Project Summary

Texas Department of Transportation

0-4687: Rubblization and Crack & Seat as Major Rehabilitation for Concrete Pavements

Background

Rubblization is a unique means of rehabilitating concrete pavements by in-place conversion of the old concrete pavement into a usable base. Two primary methods of rubblizing exist. One method uses a multiple-head breaker (MHB), which breaks the entire lane width in one pass. The other method uses a resonant breaker (RMI), which performs multiple passes across the lane width to rubblize the pavement. Texas has many miles of old jointed concrete pavements needing rehabilitation; thus, this project evaluated field projects and the rubblization process to develop guidelines for performing rubblization on Texas Department of Transportation (TxDOT) projects.

What the Researchers Did

Texas Transportation Institute researchers began this project by evaluating existing methods for selecting candidate projects for rubblization. Researchers then performed project evaluation testing and analysis on numerous potential TxDOT projects. The researchers then monitored construction and conducted field verification of the methodology proposed.

Construction at two sites in particular was monitored by the research team: US 83 (rubblized with the RMI) and US 70 (rubblized with the MHB). From these projects the researchers proposed slight modifications to the project pre-screening evaluation. Researchers also conducted pre- and post-rubblization falling weight deflectometer (FWD) tests to determine how to estimate the rubblized layer modulus for use in design.

What They Found

The research team discovered the proposed methodology worked quite well for screening candidate projects and determining their suitability for rubblization. The projects tested indicated designers should plan for approximately 15 to 20 percent removal on a rubblization project. The figure on page 2 shows how the locations predicted to be of poor suitability for rubblization (as based on the pre-screening tests) matched well with the locations actually in need of removal during construction.

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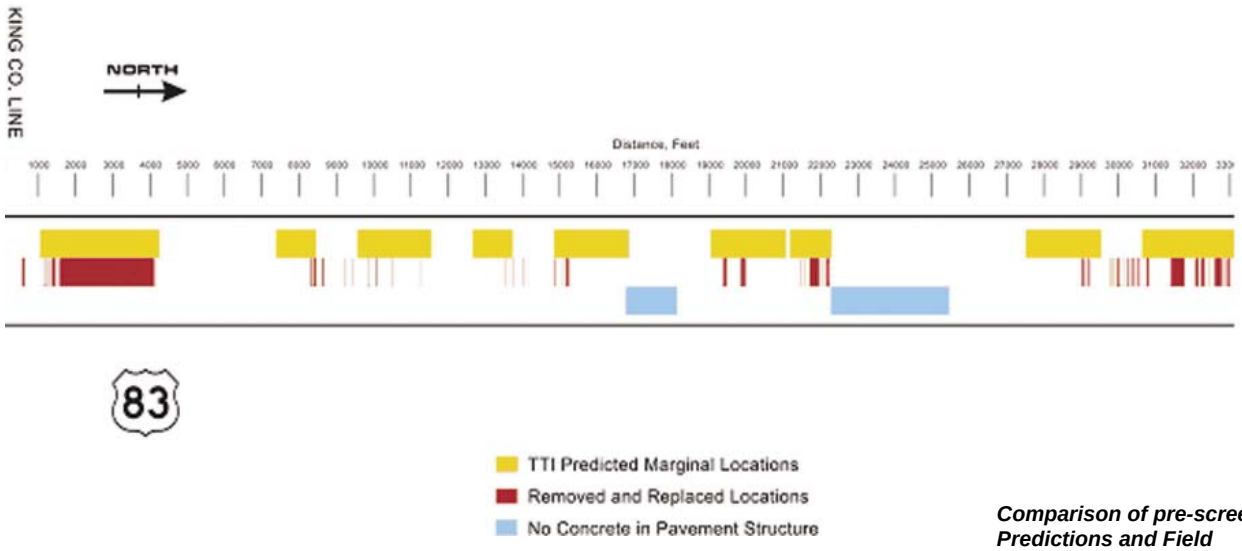
The test sites constructed also highlighted differences in the rubblization equipment. For example, the MHB produces larger particle sizes deeper in the concrete layer and flat, elongated particles at the top. These top particles are then broken down with a special "Z-grid" roller. The RMI process appears to produce a more uniform break pattern through the entire depth profile of the concrete layer.

In addition to differences in the break pattern, the field sites revealed that the RMI serves quite effectively as its own proof roller, whereas the MHB maintains the majority of the machine load on the unfractured concrete. Therefore, proof rolling after rubblization is particularly critical on projects utilizing the MHB.



Comparison of pre-screening Predictions and Field Construction on US 83.

What This Means

The procedures outlined in report 0-4687-2 should be used to pre-screen projects to determine their suitability for rubblization. These procedures use reviews of plans, visual site assessments, ground-penetrating radar testing, FWD testing, and dynamic cone penetrometer results to determine a project's suitability for rubblization. Once a project is selected for rubblization, designers should estimate the rubblized layer modulus as approximately 5 percent of the unfractured concrete modulus. The rubblized layer modulus normally ranges between 100 and 150 ksi for typical Texas rubblization projects.

When performing a rubblization project, Special Specification (SS) 3123 contains the recommended construction specifications developed from this research project. This specification seeks to improve upon TxDOT's earlier rubblization specification, SS 2002, by eliminating the proprietary nature of the earlier specification and by more adequately addressing the handling of proof rolling and spot repairs.

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