

What is a Delamination?

Delamination occurs when the top portion of a slab becomes densified and separates from the underlying concrete, often trapped by a thin layer of air or water. These defects can range from a few square centimeters to several square meters and are typically detected by a hollow sound when tapped with a hammer or dragged with a heavy chain. They may show surface cracking or color differences caused by rapid drying during curing, and traffic or freezing can cause large sections to break away.

Delaminations are most often formed during final troweling, especially in early spring or late fall when concrete is placed on a cool subgrade and daytime temperatures are rising, but they can occur at any time. Proper curing, timing of finishing, and attention to surface moisture can help minimize their formation.



Example of Delaminated Concrete

Why Does Delamination Occur?

Delamination occurs when the fresh concrete surface is sealed by troweling, while the underlying concrete remains plastic and still capable of bleeding or releasing air. These defects typically form late in the finishing process, after floating and the initial troweling. Rapid evaporation of bleed water, caused by wind, sun, or low humidity, can make the surface appear ready to trowel, while the concrete beneath is still plastic. Vapour barriers

under slabs can exacerbate the problem by forcing water upward.

The use of fly ash or chemical retarders can delay the initial set of the underlying concrete, allowing bleed water and entrapped air to escape before the surface is sealed. Entrained air reduces bleeding and supports early finishing, helping to produce a dense, impermeable surface layer. Placement over a cool subgrade can delay the bottom layer's set relative to the top, causing air and water to accumulate beneath the dense surface during finishing.

Factors Increasing the Risk of Delamination

Delamination is more likely to occur when:

- The underlying concrete sets slowly due to a cool subgrade.
- Set is delayed by chemical retarders or the use of fly ash.
- Entrained air is present, especially at higher than normal levels.
- A vibrating screed brings excessive mortar to the surface.
- A dry shake surface hardener is applied, particularly with air-entrained concrete.
- The concrete is sticky due to high cementitious content or high sand content.
- The slab is thick.
- The concrete is placed directly on a vapor barrier.

How to Prevent Delamination?

Be cautious when the concrete surface appears ready to trowel earlier than expected. Focus on screeding, straight edging, and floating the concrete as quickly as possible without working up an excessive layer of mortar.

Further finishing should be delayed as long as possible, and the surface should be covered with polyethylene or otherwise protected from evaporation. During initial floating, keep the float blades flat to avoid densifying the

surface too early. In cool weather, accelerators or heated concrete can help prevent delamination.

Delamination can be difficult to detect during finishing. If it is observed, try flattening the trowel blades or lightly tearing the surface with a wood float, and delay further finishing. Any measures that reduce evaporation will help minimize risk.

When a vapor barrier is required, place a layer of damp fine aggregate over the plastic sheet, and avoid placing concrete directly on the barrier. Avoid using air-entrained concrete in floor slabs that will be hard-troweled or not exposed to deicing salts.

Three Rules to Consider:

1. Do not seal the surface too early. Delay final troweling until bleeding has stopped and the underlying concrete has begun to set.
2. Control evaporation during finishing. Protect the surface from wind, sun and low humidity to prevent rapid drying that makes the surface appear ready too soon.
3. Manage subgrade and mix effects. Be cautious with retarders, fly ash and air entrainment that can delay set of the concrete below the surface.

References

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