DELAMINATION OF TROWELED CONCRETE SURFACES

WHAT are Delaminations?

In a delaminated surface, the top $^1/_8$" is densified and separated from the base slab by a thin layer of air or water. The delaminations on the surface of a slab may range in size from several square inches to many square feet and can be detected by a hollow sound when tapped with a hammer or with a heavy chain drag. They may exhibit cracking and color differences because of rapid drying of the thin surface during curing. Traffic or freezing may break away the surface in large sheets. They are similar to blisters, but much larger (see CIP 13).

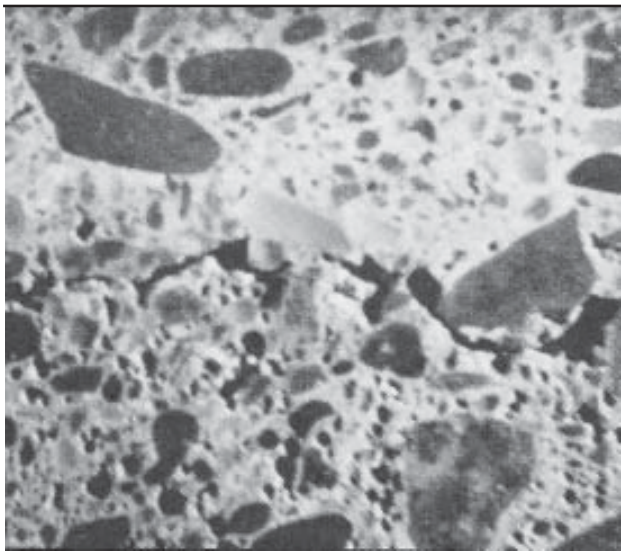
Delaminations form during final troweling. They are most frequent in early spring and late fall when concrete is placed on a cool subgrade with rising daytime temperatures, but they can occur anytime.

WHY Does Delamination Occur?

Delamination occurs when the fresh concrete surface is sealed by troweling while the underlying concrete is plastic and bleeding or able to release air. Delaminations form fairly late in the finishing process after floating and after the first troweling. Rapid evaporation of bleed water due to surface drying (wind, sun, or low humidity) makes the surface appear ready to trowel while the underlying concrete is plastic and can still bleed or release air. Vapor barriers under slabs force water to rise and compound the problem. The use of fly ash and chemical retarders will delay initial set of the underlying concrete and allow bleed water and air to move upward after the surface is sealed.

Entrained air reduces bleeding and promotes early finishing which will produce a dense impermeable surface layer. A cool subgrade delays set in the bottom relative to the top. Air and water collect under the dense surface layer during finishing.

AIR AND BLEED WATER



Delaminated Concrete

Delamination is more likely to form if:

1. The underlying concrete sets slowly because of a cool subgrade.
2. Set is retarded by retarders and/or fly ash.
3. Entrained air is used (or is higher than normal).
4. Use of a jitterbug or vibrating screed brings too much mortar to the surface.
5. A dry shake is used, particularly with air-entrained concrete.
6. The concrete is sticky from higher cementitious material or sand content.
7. The slab is thick.
8. The slab is placed directly on a vapor barrier.