

Proper curing is the most important steps in concrete construction regarding surface durability.

Curing

- Proper curing is a must and is one of the most important steps in concrete construction and regrettably, one of the most neglected.
- Effective curing (curing compound, wet burlap, plastic, etc) is absolutely essential for surface durability. Fresh concrete must be kept warm and continually moist to ensure appropriate hydration of the cement, typically 7 days or until design strength is achieved. Without proper curing, the concrete may not reach the required strength at the surface needed to resist freeze thaw cycles.
- Curing compound should meet or exceed ASTM C 309, and should be applied at a rate prescribed by manufacturer's recommendations and as soon as possible without marring the concrete. To prevent discoloration, the curing compound product must be applied uniformly.

Maintenance

- It is highly recommended to have your concrete driveway protected before the first winter to ensure maximum protection from salts and de-icing chemicals. A penetrating "breathable" waterproofing is recommended. Check with your local manufacturers for application rate and frequency.

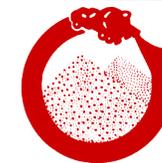
INDUSTRY STANDARDS FOR RESIDENTIAL EXTERIOR FLATWORK

A CONTRACTOR'S GUIDE FOR QUALITY & DURABLE RESIDENTIAL FLATWORK



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- Nebraska Concrete & Aggregates Association
- Nebraska Concrete Paving Association
- American Concrete Institute—Nebraska Chapter



NEBRASKA CONCRETE AND AGGREGATES ASSOCIATION

INDUSTRY GUIDELINES

Design

Base - A firm, sound sub-grade is adequate as a base as long as it is uniform and properly compacted.

Thickness - A minimum of 4 inches is adequate for car traffic. More than 4 inches should be considered based on loading.

Reinforcement - If compaction and joint spacing are constructed correctly, wire mesh is not necessary in residential slabs-on-grade. If reinforcement is used, work to ensure that the reinforcing steel and /or wire mesh end up at the proper depth in the slab. Fibers may be used as alternative reinforcement to reduce plastic shrinkage cracking.

Concrete Mix - The American Concrete Institute (ACI) recommends a **minimum compressive strength of 4500 psi air entrained concrete mix with a maximum water cement ratio of 0.45** for exterior concrete subject to freezing in a moist condition subject to deicers. (Check with your local ready mix supplier on local requirements and proposed mixes).

Drainage - The surface of the finished slab should slope a minimum of 1/8th inch per foot. A slope of 1/4 inch per foot is preferred.

Preparation

Compaction - Sub-grade must be compacted uniformly and to grade so slab won't settle and won't vary in thickness.

Forms - Stake securely. Scrape base away from forms so edges will be at least full thickness.

Isolation Joints - Install pre-molded joint material wherever flatwork come into contact with non-movable structures (i.e. walls, buildings, steps, etc).

Moistening - Dampen the sub-grade prior to concrete placement. Do not make the sub-grade so wet that it is muddy.

Placement

- Concrete should never be placed on frozen sub-grade. Minimize the use of jobsite added water whenever possible. Adding water dilutes the mixture to less than its desired strength and compromises the durability. Instead water reducing admixtures or plasticizers should be used to increase workability.
- The concrete should be placed within 90 minutes from the time the truck was loaded. In hot weather, the purchaser should shorten the time limit to 60 minutes to maintain durable concrete. Prolonged mixing time or waiting time on the job can result in a loss of air content and or slump.
- Place the concrete by pumping or direct discharge from the mixer truck to its final position. Do not dump the concrete in piles or use excessive dragging or raking. Avoid segregation of the material by minimizing handling.
- Screed twice to level the surface, and immediately bull float high and low spots. Then wait for the bleed water to dissipate before resuming the finishing process.



Finishing

- It is recommended that the concrete be screeded, bullfoated, and broomed. All finishing must be performed in accordance to ACI 332.
- **Never** use steel finishing tools on exterior concrete. This process breaks down the air-void system at the surface which is essential to long term durability.
- Finishing should not be performed with excess moisture or bleed water on the surface. Working



the bleed water back into the concrete will significantly weaken the surface of the slab and is the most common cause of delamination. Do not add water or cement to the concrete surface. **A broom finish is most often used in the industry**, particularly on driveways, walks, etc. Where a smooth finish is desired (garage floors, patios, etc), a hand float finish should be used. Machine floating and/or troweling is not recommended.

- When conditions create high water loss from slab evaporation, an evaporation retarder shall be used. Evaporation retarders are not finishing aids. **Do not work evaporation retarders into the surface.**
- Sawed Joints should be cut as soon as possible without raveling (the next day may be too late). Control joints may be hand tooled or sawed. In either method, they must be cut to a depth of at least 1/4 the thickness of the slab and spaced so that the dimension in either direction does not exceed that shown in the following table:

<u>Thickness of Slab</u>	<u>Maximum Joint Spacing</u>
4 inches	8 feet
5 inches or more	10 feet

CAUTION:

Do not overwork or over finish the surface of any exposed concrete slab. Not only is it time consuming and expensive, it also tends to bring too much fine material to the surface and weaken it. Swirl Finishes are not recommended. Never use a steel trowel on concrete exposed to weather. These practices could result in spalling or scaling.



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