SHOTBLASTING TO IMPROVE FRICTIONAL PROPERTIES

FINAL REPORT
FOR
IOWA DOT PROJECT HR-1057

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Shotblasting to Improve Frictional Properties

Final Report for
Iowa DOT Project HR-1057

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8. ABSTRACT

Thin overlays, diamond grinding, longitudinal grooving, transverse grooving, and milling have been successful techniques for restoring frictional properties on PCC pavements. Shotblasting offers a lower cost alternative if successful.

Five test sections of shotblasting were placed on IA 9 from Decorah east to the Winneshiek County line (milepost 260.0 to 270.0). Both smooth tire and ribbed tire friction testing (ASTM E274) was performed.

The conclusions and recommendations are:

Based on the study, friction enhancement by shotblasting has a relatively short service life when measured by the ribbed tire test. However, when measured by the smooth tire test, the friction enhancement is longer lasting.

Consideration of shotblasting for friction enhancement may be warranted to gain additional information, particularly when smooth tire friction properties are at issue.

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DISCLAIMER

INTRODUCTION

Iowa has conducted several research projects on the restoration of frictional properties on older PCC pavements. Thin overlays, diamond grinding, longitudinal grooving, transverse grooving, and milling have been successful techniques for restoring frictional properties. Cost is one of the drawbacks to using these techniques more often. Shotblasting the surface is a low-cost method of texturing PCC pavements. Shotblasting has been used for several years as the surface preparation prior to placing bonded PCC pavements.

OBJECTIVE

The objective of the research was to evaluate shotblasting for restoring frictional properties on PCC pavement.

PROJECT DESCRIPTION

The work was done on a section of IA 9 from Decorah east to the Winneshiek County line (milepost 260.0 to 270.0). This section was originally paved in 1970. Below is the project information:

Mix - C-3
Coarse Aggregate - Estrem Limestone (A96052)
Fine Aggregate - Decorah sand (A96502)
Cement Source - Lehigh
Surface Texture - Burlap drag

The friction testing history is as follows:

Year	Friction Number (FN)
1972	43
1975	34
1977	35
1978	39
1980	36
1982	35
1983	38
1985	36
1987	40
1990	41

CONSTRUCTION

A high-performance steel shotblasting machine, "The Skidabrader," manufactured by Humble Equipment Company of Rustin, Louisiana was used for the work. Five test sections were treated on October 24 and 25, 1990. The sections are as follows:

Section No.	Milepost	Length	Rate (ft/min)	AADT
1	260.00	500′	30	4940
2	261.00	1000′	40	8100
3	263.00	500′	40	3020
4	263.50	500′	50	3020
5	269.50	500′	30	1790

The speed of the shotblaster was varied to get different amounts of macro-texture.

In the fall of 1991, the majority of the roadway section was diamond ground (Sections 3, 4 and 5 were ground).

TESTING

Friction testing (ASTM E-274) was performed with both the smooth and ribbed tire before, after, and annually thereafter (Figure 1 and 2).

The smooth tire results were most affected by the shotblasting treatment. The increased smooth tire friction numbers have also been maintained for a longer period of time than the ribbed tire friction numbers.

Traffic volume appears to have the largest effect on how quickly the results dropped back down. Ribbed tire friction numbers initially improved after shotblasting. The effect was gone in less than one year for all sections.

The friction results coincide with the visual appearance of the surface. Evidence of the shotblasting was still present in October 1992. The mortar matrix surrounding the coarse aggregate was slightly recessed below the surface of the coarse aggregate. The texture would still allow some water to escape away from the smooth test tire. The coarse aggregate surface appears polished.

CONCLUSIONS AND RECOMMENDATIONS

Based on the study, friction enhancement by shotblasting has a relatively short service life when measured by the ribbed tire

test. However, when measured by the smooth tire test the friction enhancement is longer lasting.

Consideration of shotblasting for friction enhancement may be warranted to gain additional information particularly when smooth tire friction properties are at issue.

FIGURE 1 FRICTION TEST RESULTS SMOOTH TIRE

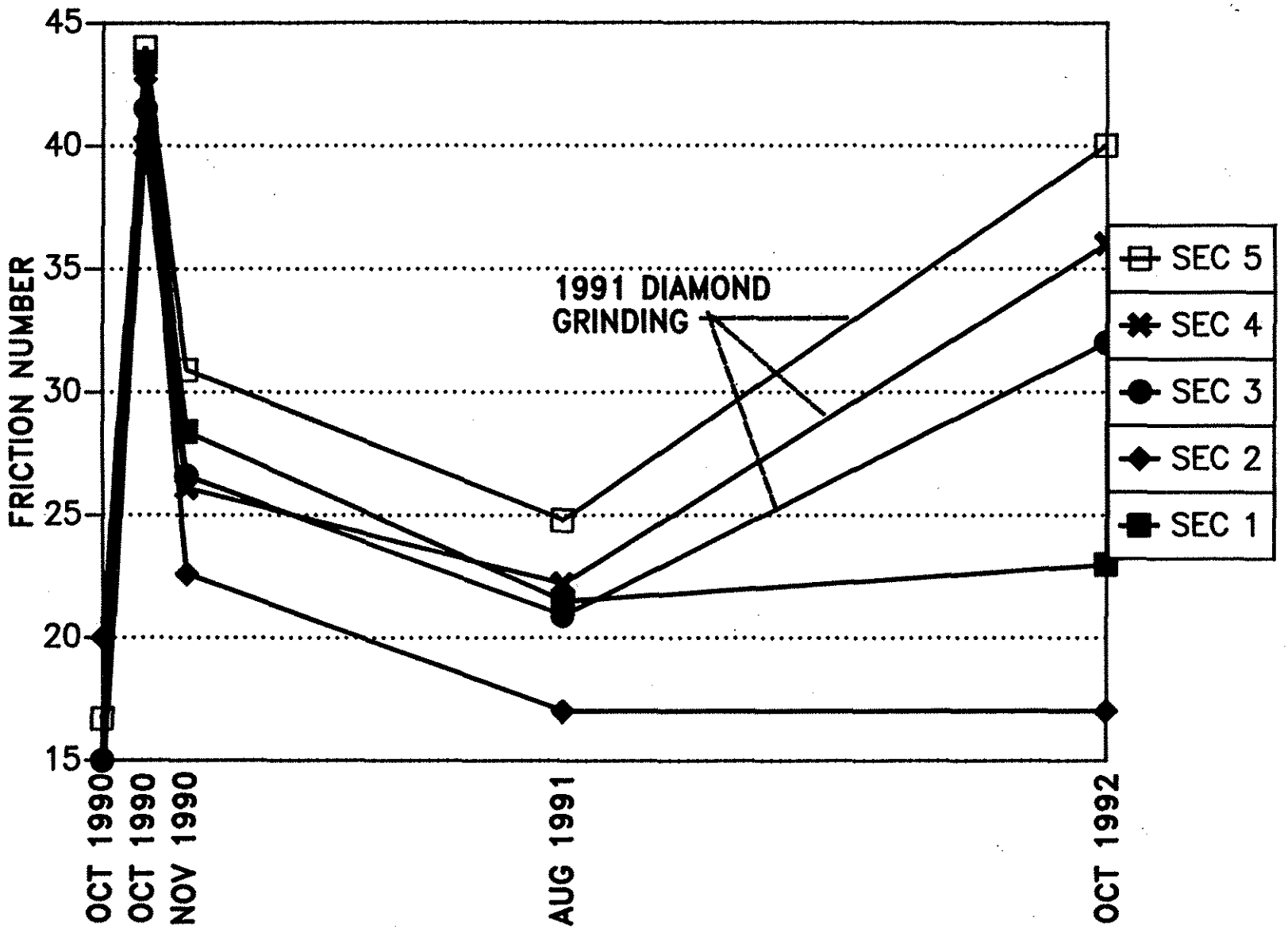

FIGURE 2 FRICTION TEST RESULTS
RIBBED TIRE