Federal Aid Research Task No. 27: Evaluation of US 31W, Hardin County

Clark Graves
University of Kentucky, clark.graves@uky.edu

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Research Report
KTC-89-34

FEDERAL AID RESEARCH TASK NO. 27
EVALUATION OF US 31W, HARDIN COUNTY
KY PROJECT F-31-1(3)

by

Clark Graves
Research Assistant

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

in cooperation with the
Transportation Cabinet
Commonwealth of Kentucky

and

Federal Highway Administration
US Department of Transportation

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April 1989
# Abstract

Breaking and Seating has been extensively utilized to rehabilitate portland cement concrete pavements. Relationships have been developed to determine effective fragment size based on effective modulus of the broken portland cement concrete. Based on this relationship, the effective size of broken segments is on the order of 30-90 inches in the inside lane and 6-15 inches in the outside lane.

Research Report UKTRP-87-26, "Breaking and Seating of Rigid Pavements" was prepared as a final report for three studies and as an interim report for Federal Aid Research Task No. 27 and two other studies. This report serves to finalize Federal Aid Research Task No. 27.
During breaking and seating, Kentucky Transportation Center investigators conducted non-destructive deflection testing on this project. A memorandum report by Gary Sharpe dated August 1, 1985 concluded that the effective pattern of breaking was in the order of 24 - 30 inches.

Kentucky Transportation Center investigators were requested to performed additional testing in early 1986 on the section after overlaying to validate the extent of breakage. Analyses of these additional data indicated there were significant differences in magnitudes of deflections between the inside and outside lanes. A comparison of these deflections and theoretical deflections calculated using the Chevron N-Layer Program and the following parameters:

Asphaltic Concrete Modulus = 1,200,000 psi @ 25 Hz, Poisson’s Ratio = 0.40
Broken PCC Modulus = (Value given below), Poisson’s Ratio = 0.2
DGA Modulus = 29,400 psi, Poisson’s Ratio = 0.4
Subgrade Modulus = 10,500 psi, Poisson’s Ratio = 0.45

<table>
<thead>
<tr>
<th>Type of Deflection</th>
<th>Broken PCC Modulus (psi)</th>
<th>Inside Lane</th>
<th>Sensor Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>#1</td>
<td>#2</td>
</tr>
<tr>
<td>Theoretical Inside Lane</td>
<td>2,000,000</td>
<td>27.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Field</td>
<td>28.3</td>
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<tr>
<td>Theoretical Inside Lane</td>
<td>1,000,000</td>
<td>30.1</td>
<td>26.7</td>
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</tbody>
</table>

Outside Lane

<table>
<thead>
<tr>
<th>Type of Deflection</th>
<th>Broken PCC Modulus (psi)</th>
<th>Outside Lane</th>
<th>Sensor Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>#1</td>
<td>#2</td>
</tr>
<tr>
<td>Theoretical Outside Lane</td>
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<td>42.3</td>
<td>34.8</td>
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<tr>
<td>Field</td>
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<td>39.5</td>
<td>30.4</td>
</tr>
<tr>
<td>Theoretical Outside Lane</td>
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<td>50.0</td>
<td>41.0</td>
</tr>
</tbody>
</table>
The field deflections listed are mean values calculated from 55 test points in the left lane and 29 points in the right lane. Due to variability of the data in each lane, isolation of specific areas of potential underbreakage was impossible.

Without more specific information about the strength of the subgrade and the thickness of the asphalt overlay in each lane, their influence on the measured deflection can not be determined.

If subgrade modulus and overlay thickness are consistent from lane to lane, then the difference in deflection may be attributed to the differences in the breakage pattern between the lanes. On the basis of this analysis and experience with other break and seat projects, the broken PCC moduli are approximately 100,000 psi for the outside lane (right lane) and 1,500,000 psi for the inside lane (left lane). Based on a previously established relation between broken particle size and effective modulus of the broken PCC pavement (Research Report UKTRP 87-26), the size of the broken segments is on the order of 30-90 inches in the inside lane and 6-15 inches in the outside lane.