



Delamination

This Flooring Technical Note considers the cause of delamination on internal power trowelled floor slabs. It also covers the detection and repair of delamination.

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Introduction

This Flooring Technical Note relates to delamination issues on internal power trowelled floor slabs. Delamination is the separation of the mortar layer from the main body of the concrete surface. The thickness of this detached surface layer is about 2mm to 5mm. This phenomenon is sometimes difficult to detect at the finishing stages and usually become apparent when the surface has been fully finished and dried and the delamination exhibits fine localised surface cracks, surface blisters or crushes under vehicular traffic.

Commentary

1. Cause

Delamination is caused by the entrapment of air or water below the mortar surface that is prematurely closed with the densification (crusting) process of power towelling. It is necessary to wait for a period of time after placing the concrete before the start of the finishing process to allow water and air to migrate to the surface. This waiting period is the variable that can cause even the most experienced flooring contractor to be caught out and the reason is because this time period could be influenced by a number of factors:

1. **The ambient environmental conditions** - Direct sunlight or wind dries out the surface too quickly and tricks the finisher into believing the concrete has finished bleeding
2. **Concrete mix design** - High fines content can delay the migration of water. The faster the mix can bleed the less likely the concrete will delaminate. It is advised that the concrete supplier is informed if a dry shake topping will be applied
3. **Admixtures** - Admixtures can slow down the bleed rate and make concrete sticky which can trick finishers into believing the bleed has finished
4. **Vibration of the concrete** - This should be sufficient and uniform
5. **Consistence class of the concrete** - slump between loads should be consistent to prevent differential set rates between loads
6. **Concrete supply rate** - Should be consistent
7. **Training and experience** - Not using an experienced finisher and lifting the blade angle too early will densify the surface too quickly
8. **Equipment use** - Leaving power trowels sat on the surface for prolonged periods between finishing stages will affect the surface locally and should be avoided where possible.

Air Content or entrained air can also contribute to delamination. Air contents over 2.5% should be avoided.

Delamination

Applying dry shake toppings can increase the risk of delamination. Successful use of dry shakes depends on good site practice, timing of application and type of material applied. Greater attention to all the causes of delamination are required when using a dry shake topping, and it is advised that the concrete supplier is informed if a dry shake topping will be applied.

2. Detecting delamination

Delamination is not always visible at the surface. Where the surface has detached and come away it is visibly obvious but this should give reason to carry out a further investigation to determine whether there are other areas that have yet to reveal themselves.

Blisters on the surface are visibly obvious and a tap test should indicate whether there is delamination. A delamination survey can be conducted using the dragging chain method or tapping with a steel rod. A hollow sound indicates delaminated areas; a ringing sound indicates there is no issue. Other methods of detecting delamination include ground penetration radar and infrared thermography.

3. Repairing delamination

The most common methods of repairing delamination are patching, surface preparation and overlaying a new surface or injection with low viscosity resin. The choice of repair method will depend on the size of the affected areas and the acceptance of the resultant aesthetic impact. Aside from potential aesthetic or warranty issues, repair methods can be effective.

Summary

Delamination is a characteristic of concrete floor slabs that may occur if the surface of the concrete floor is closed prematurely during power trowel operations. It can occur on any power trowelled concrete floor slab irrespective of dry shake use.

Consideration of the factors expressed in this document will help to minimise the risk of delamination occurring.

Further Reading

ACIFC, ACIFC Flooring Technical Note 07 – Performance Concrete and Consistency, 2014

The Concrete Society, Concrete Industrial Ground Floors; A Guide to Design and Construction, Technical Report 34 (4th Edition 2013)

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