



Final Report

Materials Management Section Project
Project 0092-22-55
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Falling Weight Deflectometer (FWD) and Ground Penetrating Radar (GPR) Testing on Pavements

Research Objectives

- Develop a structural value to help promote highly polymerized asphalt layers for a delay in reflective cracking of hot mix asphalt overlays.
- Define mechanical properties of recycled base layers to help promote their usage.

Research Benefits

- Improve pavement conditions and promote recycling of WisDOT pavement structure materials.

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Background

The department utilizes an empirical pavement design method with a calculated minimum structural number to support known traffic. As innovative practices emerge such as cold in place recycling (CIR) and highly polymerized hot mix asphalt (HMA) layers for reflective crack control, effective structural numbers need to be assigned to the product to make use of these in pavement structure design. Standard FWD testing and the Transportation Speed Deflection Device (TSDD) results can both be used to determine structural numbers.

Methodology

The resilient modulus of an existing pavement can be back calculated using the deflection basin generated by FWD testing and the correlating thickness determined by Ground Penetrating Radar (GPR).



Figure 1: Wisconsin's FWD/GPR Unit

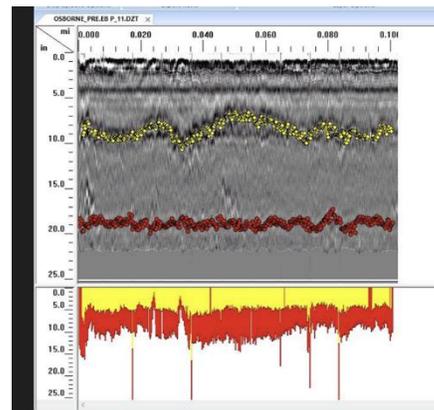


Figure 2: Example GPR Output

“The results will allow regional highway pavement design to take advantage of innovative practices regarding reflective crack control of HMA overlays. It also provides a support for the best use of in place materials with recycling...”

– Pete Kemp Pavement Unit, BTS

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A set of pavement sections which include asphalt-stabilized base layer and a cold-in-place recycled (CIR) base layer have been tested for back calculating the resilient modulus. The same sections were tested using the TSDD device. The overall load carry capacity of the roadway was calculated in the form of a structural number (Sn).

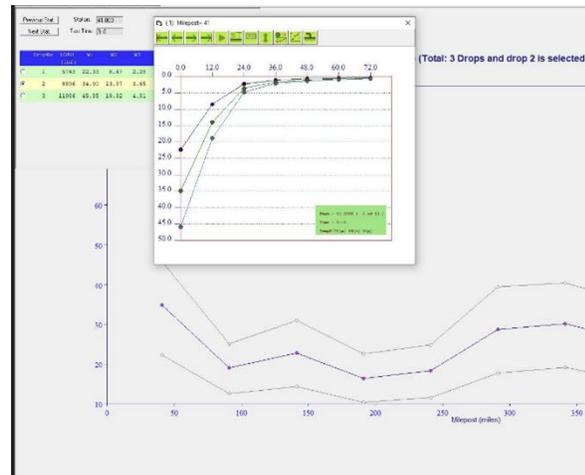


Figure 3: Example FWD Deflection Basin

Results

No correlation was found for the TSDD and standard GPR testing. However, structural numbers can be determined using the resilient modulus and GPR thickness data. For more information on this effort see: [Mechanistic Assessment of Flexible Pavements in Wisconsin Using Traffic Speed Deflectometer](#).

Recommendations for implementation

The research team recommends adoption by the Bureau of Technical Services of resultant Sn in the department pavement design software WisPave for the CIR and the interlayer. This will allow the optimization of pavement designs by giving proper credit to layers within the pavement structure with a Sn that bests represent the layer. Continued recycling of in place material is a cost effective practice and in line with the departments [MAPPS](#) performance measures by providing time and cost savings, performance and efficiency benefits.