# HR-299 Control of PCC Deterioration Due to Trace Compounds in Deicers

**Key Words:** Deicers, Rock Salt, Fly Ash, Pavement service life

## ABSTRACT

This reports work on three facets of rock salt deicer action on freeze-thaw resistance of portland cement concrete. The first deals with improvement of mortars where it is demonstrated that a 10 to 15 percent replacement of cement with fly ash can more than double the life of con-crete by reduction of porosity and stabilization of calcium hydroxide. Excessive fly ash was found to counter this benefit. Secondly, this research defines behavior and performance of aggregates displaying different service lives in concrete subjected deicers. Freeze-thaw in water produced failure in the aggregate while in deicers damage was exclusive to the mortar-aggregate interface or the mortar. Aggregate porosity appeared to be a good but not infallible predictor of concrete service life. Low porosity aggregates were best. The third feature of this research was develop-ment of a test method capable of modeling the freeze-thaw process and predicting life performance. This was done by adaptation of the ASTM C 666 test to include a reliability based design. Essential to this test method was objective definition of failure and a realistic model linking labora-tory tests to the temperature environment observed in the field. The methodology was compared to performance of a pavement in central Iowa. The model predicted life of 25 years while the pavement failed at 26 years. This predic-tive method was also used to contrast the life of a pavement subject to different deicing materials follows: no deicer--life = 25 years, low sulfate NaCl--life = 19 years, and high sulfate NaCl--life = 14 years.