# HR-266 The Relationship of Ferroan Dolomite Aggregate to Rapid Concrete Deterioration

**Key Words:** Aggregate, Concrete durability, Ferroan dolomites

## ABSTRACT

Some of Iowa's 13,200 miles of portland cement concrete (PCC) pavement have remained structurally sound for over 50 years while others have suffered premature deterioration. Research has shown that the type of coarse aggregate used in the PCC is the major cause of this premature deterioration. Some coarse aggregates for concrete exhibit a nonuniform performance history. They contribute to premature deterioration on heavily salted primary roadways while providing long maintenance-free life on unsalted secondary pavements. This inconsistency supports the premise that there are at least two mechanisms that contribute to the deterioration. Previous research has shown that one of these mechanisms is a bad pore system. The other is apparently a chemical reaction.

The objective of this research is to develop simple rapid test methods to predict the durability of carbonate aggregate in PCC pavement.

X-ray diffraction analyses of aggregate samples have been conducted on various beds from numerous quarries producing diffraction plots for more than 200 samples of dolomitic or dolomite aggregates. The crystalline structures of these dolomitic aggregates show maximum-intensity dolomite/ankerite peaks ranging from a d-spacing of 2.884 angstroms for good aggregates to a d-spacing of 2.914 angstroms for nondurable aggregates. If coarse aggregates with known bad pore systems are removed from this summary, the d-spacing values of the remaining aggregates correlate very well with expected service life. This may indicate that the iron substitution for magnesium in the dolomite crystal is associated with the instability of the ferroan dolomite aggregates in PCC pavement.