



Florida Department of Transportation Research

Long-Life Slab Replacement Concrete

April 2015

Project Number

BDV25-977-01

Project Manager

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Current Situation

Concrete slab replacement projects in Florida have demonstrated a high incidence of replacement slab cracking. Causes of cracking have not been reliably determined.

Research Objectives

University of South Florida researchers sought to identify the factors or parameters that contributed to the cracking of concrete replacement slabs on Florida Department of Transportation (FDOT) projects. The goal was to provide recommendations to minimize cracking in replacement slabs.



Working at night under bright work lights, workers place temperature and strain gauges in preparation for the pouring of a test slab on US-1 in Jacksonville.

Project Activities

A three-part research plan was designed that involved instrumentation and data acquisition from slabs placed in three FDOT projects, laboratory experiments to assess temperature rise and maturity relationships, and computer modeling to predict cracking potential under variable placement conditions.

Researchers examined concrete mixture designs approved by FDOT and mixtures with various chloride-based accelerator dosage, including dosages above FDOT specifications, as are sometimes found in replacement slabs. Temperature and strain data, as well as physical and thermal data, were acquired from slabs at the construction sites. Physical and thermal data acquired from the field were used for modeling description and verification using modeling software ConcreteWorks and HIPERPAV III. Following field testing and data acquisition, the slabs were inspected for cracking. Laboratory testing included as-received materials characterization, heat of hydration measurements using isothermal and semi-adiabatic calorimetry for temperature rise assessment, and strength maturity curves for strength assessment.

Project results, including modeling, indicated that adherence to the approved mixture design was critical. High placement temperatures and concrete placement during the day increased concrete cracking potential. Field additions of accelerator in excess of the approved mixture design were also found to increase the cracking potential.

Project Benefits

Identification of factors that lead to cracking enhances knowledge of concrete behavior and extends modeling capabilities. Recommendations provided by the project will lead to better quality control on replacement slabs, which in turn, will produce more durable slabs and lower maintenance and repair costs.

For more information, please see dot.state.fl.us/research-center