Title:

Redefining the Failure Mode for Thin and Ultra-thin Whitetopping with a 1.8- x 1.8-m (6- x 6-ft) Joint Spacing

Abstract:

Bonded whitetopping consists of a thin concrete overlay of a distressed asphalt pavement. The existing design procedures for bonded whitetopping were developed based on the assumption that the failure mode is a function of the overlay thickness. It has been traditionally assumed in design that for thin whitetopping (TWT) (overlay thickness greater than 102 mm (4 in) but less than 152 mm (6in) the failure mode is transverse cracking and for ultra-thin whitetopping (UTW) (overlay thickness between 51 and 102 mm [2 and 4 in]) the failure mode is corner cracking. However, the performance of in-service whitetopping overlays indicates that the actual failure mode is dictated more by slab size than by overlay thickness. For both TWT and UTW with a 1.8-m (6-ft) joint spacing, the cracks initiate at the bottom of the overlay at the intersection of the transverse joint and the wheelpath and propagate longitudinally. At times, these cracks will continue to propagate in the longitudinal direction and intersect the adjacent transverse joint and other times they will turn on a diagonal and propagate towards the lane/shoulder joint. To further verify this failure mechanism observed in the field, a 3-dimensonal finite-element model subjected to environmental and wheel loads was developed. The results support the proposed failure mode showing that the critical tensile stress is indeed in the wheelpath and at the bottom of the PCC overlay, which results in a longitudinal crack.

Recommended reference:

Li, Z., and J.M. Vandenbossche. (2013) "*Redefining the Failure Mode for Thin and Ultra-thin Whitetopping with a 1.8- x 1.8-m (6- x 6-ft) Joint Spacing*". Transportation Research Record: Journal of Transportation Research Board, Transportation Research Board of the National Academics, Washington, DC, No.2368, Vol.3, 2013: 133-144.