

# Installing a Hammer-Cut Stone Floor

Basic tools produce a quartzite surface that's easy on the toes

by Paul Holloway

As masonry contractors, my partner Ed Brundle and I build everything from concrete-block K-Marts to residential stone floors. The former is our bread and butter, but it's mundane work, the product of which is upstaged by the latest in underwear and toasters. Stone masonry is far more gratifying. Unfortunately, it tends to be like chrome wheels and a new paint job—when times get tough, people do without it.

When times got tough last winter, though, I enlisted the help of my partner and a hod carrier (laborer) and installed a stone floor over the plywood subfloor in my own living room (photo right). My wife and I picked stone so the floor would be as indestructible and easy to maintain as it would be beautiful, important factors when you have three small children.

Our floor would be hand cut using hammers and chisels, just like the stone floors we put down for our customers. It's quicker and easier to cut a floor with a wet-cutting, diamond-bladed saw, but I don't like the look of saw-cut floors—they're blocky and the joints are too uniform for a natural material such as stone. Besides, I couldn't afford to buy diamond sawblades for nonpaying work.

**Rocky Mountain quartzite**—A stone floor should fulfill at least two requirements: it should be attractive, and it should be flat enough that people can walk barefoot in the dark on it without stubbing their toes.

For our floor, we picked a locally available metamorphic stone called Rocky Mountain quartzite. Quarried in Idaho, it's beautifully colored, reliably flat and tends to break at 90° angles to its face, making it relatively easy to shape with a hammer. Also, the natural texture of the stone makes an excellent non-skid surface.

The stone measures from ½ in. to ¾ in. thick and is available with either silver- or gold-colored streaks in it. The silver variety is consistently flatter and smoother than the gold. That makes it easier to work with and produces a smaller percentage of waste. Nevertheless, like many of my clients, we opted for gold because we prefer the way it looks.

Whatever its color, Rocky Mountain quartzite sells either by the "ton" or as "select." Around here, tonnage costs \$.14 per lb. and is based on the luck of the draw; once you buy



The author's new living-room floor is a mosaic of gold Rocky Mountain quartzite, hand cut using hammers and chisels. The floor's even surface allowed baseboards to be installed without scribing.

the stone you're stuck with it whether or not it's usable (stone is packed tight on pallets, so it can be tough to tell). Select quartzite costs \$.28 per lb. You sort it out yourself from the "select" pile at the yard. For our 300-sq. ft. floor, I bought 4,700 lb. of tonnage and 1,200 lb. of select stone so I wouldn't have too many rejects to dispose of once the job was completed. Total waste on the job was 2,600 lb., all of it tonnage.

**Preparation and layout**—A stone floor can be installed over a concrete slab or a wood subfloor. In either case, the stone is set in a ¾-in. to 1-in. thick bed of mortar so that the total thickness of the mortar bed and stone is 1½ in. Over subfloors, though, the mortar is reinforced and anchored to the floor with gal-



**Tools of the trade.** The floor was installed without the use of power tools. Pictured here is the author's toolbox with a pair of levels stowed in the lid. In the foreground, left to right, are a pair of stone hammers, a brick hammer, two flat chisels, a brick set and a tuck pointer on top of a brick trowel.



vanized diamond metal lath nailed to the floor with galvanized 8d nails (drawing right). Over slabs, no lath is required.

Before we installed the metal lath, we snapped chalklines on the walls  $1\frac{1}{2}$  in. above the subfloor to correspond to the finished elevation of the stone. This chalkline and the use of a 4-ft. level would ensure a level floor.

**Composing the floor**—Sizing stone is an art that calls for a good eye and a sense of balance. There's no formula for it that I know of, but generally speaking, the larger the room, the larger the minimum size stone we use. For setting stone, we use a simple rule: the *leave* is worth twice the fit. Or, a well-placed stone not only fits, but its shape accommodates the next stone without forcing the use of odd-shaped stones or stones smaller than about 8 in. by 8 in. (called *chinks*). A floor full of chinks is a sign of sloppy workmanship.

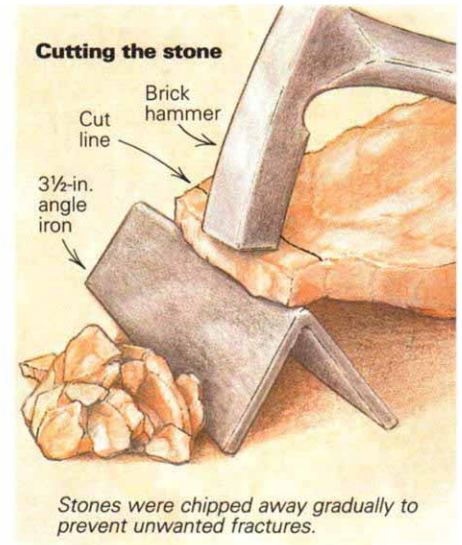
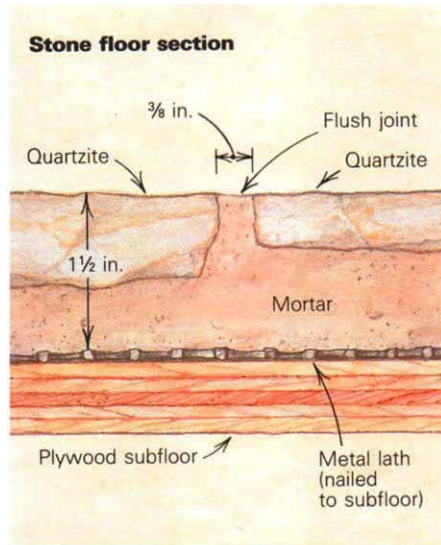
I wanted my floor to be composed with the color randomly distributed and with few chinks (ordinarily, I wouldn't use *any*, but that would have called for sorting through about 25% more stone, which was beyond our budget). I also planned to place unusually large stones at the entrances into the living room. These would serve to invite people into the room.

**Working the stone**—My stone floor was cut and laid in sections measuring about 6 ft. across, which was about as much stone as we felt like cutting at once. While laying the floor, we checked each stone for flatness, color and structural integrity. Stones with surface irregularities were discarded, except for the few that were especially nice. These were rescued by facing them (flattening their surfaces) using a brick or stone hammer and a combination of flat chisels (bottom photo, previous page). To check for fractures, we visually inspected each stone, then used the old method of striking each one with a hammer, a dull thud instead of a ringing sound signified a reject.

Wherever possible, we used *naturals* (stones that required no cutting to fit). When cutting was required, we set the stone over its final destination and marked the cut lines with a pencil. Then we cut the stone using a brick hammer in combination with an inverted length of  $3\frac{1}{2}$ -in. angle iron (top right drawing).

Our cutting procedure is pretty straightforward, but mastering it takes practice. The idea is to chip away the stone gradually rather than break it off all at once (large cuts can sometimes be accomplished with a single blow, but they're risky). So we slowly slide the stone forward over the angle iron while striking the stone with the brick hammer directly over the contact point. We reduce most large stones to smaller ones by simply standing them on edge and striking them with the side of the hammer. Difficult stones are laid down and broken with a hammer and a brick set.

**Mixing the mud**—Throughout the job, our trusty hod carrier kept Ed and myself supplied with stone and mortar. The mortar was mixed



**Dry-fitting the floor.** After metal lath was nailed to the subfloor, chalklines corresponding to the floor's finished elevation were snapped on the walls. A section of the floor was then cut when necessary, using hammers and chisels, and laid dry.



**Bedding the stone.** Section by section, the stone was bedded in mortar, then leveled to the chalklines. Poorly bedded stones were pulled up and rebbed as needed.



with a paddle mixer, which looks sort of like a riverboat paddle suspended over a barrel that's split in half lengthwise.

Our mud recipe was 3 cu. ft. of sand and  $\frac{1}{4}$  cu. ft. of lime per 1-cu. ft. bag of masonry cement. In high traffic areas, we reduced the sand content to  $2\frac{1}{4}$  cu. ft. per bag of cement to make the mortar more durable. The stiffness of the mix was critical. It had to support the stone, but it couldn't be so soupy as to be selfleveling nor so stiff that it wouldn't ooze up between the stones during installation.

Each batch was workable for about an hour and a half to two hours. To maintain the desired consistency, we tempered the mortar as often as necessary (based on temperature and humidity) by working it with a trowel or shovel and sprinkling a little water on it.

**Putting the stones to bed**—Sections of the floor were laid dry (top photo, facing page), then bedded in mortar one stone at a time. We started by bedding several stones adjacent to a wall, leveling their tops to the chalkline on the wall. Then we bedded several stones farther out from the wall, each within 4 ft. of a level stone. Once these stones were leveled, we bedded the remaining stones in the section using our 4-ft. level as a straightedge. The joints between the stones typically measure  $\frac{3}{8}$  in.

To set a stone, we started by throwing a trowel of mortar on the floor and thoroughly working the mortar into the metal lath using a brick trowel. Enough mortar was placed to produce good *squeeze*—that is, plenty of mortar squeezing out the sides of the stone. Next, we dropped the stone on the mortar and either leaned or stood on it (depending on the size of the stone) to lower it close to its finished elevation. Finally, we leveled the stone by tapping on the level or on the stone itself with the butt of

the trowel handle (bottom photo, facing page).

It's critical that a stone floor have absolutely no voids in its mortar bed. Accomplishing this is a challenge, but it's essential for a durable floor. We checked for voids by tapping on each freshly bedded stone with a hammer. A hollow sound meant the stone needed to be lifted and the bed reloaded with mortar.

**The manicure**—Our technique for finishing the joints between stones, which we call the manicure, is similar to that of a tilesetter. First, we completely pack the joints with mortar (the squeeze takes care of most of that; voids are filled using a tuck pointer). Then, once a section of the floor is bedded, we remove excessive mortar and smear mortar over the entire surface of the stone using a damp sponge (photo below left). We allow the mortar to harden for a couple of hours, then mop the surface of the floor with a wet sponge, taking care not to recess the joint (a flush joint is what we're after).

At this point, we typically let the floor sit overnight, and then have our hod carriers scrub it down thoroughly the next morning using stainless-steel pads or those green "scrubbies" and about a 9% to 12% solution of muriatic acid (ten to eight parts water to one part acid, depending on how stubborn the stain is). This requires that the floor be wet with water first and kept wet to prevent the muriatic acid from soaking into the floor, which would burn the mortar and stain the stone. Finally, the muriatic acid is mopped up with sponges and the floor scrubbed with water until its surface is impeccably clean. During this phase of the job, we have extra sponges and buckets on hand to soak up water and prevent damage to the adjacent drywall.

Anyone who has worked with muriatic acid knows that even though it won't burn holes in

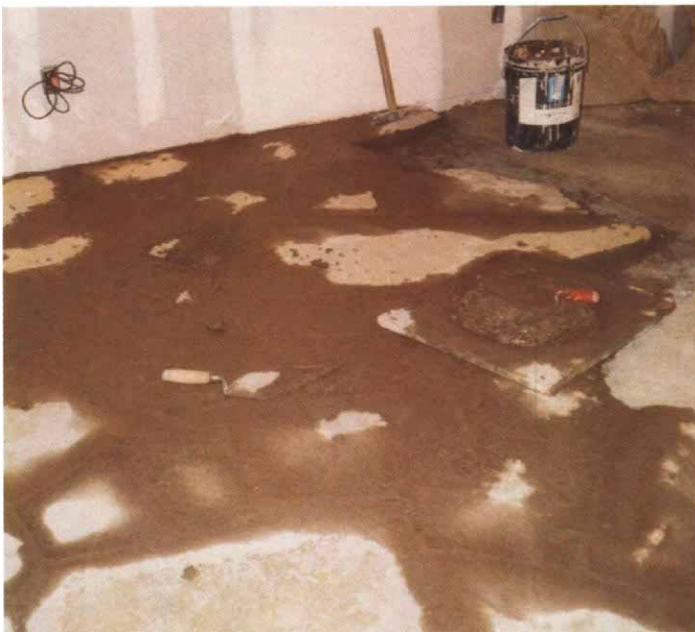
your clothes, it can still be nasty stuff. You need to ventilate the work area and wear rubber gloves and eye protection when working with it. Because this floor was in my house, I managed to avoid using muriatic acid (except on a few stubborn spots) by scrubbing the floor thoroughly with abrasive pads and water in the evenings instead of letting the floor sit overnight. The results (photo below right) were comparable to an acid-cleaned floor.

**Finishing up**—A completed floor can take from a few days to a month to dry, depending on temperature and humidity. This one took several days. Stone floors, like brick ones, effloresce while drying; that is, moisture evaporating from the surface leaves behind a white, powdery deposit of calcium carbide that comes from the mortar. Once my floor was completely dry (when dry, mortar gets lighter in color), I sponged off the efflorescence with vinegar. Then I allowed the floor to dry once more before applying a sealer.

Ideally, a sealer should waterproof the floor while highlighting the color of the stone. We use a product called Glaze 'N Seal Concrete and Masonry Lacquer (Glessner Corporation, P. O. Box 6427, Moraga, Calif. 94570; 415-621-1414). I applied it to my floor with a paint roller. A coat of this sealer once a year will keep the floor looking as good as new.

My floor took 80 hours to complete. This included installing the baseboard which, true to form, lay flat against the floor without scribing. How's the floor holding up so far? Carson City recently had a series of earthquakes measuring up to 4.8 on the Richter Scale. Not a single crack appeared in the floor. □

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**Finishing off.** Once a section was fully bedded, mortar was floated over it with a damp sponge to top off the joints.



A few hours later, the floor was scrubbed clean with abrasive pads and water. When dry, it was coated with a waterproofing sealer.