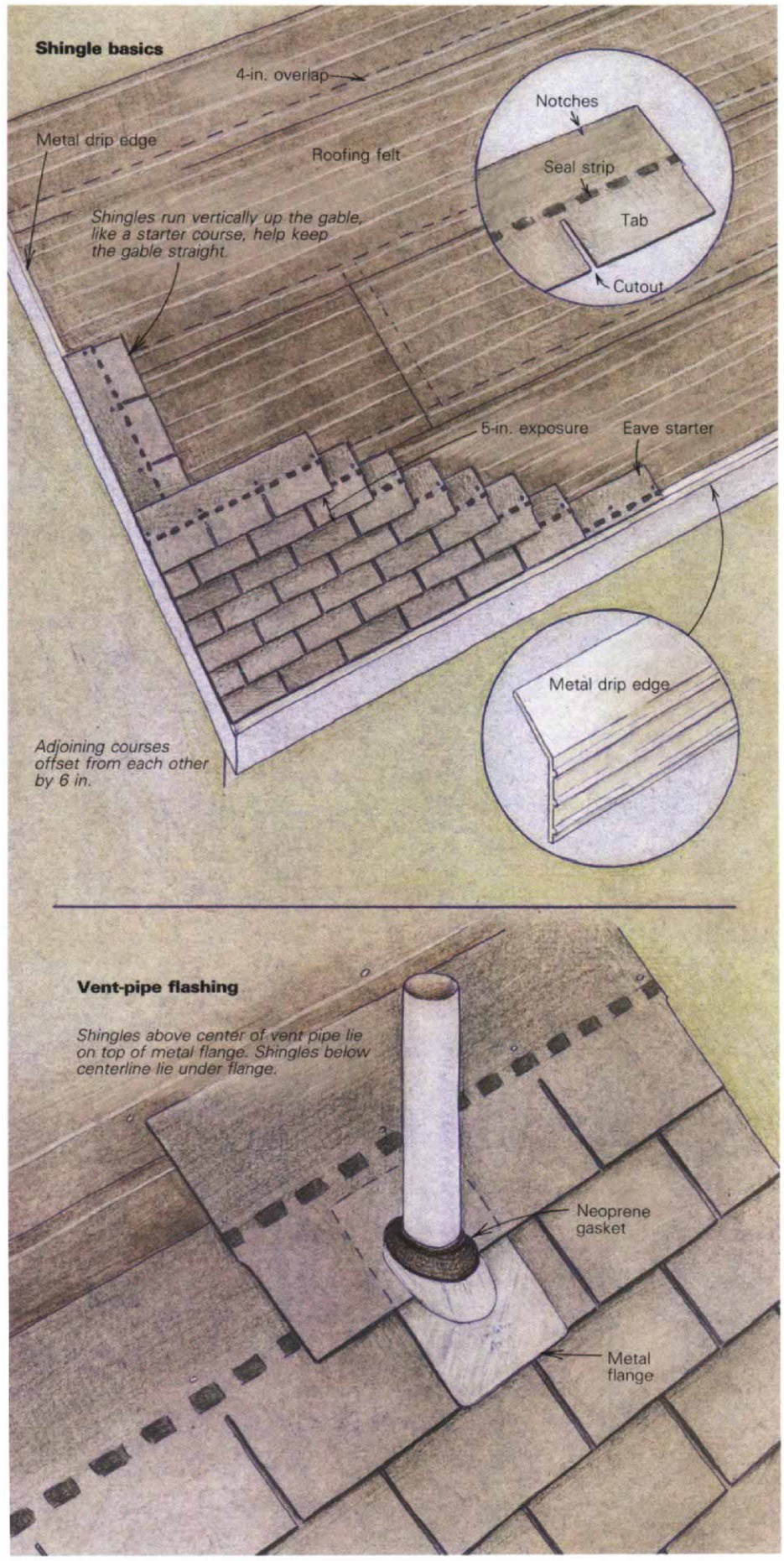
Once the felt is on, we nail strips of lath along the edges of the roof and along the seams in the felt to prevent the felt from blowing off. Until the roof is done, the felt is the only material keeping the house dry.

The edge of the roof sheathing should always be protected from the elements. I use a metal drip edge, installed with roofing nails, along the gables and eaves. At inside corners, I cut the vertical face of one piece 1 in. long and bend it around the corner, and then cut the other piece so that it butts into the corner. I cut the tops long on both pieces and overlap them in the valley. At outside corners on a hip roof, I cut a "V" out of the top section and simply bend the drip edge around the corner. Gable ends are cut flush with the rake board at the bottom. At the peak, I cut a "V" out of the vertical flange and bend the top section over the ridge. Any splices in the drip edge are overlapped 2 in.

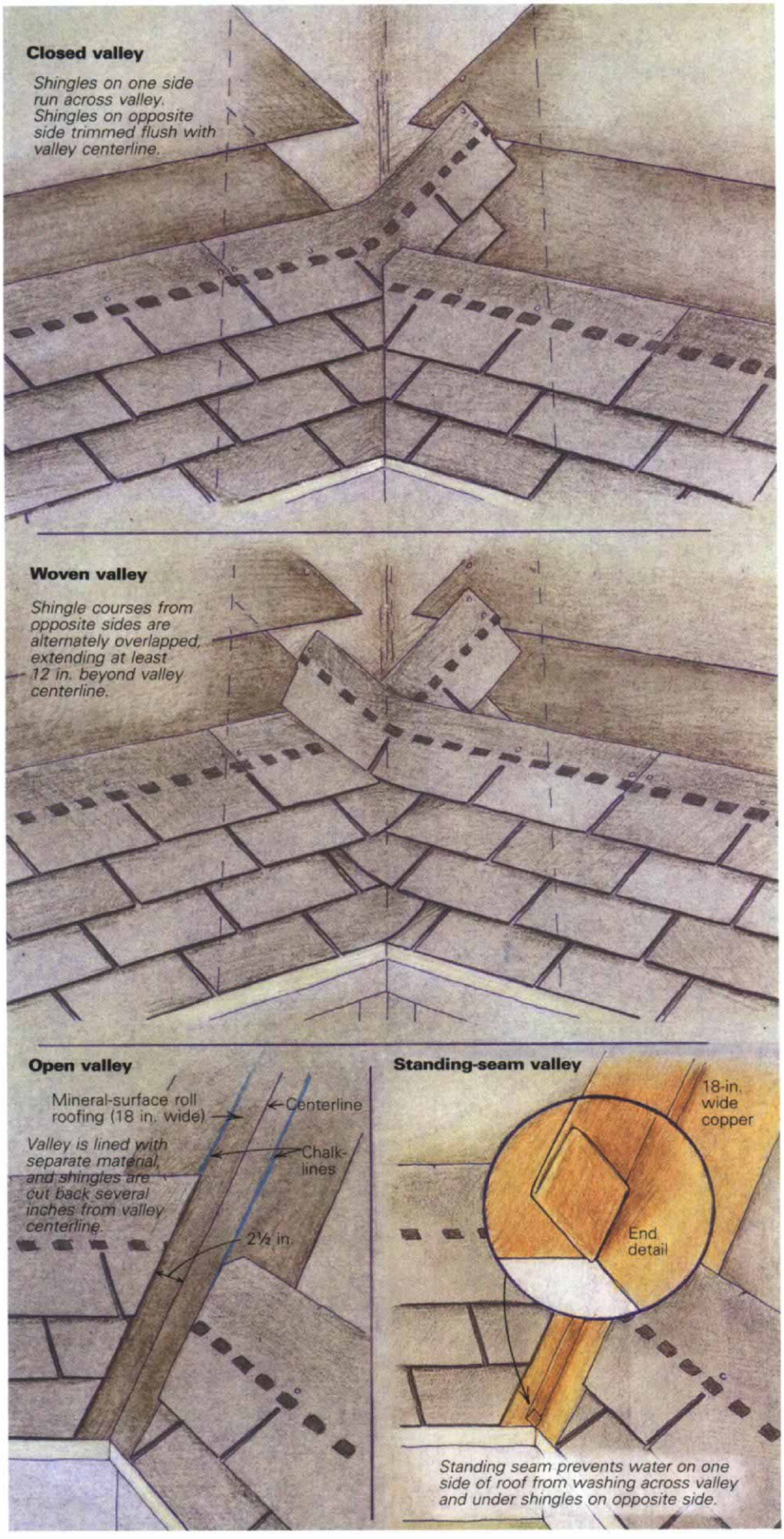
Houses without overhanging eaves are particularly susceptible to damage from ice damming. On such houses we also install a 36-in. wide strip called an ice shield, or eave flashing. Although you can use roll roofing, we use any of several membrane products specifically designed for this like Ice & Water Shield (W. R. Grace & Co., 62 Whittemore Ave., Cambridge, Mass. 02140) or Weather Watch (GAF Corp., 1361 Alps Rd., Wayne, N. J. 07470-3689). We roll them out along the eaves, tacky side down, and nail them only across the top.

Loading the roof–Shingles should be stored in the shade, or covered with a light-colored tarp. Otherwise, the sun will heat them up and seal them to each other. For this reason we seldom unload shingles directly onto the roof, even though some suppliers have lift trucks that make it possible. We either carry the bundles up by hand, or we use a gas-powered hoist (ours was made by Louisville Ladder Division, Emerson Electric Co., 1163 Algonquin Pkwy., Louisville, Ky. 40208).

Some roofers carry the shingles up to the ridge and lay the bundles over it. This isn't a good idea, especially with fiberglass shingles. The shingles can heat up, take a set



Drawings: Chris Clapp



from being bent and then not lie properly. We spread the bundles out around the roof, on approximately 6-ft. centers. Any farther apart and you'll work yourself to death. Even on shallow roofs, the bundles can slip on the felt and slide off, so we drive a pair of 10d nails into the sheathing and set the bundles above them. The nails can make a dimple in the edge, especially in hot weather, so we always lay the bundles with top edge of the shingles against the nails.

Starting the shingles—Before the first course of full shingles goes on, starter shingles are installed along the eaves. Their purpose is to protect the roof under the cutouts and joints in the first full course and to provide a seal strip for the tabs. Although some people use whole shingles installed upside down as starters, I use full length shingles with the tabs cut off (top drawing, facing page). This puts the seal strip in the right place to hold the tabs.

Along the gable end, I like to let the shingles overhang the drip edge by 1 in. This keeps water from blowing under them. To keep this line of shingles ends straight, I run a course of shingles vertically up the gable, like a starter course (top drawing, facing page). I lay them end to end from eaves to ridge, with the cutouts toward the roof and the top edge overhanging the drip edge about one inch.

Once the starter course is in place, the field shingles can be started. I begin in the center of the roof and work outward, if there is a large open area, or if I'm on a hip roof. I begin on the gable end when there is no large open area to nail shingles, or when there are dormers in the way and I won't be able to get a proper chalkline on the roof.

I install the first five or six courses without chalking any lines, following the eaves with the first course, and then following the notches and cutouts of the previous course. If I need to install roof brackets, I usually do so after the sixth course. This puts them at a comfortable height from which to get on and off the ladder. Also, I can nail two or three more rows of shingles beyond the roof brackets while still standing on the ladder, which is easier than nailing these rows from the scaffold.

Once you're up on the roof, you can work horizontally across the roof, installing several courses as you go. Or you can work vertically up the roof, installing the first two or three shingles in each course all the way to the ridge. I prefer a combination of the two. On our crews one roofer sets the pattern by nailing vertically up the roof (in the center when possible). The other roofers nail horizontally, one to the left and one to the right (photo, p. 84). This increases productivity by allowing three roofers to install shingles on the same roof without getting in each other's way.

We chalk lines on the roof to help us keep the shingle courses aligned and straight. I start with a pair of vertical lines, one in the center of the roof and another 6 in. away (on

either side). All subsequent courses are begun from these lines.

If I'm starting from the gable end rather than in the center of the roof, I don't chalk any vertical lines as long as the gable is straight. Before I go up on the roof, I make a pile of full shingles and a pile of shingles that have 6 in. cut off of them. Then when I'm on the roof, all I have to do is alternately pull shingles from each pile and work my way up the gable. Successive courses are automatically offset by 6 in.

When you reach the opposite gable with a course, the shingles are simply trimmed flush with the starter course running up the gable. Rather than trim the last shingle in each course individually, some roofers let these shingles run long and trim them later. If the shingles are not cut as they're installed, I insist that they be cut at least every few hours. If left any longer, they will droop against the side of the house, making it difficult to get a straight cut.

Unless I installed the felt and know that it's straight, I chalk horizontal lines every six to eight courses. (Roofing felt is often installed by the frame carpenters before we get to the job.) I measure 5 in. for each course, which is the amount of shingle exposure (this varies with the manufacturer, so be sure to check this by measuring the depth of the cutout on your shingles). I periodically measure from my chalklines to the ridge to make sure I'm running parallel to it. If not, I adjust the chalklines in small increments.

These horizontal lines help align the top edges of the shingles. Yet because individual shingles may vary in height as much as ¼ in., aligning the top edge doesn't guarantee a straight course. But chalking lines for the top edge means that we can chalk all the lines at once, which saves us time.

If the courses are running off and we need to straighten them out, we'll chalk a line along the tops of the cutouts of the last course installed. This aligns the bottom edges of the shingle and results in a perfectly straight course. If the shingles are running way off, we'll straighten them out gradually over several courses. We always use blue chalk, which washes away in the rain. Red chalk can permanently stain the shingles.

I use four nails to a shingle—one at each end and one over each cutout. On steep roofs I may install a fifth nail at the top center of the shingle. Contrary to conventional wisdom, I always nail right above the seal strip, not on it or below it. Nailing on the seal strip prevents proper adhesion. Below the seal strip, the nails are too close to the edge and can rust or corrode, causing the shingles to slip and the roof to leak. I have never had a shingle blow off or slip because I nailed above the seal strip.

Field shingles that end up over a hip are just run long, nailed and then cut down the center of the hip with the hook blade of a utility knife. At the ridge, we trim one side of the roof flush and fold the shingles from the other side over the top. This is just a temporary measure to seal the ridge until the caps are installed.

Working his way up an open valley lined with mineral-surface roofing, Smith uses tin snips to trim shingles flush with the chalkline. Blue chalk is preferred because it washes away in the rain; red chalk will permanently stain the shingles.

Valleys—There are three different types of valleys used on shingle roofs: the closed valley, woven valley and open valley (drawings previous page). A closed valley is created by running shingles from one side of the roof across the valley (at least 12 in. beyond the centerline), and then overlapping them with shingles from the other side, trimmed flush with the centerline of the valley. It is the cheapest, easiest and least durable option.

The woven valley is created by alternating and overlapping each row of shingles from the left and right sides of the valley. The shingles should overlap the valley by at least 12 in. and nails should be kept at least 8 in. away from the valley centerline.

An open valley is created by lining the valley with a separate material (roll roofing or copper, for instance), and then cutting the shingles back so the lining materal remains exposed. We use open valleys on 90% of our roof installations because they are the most durable. An open valley allows water to flow easily off the shingles. Depending on the budget, the type of shingle and the style of the house, we'll line open valleys with mineral-surface roll roofing, copper or lead-coated copper. One material we never use for valleys is aluminum because it expands and contracts more than other materials, which causes it to wear out much faster.

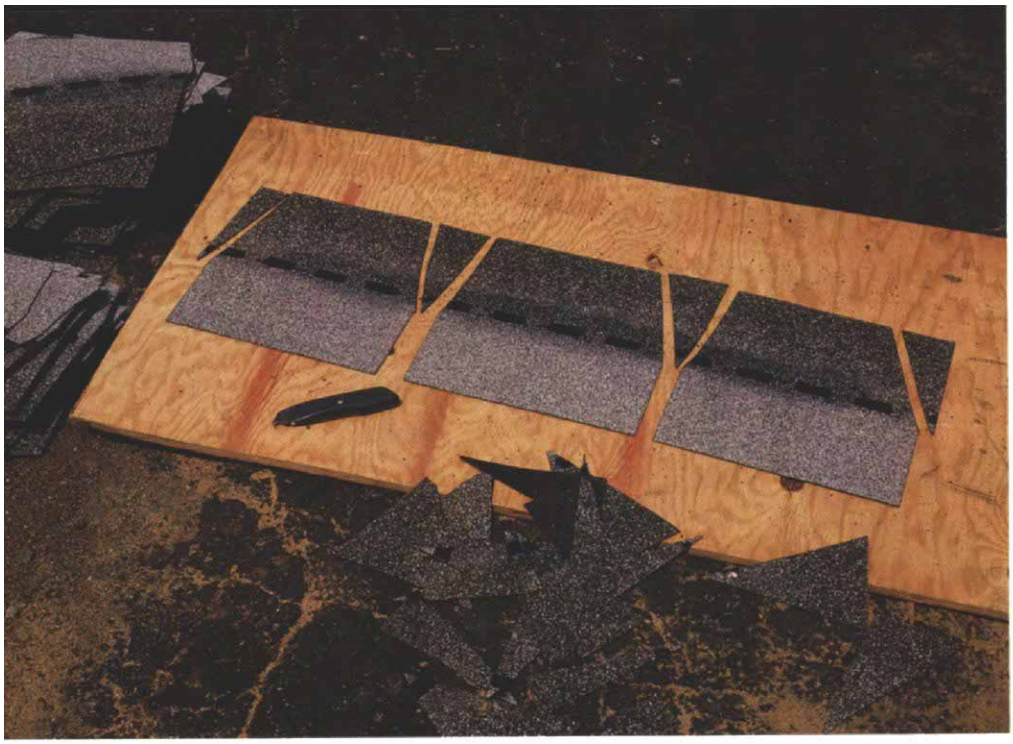
For mineral-surface valleys, I use strips of material 18 in. wide and 8 ft. to 10 ft. long. A longer piece is difficult to work with and may rip during installation. It comes in 36-in. wide rolls, which I cut down the middle. I cut the valley material on the ground, using a utility knife, and loosely roll it up to make it easier to carry on the roof. Some manufacturers produce roll roofing in colors to match their shingles. But both black and white roll roofing are pretty common and look good with most shingles.

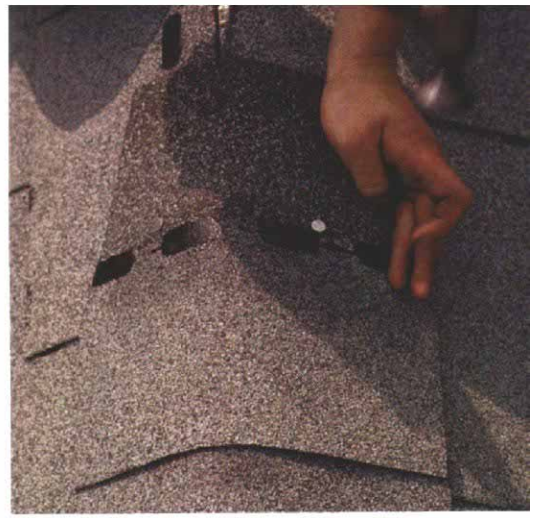
To install the valley, I start from above and unroll the material. I center it, nail one of the upper corners, then work my way down, nailing the same side every 12 in. to 18 in. It is imperative for the valley material to be tight against the sheathing. If it is not, it can break under the weight of ice and snow. To avoid misalignment, only one person should nail the valley, always working from top to bottom. First one side, and then the other. When I need a second piece to complete the valley, I overlap the first piece 4 in., but don't usually seal between them.

Metal valleys are installed pretty much the same way. Again, I use 8-ft. to 10-ft. lengths. I like to crease the center of the valley metal on a sheet-metal break. The job looks neater and cleaner this way.

I use a standing-seam valley when a steep roof drains onto a flatter shingle roof. I bend the valley metal on a sheet-metal break, creating a ridge in the middle of the valley (bottom right drawing, previous page) that prevents water from the steep side of the roof from flowing across the valley and running up under the shingles of the shallower roof. To finish off a standing-seam valley at the bottom, I cut the sides flush with the eaves, but let the standing seam run about 1 in. long. Then I simply fold the seam back on itself and crimp it tightly. At the top, I start about 6 in. from the ridge and bend the standing seam over with a rubber mallet so that it lies flat across the ridge.

It is important to seal valleys at the top to keep water from getting under them. With a mineral-surface valley, I use a 4-in. wide piece of roofing fabric and apply one coat of roofing cement under it and another coat on top of it. Roofing fabric is a cheesecloth-like material or fiberglass mesh, saturated with





Using a hook blade in a utility knife, Smith cuts ridge caps on the ground (photo left), tapering the tops so that, once installed, the lap portion will be neatly hidden beneath the exposed portion of the succeeding shingle. The caps are centered on the ridge and held in place with one nail on each side (photo above). The last cap on the ridge will have the lap portion trimmed off, and because the nails will be exposed, they'll be sealed with caulk.

asphalt. It comes in 4-in., 6-in. and 12-in. wide rolls. The 4-in. rolls cost about $7 for 100 ft. of fabric and are available at most building-supply stores.

When I don't have anything to solder to, I use the same technique to seal the tops of copper valleys. However, when two copper valleys meet at a ridge or when a copper valley meets copper flashing, I prefer to solder them. To solder two valleys at a ridge, I end one valley at the ridge and bend the other valley over the ridge about 1½ in. (again using a rubber mallet).

After installing the valley material, I chalk lines along both sides of the valley, 2 in. to 2½ in. from the center. These are the marks I follow to install the shingles. The exposed sections of my valleys are between 4 in. and 5 in. wide total. Anything smaller is impractical and anything larger doesn't look good.

I prefer to cut the shingles even with the chalklines while they are being installed, using a pair of tin snips (photo facing page). I nail the full shingle in place, use another shingle as a straightedge, scribe a line with the point of a nail, then bend the shingle up and cut it with my tin snips. I can install and trim the valley shingles on both sides as I work up the valley to the ridge.

Some roofers let all the shingles run long. As each side is completed, they chalk lines down the valley and use a utility knife to cut the shingles (being very careful not to cut the valley material). With either method, it's important to keep the nails 4 in. to 6 in. away from the edge of the shingles in the valley.

Flashing—I use step flashing along the sides of a wall or chimney (wood or masonry). Step flashing consists of small squarish pieces of metal, bent in an L-shape. The individual pieces are installed with each course of shingles so that the shingles in the succeeding course hide the exposed metal (for more on installing step flashing see *FHB* #35 p. 50). You can buy precut pieces of aluminum step flashing, but I prefer copper, so I have to make my own from 18-in. wide rolls. I make my steps at least 9 in. wide by 8 in. long, which is equivalent to 5 in. of exposed shingle and 3 in. of headlap. I nail the pieces of step flashing on sidewalls before the siding is installed. Then the siding acts as the counterflashing. In the rear of a chimney, I install a copper cricket, which is a saddle that diverts water around the chimney (see *FHB* #47 pp. 61-63).

To flash around soil and vent pipes on most houses, we use a manufactured metal flange with a neoprene gasket (bottom drawing, p. 86). It's important to remember that all soil and vent-pipe flashings lie on top of the shingles from the center of the pipe forward and lie under the shingles from the center of the pipe back. We shingle up to the center of the vent pipe, either by notching the shingles around it, or by actually cutting a hole in one of the shingles and slipping it over the pipe. Next we slip the metal flange over the pipe and nail the top corners. Then we continue applying shingles, notching them around the pipe and being careful to keep nails away from the pipe (for more on flashing see *FHB* #9 pp. 46-50; reprinted in *Construction Techniques I,* The Taunton Press 1984).

Capping hips and ridges—Hips and ridges are capped with shingles that are only one tab wide. The caps are made by cutting three-tab shingles into three pieces (photos above). Once again, this is done on the ground. The shingles are cut with a utility knife, starting at the top of the cutouts and angling slightly inward, toward the top of the shingle. This assures that the lap portion of the shingle will be neatly hidden beneath the exposed portion of the succeeding shingle (photo above right).

Of all the areas where I have installed shingles, the hips are the most difficult to keep straight without a chalkline. I snap a line parallel to the hip, about 6 in. away (it doesn't matter on which side). This acts as a guide for the outer edge of the hip caps. I start at the bottom, cut the first cap even with the eaves shingles, then I work my way to the ridge.

I nail hip and ridge caps on or just above the seal tab. Nailing higher will cause the bottom of the shingle to pop up. Hip and ridge caps are nailed with about a 5-in. exposure. The bottom of each cap is aligned with the top of the cutout on the previous cap.

Most roofers install ridge caps from one end of the roof to the other, orienting them so that the prevailing winds blow over the caps, not under them. I prefer to work from both ends toward the center. I can't really say why, except that it's the way I was taught. On steep roofs, where the centerline of the ridge is more distinct, I don't usually chalk a line for the ridge caps. On shallow roofs, I do. Once both sides of the ridge reach the center, the last ridge caps have to be trimmed so that they butt together, otherwise the ridge will have a lump in it at this point. One last cap piece will cover the butt joint. It should be only about 5 in. long and installed with two exposed nails, both of which are caulked with clear silicone caulk.

Where the ridge of a dormer meets a roof, I work from the front of the dormer back toward the roof to install the caps. The last cap spans across the seam between the valleys (which is sealed with solder or roofing fabric). And the field shingles on the roof lie over the last dormer ridge cap. □

Todd A. Smith is a roofing contractor in Verona, New Jersey. For more on asphalt-roofing techniques, contact the Asphalt Roofing Manufacturers Association (6288 Montrose Rd., Rockville, Md. 20852) for a copy of their Residential Asphalt Roofing Manual, *$10.*