Surface Resistivity for Concrete Quality Assurance

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Abstract:

The goal of this study was to determine the effectiveness of SRT for concrete quality assurance and to evaluate the relationship between SRT and the three chloride ion ingress methods currently used by various State DOTs. Additionally, the influence of binder type and content, concrete age, and water-to cementitious materials ratio on the experimental results were also examined.

In this study, Type V Portland and three SCMs; namely fly ash, slag, and silica fume were used. Fine and coarse, aggregates were supplied by a local quarry. To evaluate the transport properties of the studied concretes, RMT, RCPT, and ACT were employed. The evaluations of experimental results were based on binder content, binder type, w/cm, and concrete age.

The findings of the experimental program revealed improvements in the results of SRT, RCPT, RMT and ACT due to increases in the binder type and content, as well as concrete age. On the other hand, increases in water-to-cementitious materials ratio displayed a reversal trend. Incorporation of the secondary cementitious materials (SCMs), as a partial substitution of Portland cement, improved the results for the four testing methods and the outcomes improved with the increases in the partial replacement of Portland cement with SCMs. Amongst the three utilized SCMs, silica fume produced superior performance in all four testing programs when compared to slag and fly ash. The studied slag concretes produced better results as compared to those of the fly ash mixtures. The statistical evaluations of the test results showed strong inverse relationships between SRT and the three chloride ion penetration methods, substantiating the use of surface resistivity test for concrete quality assurance and paving the way for its adoption by the Nevada Department of Transportation and other public and private agencies.