

CONCRETE BLISTERS

WHAT are Blisters?

Blisters are hollow, low-profile bumps on the concrete surface, typically from the size of a dime up to an inch, but occasionally even 2 or 3 inches in diameter. A dense troweled skin of mortar about $\frac{1}{8}$ in. thick covers an underlying void which moves around under the surface during troweling.

The void forms under a dense surface skin by one of two phenomenon. Some believe that incidental air voids rise in sticky concretes and are trapped under a dense surface skin produced by troweling. Others believe that bleed water rises and collects to form a void under this skin. That water is reabsorbed into the underlying concrete, leaving a layer of irregular void space under the surface which is then consolidated by troweling to form a round blister which moves during subsequent troweling. Frequently, the blister is lined with a faint layer of “washed” sand.

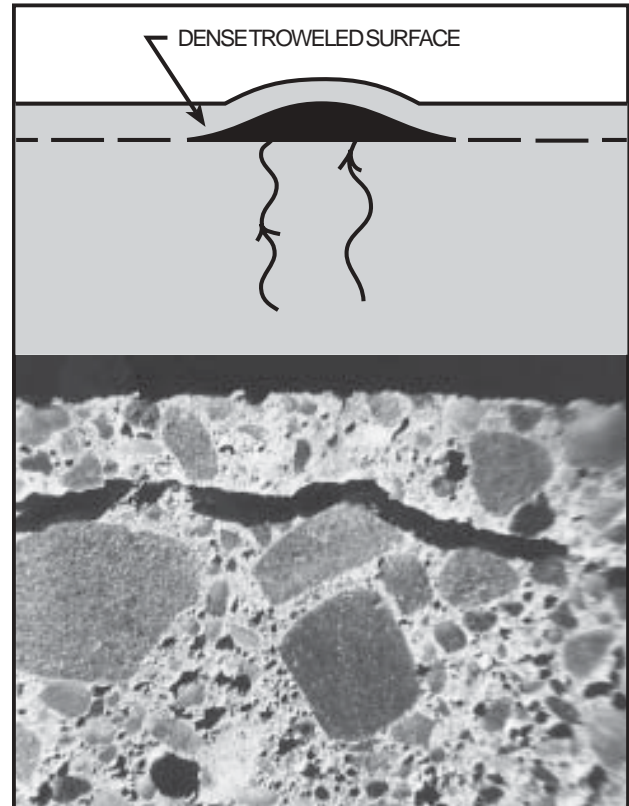
In poorly lighted areas, small blisters may be difficult to see during finishing and may not be detected until they break under traffic.

WHY Do Blisters Form?

Blisters form when the fresh concrete surface is sealed by troweling while the underlying concrete is plastic and bleeding, or able to release air. The small round blisters form fairly late in the finishing process, after floating and after the first troweling.

Moderately rapid evaporation of bleed water makes the surface ready to be troweled while the underlying concrete is still bleeding or still plastic and releasing air. Evaporation from the surface is increased by wind, low relative humidity or a warm concrete surface. If evaporation is too rapid, the slab will be affected to a depth of an inch or more and blisters will be prevented—but plastic shrinkage cracks may develop!

Entrained air is often involved since it reduces the rate of bleeding and supplies the fat necessary to produce the dense impermeable surface layer. A cool subgrade will delay set in the bottom and make the top set first.



Concrete Blister

Blisters are more likely to form if:

1. The subgrade is cool and the concrete in the bottom sets slowly.
2. Entrained air is used or is higher than normal so that the surface is ready to finish earlier.
3. A dry shake is used, particularly over air-entrained concrete.
4. The concrete is sticky from higher cement content or excessive fine sand. Lean mixes bleed rapidly for a shorter period, have higher total bleeding and tend to delay finishing.