

Surface deterioration caused by chemical de-icers is not a concrete quality problem, but rather a concrete maintenance issue. Proper use and maintenance of finished concrete products are the end-user's responsibility.

De-icers

Achieving a quality, long-lasting concrete product is dependant on using good materials, proper construction techniques and protection from adverse conditions. Exterior concrete such as pavements, garage slabs, driveways, aprons, sidewalks and gutters are especially susceptible to adverse environmental conditions when de-icing chemicals are used improperly. The use of de-icing salts containing chlorides may cause spalling and degradation of concrete surfaces. This is especially true with new concrete surfaces and has resulted in a considerable amount of damage to quality concrete within the first winter season.

Once properly placed and cured, the following instructions can minimize spalling and surface degradation caused by the use of de-icing chemicals:

1. Do not use de-icing chemicals containing chloride compounds. This includes, but is not limited to, calcium chloride, magnesium chloride, sodium chloride (salt) and potassium chloride. Never use any deicer that contains either ammonium sulfate or ammonium nitrate.
2. Remove snow and ice manually as it accumulates by shoveling, plowing or other mechanical means.
3. Wash driveways and other concrete surfaces, whenever the weather allows, to remove salts that drip off of vehicles. Many governmental agencies are using chlorides on roads and bridges for de-icing.
4. Be aware that many chemical fertilizer products can be harmful to concrete surfaces.

If you are not the owner of the newly installed concrete, forward this pamphlet to the owner and advise them of the precautions necessary to maintain the quality product you installed for them.

Maintenance

- **DO NOT** use de-icing chemicals containing chloride compounds, including calcium chloride, magnesium chloride, sodium chloride and potassium chloride. Never use de-icing chemicals that contain either ammonium sulfate or ammonium nitrate. Use sand on ice for safety.
- Keep concrete free of ice and snow.
- Ammonium nitrate is found in many fertilizers and these fertilizers should not be allowed to remain on concrete surfaces.
- Avoid using acids to clean concrete.
- Membrane sealers need to be reapplied at least every other year or when the finish shows signs of wear.
- Siloxane or silane water repellents should be reapplied every two or three years.

Disclaimer – This piece is not a complete analysis of every material fact regarding exterior residential concrete flatwork. This information is provided for use by personnel who are competent to evaluate the significance and limitations of the information provided and who will accept total responsibility for the application of this information. The information has been obtained from reliable sources, but Knife River cannot guarantee that it is accurate or complete.



North Dakota Division
Bismarck, Beulah, Dickinson, Tioga,
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Best Practices

**For Installing
Exterior Concrete**



**7 Locations Serving
North Dakota**

Best Practice – Concrete Finishing and Installing Guide

Product Design

- 4500 PSI
- 5½-inch Slump
- .45 Water/Cement Ratio
- Air Entrained (6% ± 1%)
- Water Reducer
- Durable Rock

Placing Concrete

- Place concrete within 1½ hours of batching.
- Place the concrete at or less than a 5½-inch slump.
- Once the load is adjusted to the specified slump as shown on the ticket, water should not be added.
- Water reducer can be added on the job if requested to increase the slump above the ticketed slump.

Consolidating and Finishing Concrete

- Screed or strike off.
- Level concrete by using a bull float to embed large aggregate and smooth the surface prior to the presence of any bleed water.
- Grooving and edging should be performed immediately after bull-floating before bleed water is present on the surface.
- Do not use steel trowels, steel groovers or steel edgers on air-entrained concrete.
- Bleed water must disappear before any further finishing operations. Finishing bleed water back into the concrete may result in durability problems (delamination and scaling).
- If evaporation rates are high, use an evaporation retarder (TK-2120 Tri-Film) between finishing operations to prevent plastic shrinkage cracks. **Do not work these products back into the surface.**
- A medium- to fine-transverse broom texture will provide a uniform nonslip surface.
- Never sprinkle water or cement on concrete flatwork while finishing.

Placing and Curing Concrete

Summer

- Hot weather accelerates setting times, requiring more rapid finishing.
- During sunny, windy, low-humidity weather conditions, the concrete surface can lose moisture rapidly and crack prior to hardening (plastic shrinkage cracks).
- When weather conditions cause plastic shrinkage cracking, the surface must be kept moist by a fog sprayer or the application of a mono-molecular film (TK-2120 Tri-Film) to retard the moisture evaporation until curing is applied.
- The water or film is not to be worked back into the surface, but rests there until it evaporates.
- Use of synthetic fibers can reduce the formation of plastic shrinkage cracks.

Cold Weather

- In cold weather, the concrete surface temperature needs to be maintained at 50°F to 100°F for seven days (blankets).
- To prevent thermo cracking after curing, the temperature of concrete shall be reduced at a rate not to exceed 20° F in 24 hours.
- In the fall (Oct. 1) blankets or plastic need to be used in place of curing compound. Curing compounds may trap excess water in the slab after the initial cure time and prevent the appropriate drying time.
- To prevent scaling, concrete needs 30 days of air drying after the curing period before subjecting the new slab to de-icing salts and freeze-thaw cycling.
- Some of the new studies recommend that a siloxane or silane sealer be applied before subjecting the slab to de-icing salts.

Curing Concrete

- The curing process should start within 15 minutes of the final finishing operation.
- Curing can be accomplished by several methods
 - Flood the slab with water.

- Use burlene (plastic-backed burlap).
 - Use waterproof paper.
 - Use white plastic.
 - Use a curing compound (white pigment reflects heat and aids in seeing adequate coverage).
 - Use a dissipating cure where a siloxane or silane sealer will be applied after 30 days.
 - Inform the owner of the value of proper curing.
 - Do not allow vehicles on the slab for seven days.
 - Do not apply, de-icers. Use sand.
- Curing should continue for a minimum of seven days.

Drying Concrete Slab

- To prevent scaling, concrete needs 30 days of air drying after the curing period before subjecting the new slab to de-icing chemicals and freeze-thaw cycling.
- Aug. 1 is a guideline to the latest date for pouring exterior concrete with the best chance of completing the curing, drying and sealing before the first freeze.
- New studies are recommending that a siloxane or silane sealer be applied before subjecting the slab to de-icing chemicals.

Protect Concrete – Sealing

- It is important to prevent newly placed concrete from being saturated with water prior to freeze and thaw cycles during the winter months.
- Apply a siloxane- or silane-based breathable sealer.
- An alternate treatment is a 50/50 mixture of mineral spirits and boiled linseed oil.
- Concrete should be reasonably dry prior to the application of the sealer.
- Follow the manufacturer's recommendations for application procedures and frequency.
- Concrete that cannot be sealed should be protected from de-icing chemicals until a sealer can be applied.