Acid Staining a Concrete Floor

With careful preparation, this treatment gives a custom touch to a plain-Jane slab.

by Jeroen Kaijser Bots

Courtesy Kemiko Concrete Stains

Our company, Eurofloors, specializes in acid staining concrete slabs, both in new construction and remodels. Also known as reactive staining or acid etching, acid staining is different from other types of decorative concrete work in that the colorant is not an overlay. The change in color is the result of a chemical reaction between the acid applied to the concrete surface and the lime in the concrete mix. The finish is a permanent stain that won't flake or chip off the surface. In this article, I'll explain how I prep, stain, and finish a floor.

New vs. Existing Concrete

New concrete is easier and cheaper to stain because we don't have to strip off the sealer before we begin. When the schedule allows, I like to specify the concrete mix and the finish before the slab is placed, to ensure the best possible results. A five-sack mix with a smooth but porous machine-trowel finish — neither too slick nor too hard — is ideal. It's best not to use any additives, fillers, or curing agents in the mix, and to allow the slab to cure for four to six weeks before staining.

I also try to coordinate the placement of control joints, so that they work with the design planned for the floor. If, for example, we intend to score a diagonal tile pattern, we may try to have the control joints cut diagonally at specific locations. We ask the concrete subcontractor to wait until the slab has cured before making cuts. Green concrete is softer, so most contractors will cut early to save money on diamond blades. The problem is that green concrete chips easily when it's cut, leaving ragged edges.

On the job shown here, we were brought in after the slab had been poured

Figure 1. The first step in the staining process is to fill any pronounced cracks in the slab with a Portland cement–based patching compound. After staining, the cracks create a marbled effect.

Figure 2. The scored tile grid is drawn freehand, then snapped out in chalk. Before cutting, the author fine-tunes the pattern in pencil using squares and straightedges. Here, he avoids having to cut in tight corners by including a 6-inch border around the bathroom cabinets.

Figure 3. Cutting guides of varying length (above left) ensure accurate score lines (above). A die grinder is used to finish cuts in tight spots (left).

and sealed. In a case like this, we can still produce a nice job, but we have to focus special attention on the cleaning process.

Preparing the Slab

We first fill any cracks in the slab (**see Figure 1**). We use Ardex CP (888/512-7339, ardex.com), a Portland cement–based compound that accepts the stain we use.

Next I mark the design on the floor with chalk, taking wall and door locations into account to create a pleasing layout (**Figure 2**). Since it's hard to cut around obstacles with a circular saw, I often draw a border around walls and cabinet bases in tight spaces like kitchens and bathrooms. For this job, the customer chose an irregular stone pattern in the main room and a diagonal tile pattern with a border in the bathroom.

Once the layout is approved, the crew goes back over the lines in pencil, using squares and straightedges to create an accurate guide for cutting the pattern.

Figure 4. The author spreads stripper with a mop (above left), then buffs the wet floor with a medium-grit pad and a screen to lift the concrete sealer (above). Residual stripper is picked up with a wet vac (far left). A floor may need several applications before all the sealer lifts; trouble spots (left) require experimenting with a variety of chemicals.

Scoring the Pattern

I use a 7 1/4-inch Skilsaw and a diamond blade to create the patterns, cutting to a depth of only 1/8 inch; any deeper and the cut would just collect dust and debris. We use simple cutting guides made from plywood and PVC to ensure that the lines are straight and consistent (**Figure 3, page 2**). When working in tight spaces or with designs that require more intricate cuts, we use a 4 1/2-inch angle grinder with a general-purpose diamond blade.

Final Cleaning

Cleaning is the most important step — especially with existing slabs that have been sealed. Stripping concrete sealer can be tricky and sometimes adds days to a job. I always carry an assortment of strippers and cleaners to give myself plenty of options, then use trial and error to figure out what will work on a particular slab. I start with less-toxic soy-based strippers, then move on to citrus-based products. If those don't work, I'll use stronger hydrochloric acid–based products, or petroleum-based ones like mineral spirits, lacquer thinner, and xylene. Acetone usually works well, but its fumes are so noxious we try to avoid it.

I first do a few test patches with various strippers to determine which one works best. On this project, we used SureCrete SCR (800/544-8488, surecretedesign.com), a mildly acidic, hydrochloric acid–based stripper. Once I've chosen a stripper, I spread it over the entire floor with a mop, making sure it doesn't dry out and adding water where needed (**Figure 4**). Then we lift the sealer with a low-speed buffer. The type of buffing pad we use depends on the condition of the concrete, but we usually end up with a blue pad, which is for wet, medium-duty scrubbing.

Occasionally there will be areas where the sealer doesn't strip, even after buffing. When that happens, we again rely on trial and error to find the right chemical to

Figure 5. A crew member applies acid stain with a chemically resistant hand sprayer (left). After the acid reaction is complete, it's possible to touch up areas that haven't darkened enough (below).

finish the job. This process can be time-consuming — something I'm clear about with the client. If, because of time or budget constraints, we can't remove all of the sealer, we make sure at the very least to remove enough so that there is no continuity between the cut "tiles." That way, the finish will still have a natural look.

Applying the Stain

We typically use stains made by Kemiko (903/587-3708, kemiko.com) or SRI Renaissance (803/327-6880, sriconcrete.com). We blend the acid stain with water or muriatic acid, depending on the desired effect. Water dilutes the acid reaction, while muriatic acid intensifies the effect. Muriatic acid also works well on tightly troweled concrete, which is less porous.

If we want the stain to be more interesting or artistic, we'll use ground iron or fertilizer. The ground iron gives the color a starry look, while the fertilizer gives it an almost explosive effect.

We usually apply the stain with acid-resistant spray pumps (**Figure 5**), but we also use brushes or sponges, depending on the finish we want. We use spray shields and masking tape to protect areas that are not being stained. We apply the stain carefully next to the tape, because the acid can react with the adhesive, making it difficult to remove.

Once the reaction has taken place — four hours is typical — we check for irregularities and touch up the finish where necessary.

Sealant

On this floor we used Euclid Everclear TB (800/321-7628, euclidchemical.com), a 25 percent–solids acrylic sealer. Acrylics are durable and inexpensive, but because they contain VOCs, some customers will ask for a more environmentally friendly option. In that case, we use a water-based epoxy sealer, which is more expensive but free of VOCs. We apply the sealer with a fine-nap paint roller, working slowly so as not to create any bubbles in the finish.

To protect the sealer, we usually recommend a protective coat of urethane-modified floor finish. These finishes are durable and buffable, and they can be repaired or replaced without harming the sealer and stain. My favorite is an acrylic-based coating from Pioneer Eclipse called WonderGlo (800/367-3550, pioneer-eclipse.com). We generally apply three coats, which increases the depth and luster of the stain.

Cost

Our jobs typically start at around $3 per square foot for a single color and a standard two-coat urethane sealer. This project cost the client $5.50 per square foot: $0.85 for the sealer removal, $1.45 for the irregular stone pattern design and cutting, and $3.20 for the color, sealer, and protective topcoats.

Jeroen Kaijser Bots *owns Eurofloors in Charlotte, N.C.*