EVENRANGE

==========Australia ==========

Concrete Treatment Solutions

CONCRETE BLISTERS

1. WHAT are Blisters?

Blisters are hollow, low-profile bumps on the concrete surface typically from the size of a $2 coin up to an inch, but occasionally even 2 or 3 inches in diameter. A dense troweled skin of mortar about 1/8 inch 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. Other believe that bleed water rises and collects for 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 lit areas, small blisters may be difficult to sec during finishing and may not be detected until they break under traffic.

2. 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 prevent – but plastic shrinkage cracks may develop!
Entrained air is often involved since it reduces that 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.

Blisters are more likely to form if:

- The subgrade is cool and the concrete in the bottom sets slowly.
- Entrained air is used or is higher than normal so that the surface is ready to finish earlier.
- A dry shake is used. particularly over air entrained concrete.
- 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.
- The slab is thick.
- The slab in on polythene and the slump is less than 3 or 4 inches.
- Excessive use of a jitterbug or a vibrating screed which works up a thick mortar layer on top

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3. How to Prevent Blisters

The finisher should be wary of a concrete surface that appears to be ready to trowel before it would normally be expected to be. Emphasis in finishing should be on placing, straightening and floating the concrete as rapidly as possible and without working up an excessive layer of fat. After these operations are completed, further finishing should be delayed as long as possible and the surface covered with polythene or otherwise protected from evaporation. In initial floating the float blades should be flat to avoid densifing the surface too early. Use of an accelerator or heated concrete often prevents blisters in cool weather.

If blisters are forming, try to either flatten the trowel blades or tear the surface with a wood float and delay finishing as long as possible. Any steps that can be taken to slow evaporation should help.

References.

1. "Guide for Concrete Floor and Slab Construction" ACI 302 1R-8C, Sections 2.4.1, 8.4 and 11.7 Concrete International. June 1980 pp. 51-96 and ACI Manual of Concrete Practice, Pan 2, 1983. American Concrete Institute.
2. "Carl O. Peterson "Concrete Surface Blistering – Causes and Cures" Concrete Construction Publications, September 1970
3. "Finishing" Concrete Construction, August 1976 p. 369
4. "J.C. Yeager. "Finishing Problems and Surface Defects in Flatwork. Concrete Construction, April 1979
5. Problems and Practices. ACI Journal. December 1955

Follow These Rules to Avoid Blisters

- Do not seal surface before air or bleed water from below have escaped.
- Avoid dry shakes on air-entrained concrete.
- Use heated or accelerated concrete to promote even setting throughout the depth of the slab.
- Do not place slabs directly on polythene sheeting.

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EVENRANGE liquid impermeable-membrane curing compounds are "apply and forget" systems that effectively, efficiently and economically replace labour intensive curing systems such as wet hessian, polythene or ponded water. These latter systems. whilst effective if utilised properly, require constant maintenance because they are very easily disrupted by atmospheric conditions such as winds or high temperatures.

EVENRANGE can supply the curing compound most suited to your needs whether it be water based, solvent based, bituminous and chlorinated rubber.

Your Manufacturer

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