

JUST THE FACTS

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SPR

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Evaluation of Surface Resistivity Measurements as an Alternative to the Rapid Chloride Permeability Test for Quality Assurance and Acceptance

PROBLEM

Many entities currently use permeability specifications in Portland cement concrete (PCC) pavements and structures. For those states using permeability specifications, two test methods are generally used and include ASTM C 1202 (Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration) or ASTM C 642 (Standard Test Method for Density, Absorption, and Voids in Hardened Concrete). A couple of states allow the use of a surface resistivity device that correlates well with rapid chloride permeability results. This project will investigate the use of a surface resistivity device as an indication of concrete's ability to resist chloride ion penetration.

Until recently, the rapid chloride permeability test was the only test that quickly determined the concrete's ability to resist chloride ion penetration. Recent advances in surface resistivity measurements and their correlations to the rapid chloride permeability results have led many owners to use them for a variety of reasons (i.e., low cost and a reduction in the number of man hours required to conduct the test).

OBJECTIVES

The objectives of this research are to characterize the surface resistivity of concrete specimens produced in the laboratory and field conditions, characterize the rapid chloride permeability of said concrete specimens, and conduct comparative testing on the concrete resulting from the Caminada Bay Bridge project. From these results, an evaluation of the surface resistivity device can be determined and a recommendation for implementation can be developed.

SPECIAL POINTS OF INTEREST:

- Problem Addressed
- Objectives of Research
- Methodology Used
- Implementation Potential

METHODOLOGY

Task 1 - Design Testing Program

The concrete samples to be tested for this study will come from ongoing construction projects such as the Twin Spans and Caminada Bay Bridge projects and ongoing research project LTRC 09-4C: Evaluation of Ternary Cementitious Combinations. To evaluate the effects of varying water to cement ratios, samples will be created with 0.40, 0.50, and 0.60 water to cement ratios.

Task 2 - Permeability Testing

Comparative testing will be conducted on samples of varying ages including 14, 28, and 56 days. Surface resistivity of a sample will be measured with the surface resistivity device using the AASHTO draft test procedure. The same sample will be used for rapid chloride permeability testing (ASTM C 1202).

Task 3 - Data Analysis

Statistical analysis including least squares regression and modeling will be used to compare the two test methods. With positive results, an implementation plan will be developed for LADOTD.

Task 4 - Implementation Plan

The implementation plan will be piloted on a current bridge construction project. This will show the direct economic benefits of using surface resistivity compared to ASTM C 1202 to the Department.

Task 5 - Final Report Preparation

A final report will be prepared and will include the results and findings of the study. A recommendation for use and implementation of the surface resistivity device will also be detailed.

IMPLEMENTATION

It is foreseen that results of this study will greatly assist the Department in determining whether or not to allow the use of surface resistivity devices as an indication of chloride permeability. The results of this research are anticipated to be applied to all classes of concrete including pavement, structural, and concrete for other applications such as precast and drilled shafts. It is envisioned that incorporation of surface resistivity devices will benefit the Louisiana Department of Transportation and Development (LADOTD) and the state economically by significantly reducing both the cost of testing equipment and the number of man hours required to conduct the quality assurance testing.

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