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Evaluation of PCC Specification Changes Impact on Durability: 1992 – 1997 Core Study	Final Report, October 1998 to March 2004
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8. ABSTRACT	
<p>In 1990, early distress had shown up on US 20 in Hamilton/Webster counties, three years after paving. Since that time, over a dozen more projects, constructed between 1984 and 1994, have been found to exhibit similar early distress. Several changes to the concrete and Portland cement specifications occurred in 1994 and 1996. This study was undertaken to investigate in place concrete pavements before and after specification changes were implemented.</p> <p>The objective of this research is to evaluate the impact of Portland cement and concrete specification changes made in 1994 and 1996 on PCC durability. Cores were obtained in 1998 and 2003 from projects constructed in 1992, before specification changes, and 1997 after specification changes.</p> <p>The following is a brief summary of the conclusions:</p> <ol style="list-style-type: none">1. The pavements in the study constructed under the new specifications are performing much better after 5 years of service than the pavements constructed under the old specifications.2. According to ISU, micro-cracking is evident in all concrete that has been in service, due to thermal stresses and loading stresses. Also, the low vacuum SEM will desiccate the concrete enough to cause micro-cracking. The SEM should not be used as a tool to indicate micro-cracking.3. Use of Type II cement ($C_3A < 8\%$) and a 3.0% SO_3 limit does not completely eliminate ettringite infilling in air voids, as indicated in the bottom of the 1997 cores.4. In areas of high moisture (bottom of the core), infilling is present in most of the 1997 cores.5. Low air content and high spacing factor in the top of 1992 cores apparently causes F/T cycling cracking and then increased moisture paths from cracking causes infilling.6. Use of ground granulated blast furnace slag (GGBFS) and fly ash reduces ettringite infilling either by diluting the aluminate (C_3A) or lowering permeability, which slows ingress of moisture.7. The specification changes that made the biggest impact on pavement durability are the limits on vibration and increase in air content in September 1994.8. Investigations of cores from pavements placed in 2002 and 2003 indicate improved air contents and spacing factors. In-place air content and spacing factors should be monitored to determine if appropriate air void parameters are being met.	
9. KEY WORDS	10. NO. OF PAGES
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