

# Forensic Investigation of Longitudinal Cracking in Iowa Widened Concrete Pavement System

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As opposed to standard 12 ft wide slabs, 14 ft widened slabs have been widely employed in jointed plain concrete pavement (JPCP) in Iowa since 1990s. The primary reason of this practice is intended to reduce stresses and deflections at the critical concrete pavement edge location, by effectively moving the normal traffic path away from the edge. Moreover, it helps to reduce shoulder maintenance costs and minimize the exposure of maintenance crews to traffic. However, many widened concrete pavements are now approaching 20 years of service life, and tremendous 14 ft widened concrete pavements were found with sudden and significant amounts of longitudinal cracking. These suddenly appeared cracks within 2 to 4 ft from slab edges have never been reported before and could be detrimental to the long-term pavement performance. Therefore, the primary objectives of this study are to investigate the causative factors contributing to longitudinal cracking in widened JPCP and to provide recommendations for preventing its occurrence. A comprehensive field survey was performed on 12 selected sites, and the locations and extent of longitudinal cracks were documented and compared. Degree of curling and warping were measured at selected sites using a terrestrial laser scanner. Concrete cores at cracking spots were examined, and historical construction files were reviewed as well. It was found that the unexpected cracks are possibly attributed a combination of insufficient support from subsurface layers, high traffic volume, skewed joints, untied shoulder, and high degree of curling and warping.

*Keywords:* Concrete pavement, terrestrial laser scanner, longitudinal cracking, curling and warping