

## ABSTRACT

Newbolds, Scott Andrew Ph.D., Purdue University, August 2007. Evaluation of Performance and Design Ultra-Thin Whitetopping (Bonded Concrete Resurfacing) Performance and Design Using Large-Scale Accelerated Pavement Testing. Major Professor: Jan Olek.

Ultra-Thin Whitetopping (UTW) is a pavement rehabilitation technique that involves the placement of a thin Portland Cement Concrete (PCC) overlay, 2 inches (50 mm) to 4 inches (100 mm) thick, over a distressed Hot Mix Asphalt (HMA) pavement. Typically, the HMA pavement is milled and cleaned which helps to create a bond between the existing HMA pavement and the PCC overlay. The bond between the two layers promotes composite action of the pavement section and as a result has a direct impact on the performance of the UTW Pavement. This composite action allows for the reduced thickness in the UTW layer. Additionally, a short joint spacing is typically used, which reduces the UTW flexural and curling stresses.

In this study three different test areas were constructed in the INDOT/Purdue University Accelerated Pavement Testing facility. Each test area had different lanes that varied by concrete mix design, bonding preparation, and pavement cross-section. These sections were subjected to 300,000 to 560,000 load applications. An additional test area was constructed outside the facility to evaluate pavement thicknesses and environmental effects.

The project resulted in a simplified UTW design methodology that takes into account the stiffness of all underlying pavement layers. Additionally, the project provides insight into the effects of pavement section, UTW mix design, mechanical loading, bonding conditions, and environmental loading on the performance of UTW.