HAHN READY MIX

Best Practices - How to Avoid Scaling Concrete Surfaces

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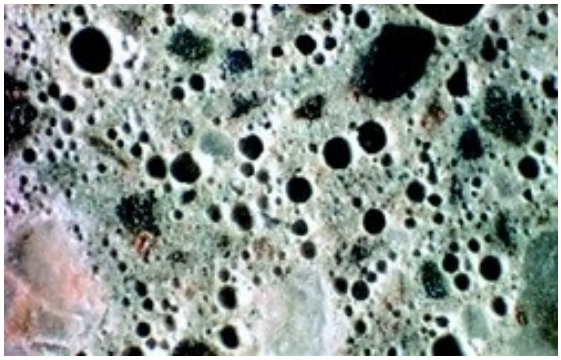
In the construction industry, we've all seen it. Spring rolls around and some of the concrete poured the previous year starts to have it's top surface peel away or disintegrate. This surface issue is known as “scaling”. Scaling is the flaking or peeling of a hardened concrete surface as a result of the expansive nature of water when it freezes (just like frozen pipes). This freeze/thaw action can damage the very top surface of a concrete slab (typically less than 3/8”). This phenomenon is unfortunately very common in areas with severe freeze/thaw cycles, and is not easily fixed. Below are the best practices in regards to Mix Design, Finishing Operations, and Homeowner Tips to help prevent scaling. While these guidelines will help decrease the likelihood of scaling and reduce the severity of scaling if it does occur, there is no way to fully guarantee that concrete will not scale in areas with severe freeze/thaw cycles.

MIX DESIGN

- Use Air Entrained Concrete – All concrete poured for exterior flatwork in the mid-west MUST have air entrainment to serve as pressure relief voids for freezing moisture present in concrete. Air content should target 5-7% with typical aggregates.

- Use Supplementary Cementitious Materials (SCMs) – SCMs like Fly Ash and Slag help provide decreased permeability. This helps prevent excess moisture, salts, or other undesirable outside materials from penetrating the concrete. In particular, SCMs help prevent joint deterioration.

- Target .45 Water/Cement Ratio – ACI recommends a maximum water/cement ratio of .45 for the type of exposures experienced in this market. A .45 would typically be associated more with a 4500psi mix, but can also be achieved with mid-range water reducers, superplasticizers, or pouring at a 4” or lower slump for many mix designs.



FINISHING PRACTICES

- Order the Correct Slump. Concrete can tolerate some additional water, but generally, more additional jobsite water means more problems. Consider mid-range or high range water reducers for higher slump.

- Avoid Over-Finishing – Over-finishing the surface can reduce the air content and work water up into the surface. This can result in a higher water/cement ratio in the surface layer of the concrete, where the greatest durability is required. A Jitterbug or vibrating screed should not be used with high slump concrete, as it tends to knock the air out of the surface.

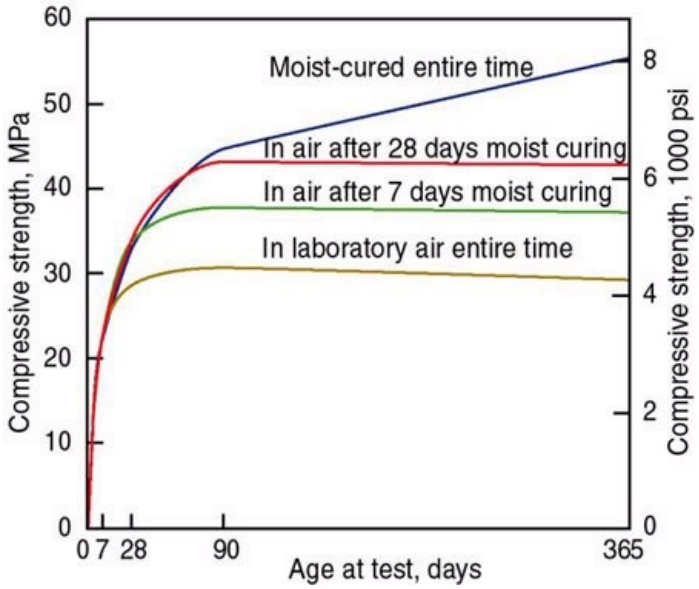
- Avoid Finishing Operations With Water Present On The Surface – Finishing bleed water into the surface will substantially increase the water/cement ratio of the surface layer, crippling the freeze/thaw resistance of the top of the concrete. Similarly, avoid “blessing” the slab or any other addition of water to the surface of poured plastic concrete.

- Avoid Pouring During Extreme Weather Conditions – Pouring on windy days can make surface finishing difficult, often resulting in addition of water to the surface of the concrete. Pouring exterior flatwork when the concrete will be exposed to freezing temperatures in the near future is not optimal. If it is unavoidable, be sure to protect the concrete from freezing utilizing blankets for at least a week to allow the concrete to gain the necessary strength to resist freeze/thaw cycles at an early age.

- Properly Cure the Concrete – This often-skipped step may be one of the most important thing we can do to prevent scaling. A wet cure is best, but a spray-on curing compound applied after brooming can increase the surface strength of a slab 33% relative to an un-cured surface. (see chart below) Considering the surface of the concrete is the part that is most under stresses from freeze-thaw and wear, it's important that we make this surface layer as strong as possible. Allow 30 days after applying a curing compound before applying a sealer. Curing compounds should not be used when concrete may be subject to freezing in the 30 day window.

- Seal the Concrete – A penetrating, breathable silane or siloxane sealer will help prevent salts or other corrosive materials from penetrating the concrete. Late summer is the best time to apply a sealer. Note- A Cure & Seal product is likely doing a terrible job at both. If it is unfeasible to both cure and seal the concrete separately, you are better off doing one of them right. We would normally recommend curing as more valuable than sealing if one must make a choice.

- Consider the Season – Exterior concrete poured in late fall will have less time to gain strength before enduring a winter season. Ideally, concrete would have 30 days to cure and then 30 days to “dry out” before being subjected to freeze/thaw action.



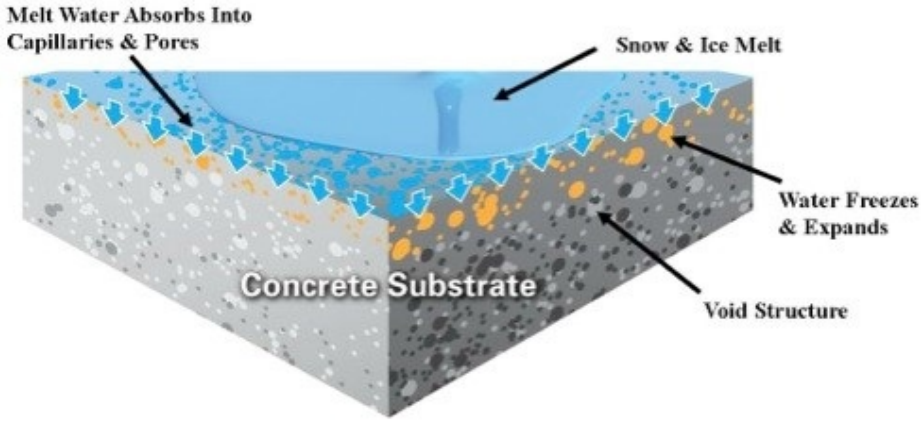
HOMEOWNER TIPS

- Do Not Apply Salts to the Concrete in the First Year – Concrete is particularly susceptible to corrosive salts in the first year of its life. Corrosive salts will eat at the surface of concrete and promote saturation of the concrete structure with water, amplifying the effects of freezing and thawing. Use clean sand for traction in lieu of salt. If salts must be used for safety reasons, or are desired to be used after the first year, use them sparingly, and we would recommend Rock Salt. As soon as is feasible, wash the salts off the surface of the concrete. Magnesium chlorides and fertilizer based de-icers such as urea or ammonium nitrate are particularly corrosive to concrete and remain in solution longer than rock salt. This makes them very effective deicers but especially damaging to concrete. Check for these harmful ingredients in store bought de-icers as many claim they are “Safe for Concrete!” in big letters on the front, but then stipulate where freeze-thaw cycles are not present or some other nonsense in the fine print on the back.

- Be Aware of Street Salts – Many damaging salts can be tracked up into a driveway from your vehicle. Municipalities are more commonly utilizing magnesium chloride dissolved into a solution on streets. This highly corrosive salt can ride with your vehicles and drip onto your pavements. This often results in scaling in local areas where vehicles park or commonly drive. When temperatures allow, wash off these higher risk areas. The signature sign of this phenomenon is four areas of scaling right where the wheels sit of a vehicle that parks outside.

- Keep the Concrete Free of Ice and Snow – Do your best to keep your concrete plowed or shoveled. Ice and snow that sit on a slab all winter provide a constant water source to saturate the slab, increasing the likelihood of scaling.

- Consider Reapplying a Sealer – Depending on the sealer your slab has, consider resealing 2-5 years after your concrete is poured, as some sealers will break down over time. A silane sealer should last about 5 years, where a siloxane may only last two years.



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