

Evaluating Unbonded Ultrathin Whitetopping over Brick Streets

tech transfer summary

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RESEARCH PROJECT TITLE

Evaluation of Unbonded Ultrathin Whitetopping of Brick Streets

SPONSORS

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Whitetopping proves to be successful as a rehabilitation technique for aging brick surfaced streets that are experiencing increased traffic loadings and reduced performance from flexible overlays.

Objectives

- Demonstrate the ability to design and place an ultrathin portland cement concrete (PCC) overlay on an existing base of asphaltic cement concrete and brick.
- Evaluate the short-term (one year) and long-term (five years) performance of a PCC overlay of approximately three inches in depth, and compare it to the performance of an asphaltic cement concrete overlay of three inches in depth.

Problem Statement

Many cities in Iowa have retained the original brick street surfaces in downtown areas and in older residential areas as the base for modern driving surfaces. However, the original brick surfaces were not built to handle current traffic loadings. In recent years, these surfaces have tended to shift and become uneven, creating problems with safety. Asphaltic concrete overlays have been the typical rehabilitation technique in these situations. While this technique has proven successful in some cases, in other cases the combination of the movement of the brick and the flexibility of the asphalt accentuated the original problem. An alternative rehabilitation approach uses PCC as an overlay of the brick surfaces, but little research has been done in this area.



Deteriorated asphalt surface with exposed brick

Technology Description

Two projects were studied in which a PCC overlay was applied to a base of asphaltic cement concrete and brick, one in Oskaloosa and one in Des Moines, Iowa.

The Oskaloosa project consisted of a PCC overlay of two city blocks. The original brick street was built in 1899, and a three-inch lift of hot mix asphalt was placed over the deteriorated bricks in 1960. The contractor first removed the existing asphalt overlay from the bricks by milling and air blasting. The existing curb and gutter were then removed and replaced in a raised position to allow four inches of concrete to be placed on top of the existing brick. Concrete, some mixed with polyfibers, was placed in half-roadway widths in different phases over the next ten days. Joints were then cut with a dry saw 3/8 inches wide to a depth of T/3. The Iowa DOT's falling weight deflectometer (FWD) was used for deflection testing and to determine the support value of the existing surface.

The Des Moines project consisted of a two-block stretch of roadway that serves as a heavy truck connection between a portion of I-235 and grain-processing facilities. The existing pavement consisted of a four- to six-inch-deep asphalt layer over a single layer of brick standing on edge. All asphalt was removed prior to adding the new overlay, and the specifications for this project were patterned after the Oskaloosa project. Two cores were taken at random locations after the concrete was placed to review the bond between the two pavement materials. The project was also reviewed for pavement distress immediately after opening to traffic and again roughly 20 months later.

Key Findings

- The Oskaloosa and Des Moines projects have shown that ultrathin PCC overlays of brick streets are feasible and perform well under heavy truck route conditions.
- Conventional mixes with the addition of polyfibers can be used to ensure the performance of the 3–4.5-inch-deep overlay sections.
- The deflection (FWD) data for the Oskaloosa project indicate good load transfer in all test locations, slab sizes, and testing periods.
- The pavement overlay for the Des Moines project is performing well for the type of traffic it is serving.



Overlay paving on the Oskaloosa project



Completed overlay paving for the Des Moines project

Implementation Benefits

- Ultrathin PCC overlays can be placed very quickly with minimal closure and traffic delay.
- In areas where asphalt overlays have failed in the past due to the overlay material's flexibility, ultrathin PCC overlays are a better alternative.