**Expectations**

Concrete is made from manufactured cement, beneficial supplementary cementitious materials, aggregates mined from the earth, chemical admixtures, and water. These items are combined, and a chemical reaction occurs producing hardened concrete. Successful exterior concrete combines the use of a properly engineered concrete mix design that is installed by a quality-oriented contractor.

Using lower quality mixtures and installation techniques will result in a reduction in the concrete’s service life. However, by using the guidelines presented herein, the buyer can have confidence that the installed concrete can meet long term performance expectations.

**Site Preparation**

Any pavement is only as good as the subbase material it is placed on. It is recommended that exterior concrete pavement be placed on a properly installed subbase. Do not place concrete on a frozen subgrade or subbase.

**Ready Mix Concrete**

The mixture shall meet the following criteria:

- Minimum compressive strength of 4,500 psi in 28 days
- Maximum targeted water cementitious ratio = 0.45
- Slump = 5” +/- 1”
- Air content shall be 6% ± 1.5%
- Fine and coarse aggregates shall be approved by INDOT for use in concrete.
- Research has demonstrated that the use of supplementary cementitious materials can reduce the damaging impact of aggressive deicing agents.

The use of fresnos, trowels, or finishing machines can damage the concrete's air void system or lead to delamination that results in a significant reduction of the concrete's surface durability.

Finishing operations that occur while bleed water remains on the surface or with the addition of water to the surface of the concrete will result in a loss of surface durability.

**Jointing**

Tooled or sawn contraction joints should be installed per the following criteria:

- Joint Depth: 25% of slab thickness.
- Maximum Joint Spacing:
  - 4” thick, 10’ on center
  - 5” thick, 12’6” on center
  - 6” or more, 15’ on center
- Maximum Aspect Ratio of the panels created by jointing shall be 1.5:1 (Length of the panel divided by the width of the panel).
Curing, Protection and Maintenance

Curing
Proper curing results in the retention of moisture in the concrete. Proper curing of the concrete is critical to the surface's freeze/thaw durability. Curing compound shall be applied as soon as possible after the finishing process is completed. Ensure that the selected curing compound is compatible with the selected penetrating sealer.

Protection
Sealing the concrete inhibits the ingress of moisture, deicing agents and other environmental impurities that can result in a reduction of surface durability.

Because pavements are being treated with modified deicing salts containing calcium chloride or magnesium chloride treated sodium chlorides, it is recommended that the exterior concrete be treated with a breathable penetrating sealer prior to being subjected to its first winter.

Several breathable and penetrating sealers are available including those that contain silanes, siloxanes or soy methylesters. Consult an IRMCA member for more information.

Maintenance
Concrete pavements require little maintenance. It is recommended that additional applications of the penetrating sealer by applied every three years. The products should be applied after the concrete surface has dried for 24 hours. Early fall is an ideal time to apply the penetrating sealer. Contact an IRMCA member for product recommendations.

DEICING CHEMICALS
It is understood that vehicles traveling on the roadways will transport deicing agents that can be deposited on the surface of the concrete. However, it is important that deicing agents are not directly applied to concrete during its first winter.