Use the Right Finishing Tool at the Right Time

Avoid these common mistakes when finishing concrete

By Ralph H. Spannenberg

The grate pattern disappears immediately when a grate tamper is used on concrete that's too wet. When the tamper is used on concrete of the proper slump, the grate pattern remains.

Craze cracking, dusting, blistering, scaling, random cracking, and other surface defects can be caused by using low-quality concrete. But sometimes they're caused by using the wrong finishing tool, or the right tool at the wrong time.

Most finishing tools do one of two things: They either keep the surface open, allowing mix water to escape, or they seal and densify the surface, preventing mix water from escaping. The effect of using a tool depends primarily on what material it's made of and when it's used during the finishing process. Floats usually keep the surface open. Trowels close or seal the surface.

Job conditions can also affect finishing tool effectiveness. Some tools can be correctly used with medium-slump but not high-slump concretes. And some tools are properly sized for a 4-inch-thick slab but not a thicker one.

Used correctly, finishing tools can improve concrete abrasion resistance, flatness, and slip resistance. Used incorrectly, they can tear the surface, bring up too much cement paste, trap water beneath the surface, or contribute to random cracking. The result depends on knowing when to use the right tool at the right time with the right concrete. For good results, avoid the finishing mistakes described below.

Jitterbugging High-Slump Concrete

Grate tampers, or jitterbugs, are used to push coarse aggregate particles below the concrete surface right after strikeoff. They make concrete finishing easier by bringing a layer of mortar to the surface. They're also useful in lightweight-concrete placements to embed coarse aggregate particles that sometimes float to the surface.

Too often, however, jitterbugs are used when the coarse aggregate doesn't need any help in sinking below the surface. If used when the slump of normalweight concrete is greater than 3 inches, a jitterbug segregates the concrete, creating a thick layer of mortar at the surface. When the concrete dries, this cement-rich surface shrinks more than the underlying lean concrete. Map-cracking or crazing is often the result.

There's an easy way to tell if jitterbugging is needed for normalweight concrete. If the grate leaves a visible pattern on the tamped surface, the concrete is stiff enough to jitterbug without bringing too much mortar to the surface. If the grate pattern disappears immediately after tamping, or if the tamper splatters mortar during use, the concrete slump is too high for the use of this tool.

BEST METHOD: Use jitterbugs only on low- or medium-slump normalweight concrete or lightweight concretes with slumps less than 4 inches.

Using a Fresno Incorrectly

A fresno is a steel trowel attached to a bull-float handle. Some finishers call it a walking trowel. It was originally developed for use on driveways where a hard-troweled finish wasn't needed but the owner wanted a smooth surface that was easy to keep clean. Putting a long

handle on the trowel allowed finishers to do their troweling without walking on the slab.

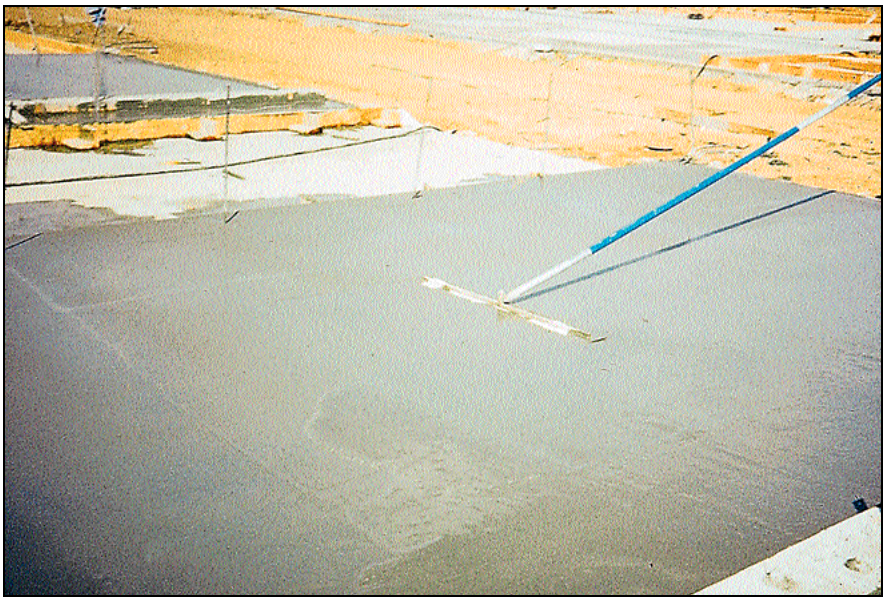
Because it looks like a bull float, some finishers use the fresno as they would a bull float—right after strikeoff. Doing this has harmful effects, since steel troweling seals the surface. When this is done before bleeding has stopped, bleedwater and air trapped beneath the sealed surface create blisters that later break or a weakened plane that causes sheet delamination (loss of large areas of the surface to depths usually less than ⅛ inch). In cold climates, prematurely sealing the surface can cause deicer scaling.

Other finishers start using the fresno soon after bull floating, while the concrete is still bleeding. This violates a basic rule of concrete finishing: *Don't finish concrete while there's bleedwater on the surface.* Wait until the concrete has stopped bleeding and any water sheen has disappeared. Using any finishing tool while there's water on the surface increases the water-cement ratio by working the water back into the concrete instead of allowing it to evaporate. Doing this can cause dusting, surface scaling, or craze cracking, even if it doesn't trap water and air beneath the surface.

Finally, remember that even if it's done at the right time—after bleedwater has disappeared—troweling with a fresno doesn't produce the same surface density and wear resistance that's achieved by multiple hand trowelings or by power trowels. When several hand trowelings are used, each successive troweling is done with smaller trowels and a progressively steeper angle to the concrete surface. This enables the finisher to apply more pressure as the concrete stiffens during finishing. The power-trowel operator also increases the angle of the trowel blades with each successive pass of the machine to exert greater pressure on the concrete surface. With a long-handled fresno, the finisher can't apply as much pressure and thus can't densify the surface as much.

Troweling with a fresno *is* useful as a final step after power troweling. This helps to remove the sometimes objectionable trowel pattern left by repeated power troweling.

BEST METHOD: Use a fresno only after bleeding has stopped, to produce a trowel finish for surfaces that don't need to be particularly hard and dense. For heavy-duty industrial floors, use it to remove trowel patterns after a dense, hard-troweled surface has been achieved with power trowels or conventional hand trowels.



Using a fresno while the concrete is still bleeding seals the surface. This stops further bleeding but traps bleedwater beneath the surface and can cause blistering, surface delamination, or deicer scaling. Wood floats, which work best on non-air-entrained concrete, keep surfaces open, so bleedwater isn't trapped beneath the surface.

Using the Wrong Float On Air-Entrained Concrete

Bull floats and hand floats are usually made of wood or magnesium, although aluminum is sometimes used. Wood floats work best for non-air-entrained concrete. They keep the surface open, reducing the possibility of blistering caused by trapping bleedwater and air beneath the surface.

Because air-entrained concrete is sticky and bleeds less, wood floats tear the surface. They can also tear the surface of lightweight concrete. Magnesium floats reduce tearing and keep the surface open.

However, proper finishing of air-entrained concrete is also related to the mix properties. When an air-entraining agent is added to concrete, water and sand content can be reduced without making the concrete less workable. If these mix adjustments aren't made, you'll be finishing a high-slump concrete that's much stickier than a properly proportioned concrete. Then even a magnesium float can seal the surface.

BEST METHOD: Instead of wood, use magnesium or aluminum floats on air-entrained and lightweight concretes. These floats slide over the surface more easily but still keep it open if the concrete slump doesn't exceed 3 to 4 inches.

Troweling Air-Entrained Concrete Too Soon

Many homeowners request a steel-trowel finish for driveways, sidewalks, or patios because the surface is neat, smooth, and easy to clean. However, the surface of a trowel-finished air-entrained concrete is more likely to scale, especially in cold climates where deicers are used. Often the scaling can be

Stop power floating if the float blades are throwing mortar. Wait until the surface has stiffened further before resuming power floating.

traced to poor timing of the troweling by inexperienced finishers.

Unless you're an experienced finisher, don't use a trowel on air-entrained concrete flatwork. Because air-entrained concrete is more cohesive than non-air-entrained concrete, solid particles settle more slowly and bleedwater doesn't come to the surface as fast. The concrete often looks like it's ready for floating and troweling before bleeding has stopped. When inexperienced finishers start troweling too soon, they seal the surface and increase the likelihood of blistering, sheet delamination, or deicer scaling.

BEST METHOD: Use floating as the final finish for air-entrained concrete whenever possible. If the owner requests a steel-trowel finish for air-entrained concrete, start troweling only after bleeding has stopped.

Using Jointers or Groovers With Short Bits

Jointers are used to cut contraction joints in fresh concrete. To effectively control random cracking, these joints must be deep enough to cause cracking at the joint location. The recommended depth of cut is usually one-fourth the slab thickness, but groover bit depths range from ⅜ inch to 1½ inches. When the bit doesn't cut deeply enough, cracks often form at locations other than the joint.

BEST METHOD: For contraction joints, use a groover with a bit deep enough to cut one-fourth the thickness of the slab. For decorative grooving, use a tool with a shallower bit, but also provide contraction joints to control random cracking.

Power Floating Too Soon

Timing of power floating depends on how fast the concrete is stiffening. When cold weather or admixtures delay setting, start floating as late as possible. Power float as soon as possible during hot weather or when the concrete is setting fast.

Concrete has to be a bit stiffer for power floating than it does for hand floating. Walk on the surface before starting to power float it. Your footprints should normally be about ⅛ inch deep. Behavior of the concrete while it's being floated is another good timing indicator. If the float blades are throwing mortar, floating is being done too soon.

Premature floating brings too much mortar to the surface, making it less wear resistant. Craze cracking is also more likely because shrinkage of the higher-cement-content mortar is restrained by the underlying concrete.

BEST METHOD: Use the footprint test to help you judge when to start power floating, and observe the surface while floating. Postpone power floating if the float blades are throwing mortar.

Ralph H. Spannenberg is a concrete construction consultant who also teaches seminars on concrete technology and concrete construction practices. He has been a highly rated speaker at World of Concrete seminars since their inception in 1975.

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