Kansas Department of Transportation

TECHNICAL SUMMARY

Construction of Crack-Free Bridge Decks

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A Transportation Pooled Fund Study - TPF-5(174)

Introduction

This serves as the final report on Transportation Pooled-Fund Program Project No. TPF-5(174), "Construction of Crack-Free Bridge Decks." The goal of the study was to implement the most cost-effective techniques for improving bridge deck life through the reduction of cracking. Work was performed both in the laboratory and in the field, resulting in the construction of 17 bridge decks in Kansas that were let under Low-Cracking High-Performance Concrete (LC-HPC) specifications.

Map Cracks and Discolored

Project Description

The report documents the performance of the decks based on crack surveys performed on the LC-HPC decks and matching control bridge decks. The specifications for LC-HPC bridge decks, which cover aggregates, concrete, and construction procedures, as well as procedures for performing crack surveys, are summarized. The first 13 LC-HPC bridge decks are compared to control decks in terms of crack density as a function of time. Survey results are also presented for three LC-HPC decks without control decks and one deck let under LC-HPC specifications on which the specifications were not enforced. The widths of measured cracks ranged from 0.006 to 0.025 inches (0.15 to 0.64 mm).

Project Results

The LC-HPC bridge decks exhibit less cracking than the matching control decks in the vast majority of cases. Only bridge decks LC-HPC-2 and LC-HPC-3 have higher overall crack densities than their control decks, the two best performing control decks in the program, and the differences are small. The majority of the cracks are transverse and run parallel to the top layer of the deck reinforcement. Relatively short cracks are present near the abutments and propagate perpendicular to the abutments (longitudinally).

The study demonstrates the positive effects of reduced cementitious material and cement paste contents, improved early-age and long-term curing, concrete temperature control, limitations on or de-emphasis of maximum concrete compressive strength, limitations on maximum slump, and minimizing finishing operations on minimizing cracking in bridge decks.

Project Information

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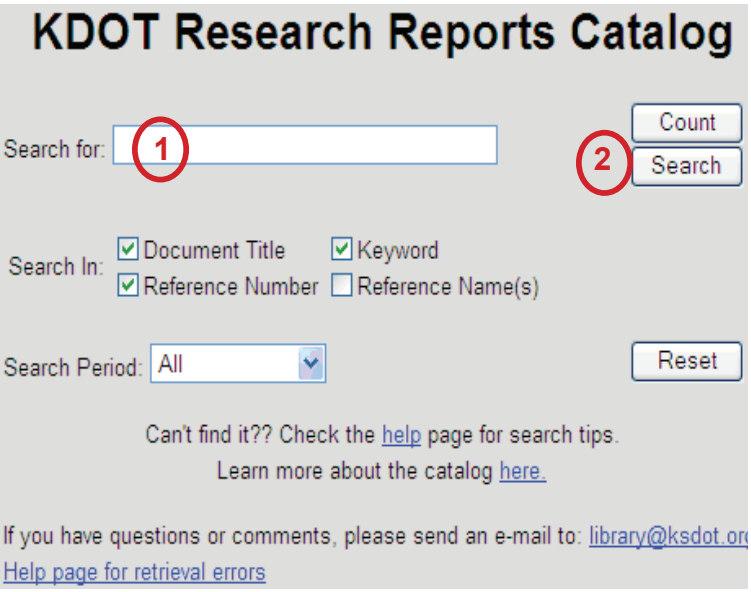

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