

ARM of Minnesota

**Exterior Concrete
Recommendations
for Commercial
Construction**

ARM of Minnesota

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ARM Exterior Concrete Recommendations for Commercial Construction

Concrete

- Minimum strength 4500 psi at 28 days
- Water to Cementitious Ratio 0.45 Maximum

Aggregate for Use in Concrete

Aggregate should conform to ASTM C33 Class 5S minimum or, better, MN/DOT 3137 aggregate specification. It is noted that even with these specifications, aggregate popouts can occur in the 20-30/yd² and 15-20/yd² range, respectively, for **all glacial gravels found in Minnesota**. A popout is caused by the breakdown of individual coarse aggregate particles and is generally greater than ¼" in diameter.

Aggregates conforming to MN/DOT 3137 Superstructure specification as well as 3137 Class A can reduce popouts to 5-10/yd² or less. Some crushed bedrock, such as selected carbonates, has a very good performance history. These materials can be used to substitute for Class A aggregate where the performance history is known.

Curing

Curing is a process that provides a moist environment that prevents newly placed concrete

from drying out and protection from the elements while the hydration process is taking place. For recommendations on curing and duration, see the "ARM Curing Guidelines." The use of Class A aggregate can exacerbate light scaling (mortar flaking) where curing is inadequate.

A cure that provides additional water is preferred as concrete needs water to gain strength. Curing can be accomplished with a membrane forming curing compound applied at a uniform coverage rate (gal/ft²) equal or greater than the manufacturers recommended coverage rate. At minimum, curing compounds should comply with ASTM C309, MnDOT 3754 AMS is preferred.

Sealing

Sealing is the application of an agent which prevents the infiltration of water and chemicals into the concrete, which can lead to deterioration. All concrete should be allowed to dry for an additional 30 days after the curing period and sealed with a high quality silane and/or siloxane sealer or a 50/50 mixture of mineral spirits and boiled linseed oil to reduce water penetration. This should be applied according to the manufacturer's recommendations.

Late Season Placement

Concrete placed in the Fall that will not have adequate time to cure and dry prior to exposure to freezing is more prone to surface deterioration, and needs additional protection until it reaches design strength. The concrete should be treated with a penetrating sealer, silane or siloxane, or with a 50/50 mixture of mineral spirits and boiled linseed oil to reduce water penetration.

De-Icing Chemicals

De-icing chemicals may be applied conservatively and fertilizers such as ammonium sulfate and ammonium nitrate should be avoided as they may chemically attack the concrete.

Additional Information

Additional technical information and recommendations for commercial and residential concrete can be found at ARM of Minnesota at the contact information below.

Air Content, achieved at the time and point of placement, shall conform to the following table based on the maximum aggregate size.

<u>Nominal Maximum</u>	<u>Air Content</u>
<u>Aggregate Size</u>	<u>(%)</u>
3/8	6-9
1/2	5 1/2-8 1/2
3/4	5-8
1	5-8

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