

ABSTRACT

Spragg, Robert Paul. M.S.C.E., Purdue University, May 2013. The Rapid Assessment of Transport Properties of Cementitious Materials Using Electrical Methods. Major Professor: Jason Weiss.

The service life of a concrete element can be directly related to its transport properties, that is the speed at which moisture or ionic species move through the concrete. Historically, transport properties have been evaluated using tests that are: time-consuming, empirical, and subjective. Over the last decade, the application of a characterization technique based upon the electrical properties of a particular concrete mixture has shown increased interest. One of these new, rapid electrical tests has been termed the uniaxial resistivity test. This study will present variability data on this test method that will help in the development of standard test methods. A series of factors that influence resistivity measurements will be highlighted, which range from testing frequency to material homogeneity. The effects of temperature (on both hydration rate and electrical measurements) will be discussed, as these relate to accelerated curing for measurements of electrical properties. Additionally, the idea of alkali leaching will be extended to specimens stored in lime-saturated water, as this can cause significant changes to the pore solution, which should be considered in the development of resistivity test methods.