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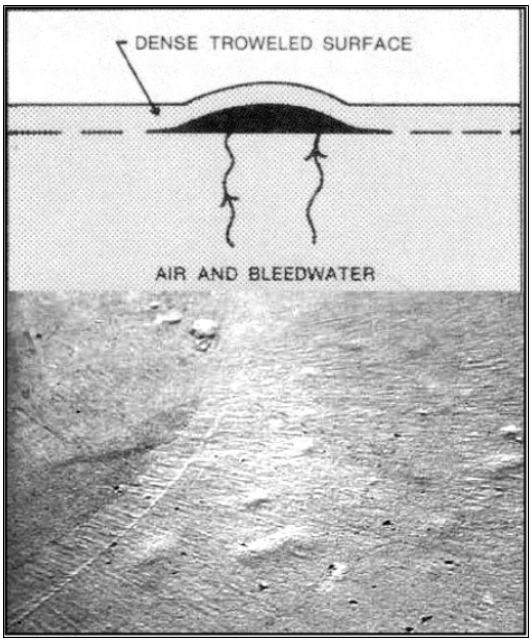
Concrete Blisters

1. WHAT are Blisters?

Blisters are hollow, low-profile bumps on the concrete surface typically from the size of a dime (10mm) up to the size of a quarter (25mm), but occasionally even 50 to 75mm in diameter. A dense troweled skin of mortar about 2mm 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 phenomena: air voids rise in sticky concretes and are trapped under a dense surface skin produced by troweling, or bleed water rises and collects to form a void under this skin. Bleed water is re-absorbed into the underlying concrete leaving a weak layer or irregular void space. 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.



Concrete Blister

2. WHY Do Blisters Form?

Blisters may form on the surfaces of fresh concrete when either bubbles of entrapped air or bleed water migrate through the concrete and become trapped under the surface which has been sealed prematurely during finishing operations. These defects are not easily repaired after concrete hardens.

Blisters are more likely to form if:

A) Insufficient or excessive vibration is employed. Insufficient vibration prevents entrapped air from being released. Excessive use of vibrating screeds or jitterbugs can work up a thick layer of mortar on the surface.

B) An improper tool is used for floating the surface or a correct tool is used improperly. The surface should be tested to determine which tool, whether it be wood or magnesium bull float, does not seal the surface. The floating tool should be kept as flat as possible.

C) Excessive evaporation of bleed water occurs and the concrete appears ready for final finishing operations (premature finishing) while underlying concrete is still releasing bleed water and entrapped air. This is of particular risk when concrete is air entrained as this will reduce the rate of bleeding of both air and water.

D) The concrete is sticky from higher cement content or excessive fine sand. These mixes tend to bleed less and at a slower rate. Lean mixes bleed rapidly for a shorter period, have higher total bleeding, and tend to delay finishing.

E) The subgrade is cooler than the concrete. The top surface sets faster than the concrete in the bottom and the surface appears ready for further finishing.

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10. CIP #13 – Concrete Blisters, NRMCA CIP Series, with permission, www.nrmca.org

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F) The slab is thick and the bleed water and entrapped air take longer to reach the concrete surface.
G) The slab is placed directly on top of a vapour retarder and no mix design provisions are made to reduce bleed water content and rate potential.

3. HOW To Prevent Blisters

The finisher should be wary of a concrete surface that appears to be ready for final finishing before it would normally be expected. Emphasis in finishing should be on placing, strike-off and bull floating the concrete as rapidly as possible and without working up a layer of mortar ("fat") on the surface. After these operations are completed, further finishing should be delayed as long as possible and the surface covered with polyethylene or otherwise protected from evaporation. In initial floating the float blades should be flat to avoid densifying 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.

Follow These Rules to Avoid Blisters

1) Do not seal surface before air or bleed from below have escaped.
2) Avoid dry shakes on air-entrained concrete.
3) Use heated or accelerated concrete to promote even setting throughout the depth of the slab.
4) Do not place concrete slabs directly on polyethylene vapour retarders without specifically adjusting the mix designs to reduce bleed water potential.

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