

Comparison of Spacing Factors as Measured by the Air-Void Analyzer and ASTM C457

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Introduction

Freezing and thawing cycles will result in damage to concrete that is saturated unless the concrete is properly entrained with small and well-dispersed air voids. Durable concrete subject to cycles of freezing and thawing must have an air-void system (in the cement paste) with an adequate spacing factor, specific surface area, and air content. The Kansas Department of Transportation (KDOT) places limits on the air content and spacing factor, which is the focus of this report.

Project Description

The Kansas Department of Transportation (KDOT) began using the Air-Void Analyzer (AVA) in 2001 and first incorporated an AVA spacing factor requirement into paving specifications beginning in late 2002.

In 2005, a statewide investigation to evaluate the AVA and specifications began with the collection of 4-inch diameter hardened concrete samples taken at or near locations where the spacing factor was determined with the AVA. The hardened concrete samples were tested to determine the spacing factor in accordance with ASTM C457 (2012), a well-established test method used to determine spacing factors in hardened concrete. A total of 270 data pairs were collected to evaluate KDOT's current use of the AVA and ASTM C457 tests and to determine if a correlation (either direct or pass-fail criteria) exists between spacing factors obtained with the two methods.

Project Results

Results of the study indicate that average spacing factors obtained with the AVA were 1.67 higher than average spacing factors determined using ASTM C457. A strong direct correlation was not identified between the two test methods, although pass-fail criterion that limits KDOT's risk of accepting concrete with an inadequate air-void system was identified.

Project Information

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