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Curling and Warping on Concrete Pavement: Phase II

Kexin Tian, Iowa State University
Bo Yang, Iowa State University
Danial King, Iowa State University
Halil Ceylan, Iowa State University
Sunghwan Kim, Iowa State University

Abstract

Curling and warping of concrete pavement slabs is a well-known problem induced by temperature and moisture variations. These characteristics are influenced by seasonal and climatic factors, as well as pavement design features like slab geometry and mix design. Although significant efforts have been made in recent decades to assess the impact of curling and warping-related behaviors on JPCP smoothness, a standardized method for characterizing all engineer-controlled variables, seasonal, and diurnal impacts on JPCP smoothness remains lacking. Excessive curling and warping can cause stresses that increase the risk of cracking under traffic loads, as well as deflections that contribute to pavement roughness, both of which can reduce the service life and induce maintenance costs of concrete pavements.

A powerful automatically MATLAB algorithm has been developed for analyzing a pavement profile and calculating the curvature IRI, deflection, deflection ratio, and curvature IRI of a jointed concrete slab, and the developed method successfully quantified diurnal and seasonal changes in deflection of concrete slabs over time and their effects on JPCP smoothness. The findings allowed for an analysis of the sensitivity of roughness caused by curling and warping to the various influence factors.