

Protecting Concrete From Damage Due to Deicers

Every spring, after the winter snow and ice have disappeared from the surface of concrete driveways, sidewalks and other exterior flatwork; homeowners are uncovering what first appear to be surface defects that were not apparent in the fall or when the concrete was first placed. The concrete now has a number of blemishes, pock marks, or areas where the surface of the concrete flaked off. This condition, known as scaling, can be initiated and exacerbated by the use of deicers.

HOW CAN THIS SITUATION BE AVOIDED?

First, be sure that the concrete has been properly specified. Concrete that will be subject to winter conditions should be at least 4000 psi, have a maximum water/cementitious ratio of .45, and contain 5%-7% air entrainment. It must also have been placed, finished and cured properly. You should then avoid the use of deicing agents during the critical first year after placement and use the **proper** deicers in moderation in the years that follow. The appropriate sealers can provide additional protection.

Under no circumstances should a deicer be used on concrete that has not reached sufficient strength to provide resistance to damage from freezing and thawing. Recent research has shown this value to be at least 4000 psi. While deicers are efficient in melting snow, they can play particular havoc with freshly placed concrete. Deicers should not be used on concrete less than one year old. Typical deicers used on concrete may contain any of the following chemicals:

- Sodium chloride
- Calcium Chloride
- Magnesium Chloride
- Potassium Chloride
- Calcium Magnesium Acetate, Urea, Ammonium Sulfate, Nitrogen Salts

Many deicers have the label “**safe**” in large letters on the front of the bag, however the fine print on the back of the bag lists many conditions on its use. Be sure to check the labeling to know what chemicals are in your deicer.

Sodium chloride or calcium chloride based deicers are generally considered acceptable for use on good quality dense concrete. However, deicers containing magnesium chloride, potassium chloride, calcium magnesium acetate, urea, ammonium sulfate, and nitrogen salts have been shown to cause much higher rates of deterioration. **Never** use deicers with ammonium sulfate or ammonium nitrate as these chemicals are too aggressive and will easily destroy a concrete surface.

Concrete sealers can provide increased protection for your exterior concrete. Silane or siloxane based penetrating sealers provide the highest level of resistance to the damaging effects of deicers, and freezing and thawing. Water repellant sealers, specifically designed for use on concrete will also provide added protection.



References

Design & Control of Concrete Materials, Portland Cement Association, Skokie, IL 16th. Edition, 2016
Scale Resistant Concrete Pavements, IS-117.02P, Portland Cement Association, Skokie, IL
Verbeck, G, and Klieger, P, Jan. 1956, *Studies of — Salt Scaling of Concrete*, Portland Cement Association, Skokie, IL Bulletin 83
Guide To Durable Concrete, ACI-201-2R, American Concrete Institute, Farmington Hills, MI
Concrete International, Volume 16, Issue 8, *Deicer Salt Scaling Resistance*, Colin D. Johnson, 1994
Concrete In Practice – Bulletin #2, 2007, National Ready Mixed Concrete Association, Silver Springs, MD.
Concrete Deterioration by Deicing Salts, Cody, R.D., Iowa State University, May 1996
Mechanisms for Salt Scaling, John Valenza II-George W. Scherer, 2006, Princeton Institute for Science & Technology, Dept. of Civil & Environmental Engineering, Princeton, NJ,
Environmental Stewardship Practices, Procedures and Policies, 2004, Chapter 7, American Association of State Highway Officials
Concrete in Practice, CIP2, Scaling Concrete Surfaces, National Ready Mixed Concrete Association, 2014

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