

SCALING OF CONCRETE SURFACES

Introduction

Concrete is a mixture of natural sand and stone that is glued together with portland cement, supplementary cementitious materials, water, and admixtures. You can expect some variations in surface and performance because concrete is mostly made of natural materials. Concrete can provide long-term durability and value when you use quality materials, and place, cure and maintain it properly.

This document addresses a specific concrete issue and provides guidance on how to prevent it.

What is Scaling?

Scaling is a cosmetic surface defect characterized by flaking or peeling of the finished concrete surface. It is often associated with concrete slabs exposed to freezing and thawing.

Why does concrete scale?

There are multiple potential causes of scaling some of which are listed below:

- Inadequate curing, which causes the surface of concrete to dry and hydration reactions to stop. This dry thin surface layer will scale off when exposed to freezing and thawing or deicing salts.
- Finishing concrete while water or bleed water is still on the surface. The finished surface will have a higher water cement ratio.
- Exposing concrete to weather without a period of drying. If the concrete freezes while the concrete humidity is high, it may scale even if everything is done correctly.
- Improper or excessive use of deicers.
- Using concrete that is not suitable for exterior applications.

How to minimize scaling?

- Refer to ARM Exterior Concrete Guidelines Brochure.
- Use air entrained concrete with adequate strength and w/cm ratio: For severe exposure (F3) use 7% ($\pm 1.5\%$ Field Tolerance) air entrained, minimum 4500psi strength and maximum 0.45 w/cm ratio concrete as recommended by ACI 201.2R-16(for $\frac{3}{4}$ " aggregates).
- Properly cure and protect your concrete until it achieves its design strength, and allow some time for the concrete to dry out before exposing it to freezing and thawing.
- Avoid placement techniques that will result in a weak layer on surface.
- Do not perform finishing operations when bleed water or water is still on the surface of concrete.
- ACI 302.1 R states: "The use of any deicing chemicals is not recommended in the first year of service." Sand or other grit materials may be used for traction.

- After the first year, minimize the use of deicers since they increase the frequency and severity of freezing and thawing on concrete. Some deicers contain materials shown to rapidly disintegrate concrete such as ammonium sulfate, ammonium nitrate, and magnesium chloride. (ACI 302.1) These materials should not be used as deicers on concrete.
- Ensure proper drainage and do not let water or salt stand on the surface for extended periods of time. Even salt carried on cars can damage recently placed concrete.
- Protect your concrete with a sealer.

If you are concerned about scaling, please contact your contractor and concrete producer for the most suitable materials and methods for your application.

For more information, call your local concrete contractor, ready mix producer or www.chooseconcrete.com.

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