Final Report
Experimental Features WA 98-01

PCCP Texture Modification Using the Skidabrader

I-5
Tukwila to Lucile Street
MP 153.94 to 162.48

Washington State Department of Transportation

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This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.

16. ABSTRACT

A Skidabrader machine was used to remove the corduroy texture of a section of PCCP on Interstate 5 in Seattle Washington. The corduroy texture of the pavement was the product of a previous diamond grinding operation that improved the ride quality and restored the transverse profile of the pavement.

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DISCLAIMER

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Table of Contents

List of Figures

List of Tables

Introduction

In the fall of 1997 the portland cement concrete pavement on Interstate 5 from MP 154 to MP 162 was diamond ground to remove pavement wear caused by 25 plus years of traffic with a mix of studded tires. Following completion of the project complaints were received from the traveling public concerning the pavement ride (transverse motion), glare and the difficulty in seeing the lane stripes. The transverse motion that was felt was in part due to the changes in lane configuration that caused traffic to travel diagonally across the grinding pattern. However, the primary source of the complaints stemmed from the fins that resulted from the diamond grinding operation. The diamond grinding process consists of a number of individual blades grouped together on a mandrill with small spaces in between to provide a place for the cuttings to escape and the cooling water to enter. These fins usually wear off within a few months, but because of the extreme hardness of the cement and aggregate in the Seattle area, this did not happen even after nine months of traffic. The lane stripe visibility problem is common to many grinding projects, especially those where the lane configuration is changed. The glare problem is not very common, but one that also needed to be addresses because of the safety issue.

Objective

The objective of this experimental feature was to evaluate the effectiveness of the Skidabrader in providing a uniform surface texture, reducing the glare, and improving the lane strip visibility. Steel shot is blasted against the pavement surface at a high velocity to remove the surface material to a depth of up to ½ inch. The steel shot is recycled through the process and all of the pavement material removed is collected and dumped at an appropriate waste collection site. The machine produces a texture that is extremely uniform in both the transverse and longitudinal direction.

Results

The work plan for this experimental feature states that a visual examination of the pavement will be made to determine if the Skidabrader treatment was successful in removing the

corduroy texture and reducing the glare. A copy of the work plan is included as Appendix A. Figures 1 shows the pavement prior to the use of the Skidabrader. The fins left by the diamond grinding are clearly visible, especially in the foreground of the photo.

Figure 1. Pavement prior to the Skidabrader resurfacing showing the fins left by the diamond grinding operation. July 1998.

Figure 2 shows the Skidabrader machine in operation and Figure 3 a close-up of the area where the steel shot impacts the pavement.

Figure 2. Skidabrader in operation. July 1998.

Figure 3. Close-up of Skidabrader showing the area just behind the where the steel shot impact the pavement. July 1998.

Figure 4 is a distance view of the pavement after treatment and Figure 5 a close-up showing that the fins of pavement have been reduced in size or completely removed.

Figure 4. Long distance view of the pavement after the Skidabrader. July 1998.

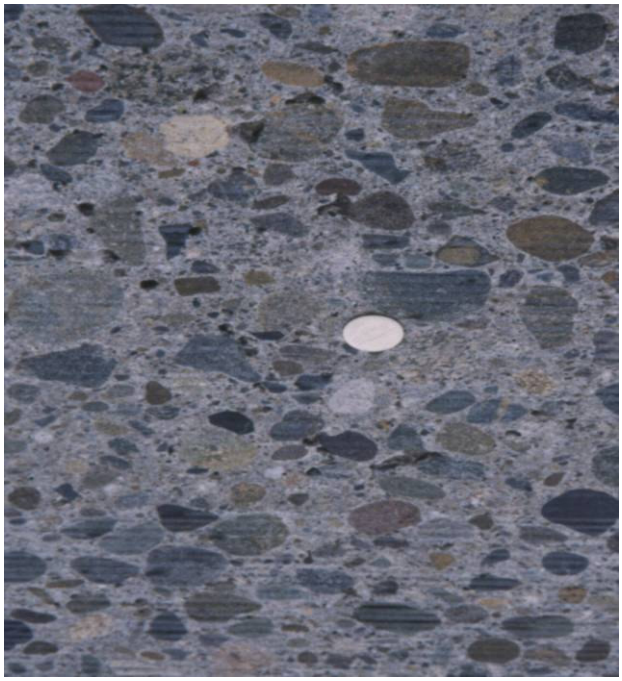

Figure 5. Close-up of showing absence of fins left by the diamond grinding. July 1998.

Evaluation

The photographs taken after the Skidabrader operation show the successful removal or reduction in size of the fins that were causing the lateral motion problems. There is no way to physically measure the effect that the treatment had on the glare problem or the lane visibility issue, but it can be deducted from the absence of further complaints from the public that these issues were also mitigated.

Although not required in the work plan, a check was made of the friction resistance of this pavement section after the treatment to determine if any improvement could be measured. Table 1 tabulates the friction numbers (FN's) for the years 1996 through 2004. The friction numbers in 1996, prior to treatment, averaged 35 with a range of 33 to 37. After treatment the FN's increased to an average of 44 and a range of 38-51. Since that time FN's have been in a slow decline back to pretreatment levels. This is not an uncommon trend on PCC pavements subject to the polishing action due to studded tires.

Table 1. FN values for the Skidabrader treated section of I-5.

Milepost	Direction	FN				
		1996	1998	2000	2002	2004
155.00	S	36	44	41	41	40
156.00	S	34	41	44	42	33
157.00	S	35	45	39	41	40
158.00	S	36	44	38	40	37
159.00	S	35	51	36	40	44
160.00	S	33	48	43	41	30
161.00	S	37	45	39	40	29
162.00	S	34	43	41	39	25
163.00	S	34	38	39	37	31
AVERAGE		**35**	**44**	**40**	**40**	**34**

Conclusions

The Skidabrader resurfacing was successful in removing the fins left by the previous diamond grinding operation. It also improved the friction resistance of the pavement to a minor degree. The use of the Skidabrader to fix the texture issues noted on this project is not a

common practice by WSDOT due to the rare occurrence of such problems from diamond grinding operations.

Appendix A

Experimental Feature Work Plan

PAVEMENT SURFACE TEXTURING USING THE SKIDABRADER

I-5
Tukwila to Lucile Street

Proposed to
Washington State Department of Transportation

By
Dennis Jackson, PE
Materials Engineer

Department of Transportation
Work Plan
For Pavement Surface Texturing Using The Skidabrader
I-5
Tukwila to South Lucile Street

OBJECTIVE

The primary objective of this experimental feature is to evaluate the effectiveness of the Skidabrader for providing a uniform surface appearance and reducing the surface glare that results from the grinding of concrete pavements. The skidabrader is designed to texture road surfaces by the use of a recycled steel abrasive media. The Skidabrader provides a fast and simple process to remove surface material without causing damage to the underlying surface.

Diamond grinding of concrete pavements in Washington state has been an integral part of the concrete rehabilitation process for the past 5 – 8 years. Numerous rehabilitation projects, which include diamond grinding, have been constructed across the state with very successful results. In the fall of 997 the concrete pavement on Interstate 5 from MP 153.94 to MP 162.48 (vicinity of Strander Boulevard to vicinity of South Lucile Street) was diamond ground to remove pavement wear. Following the completion of the project several complaints were received concerning the pavement ride (transverse motion), glare and inability to see the lane stripes by the traveling public. The transverse motion that was felt in part is due to changes in lane configurations, which in some places caused the new lane configuration to diagonally cross the grinding pattern. The other influencing factor is due to the fins that is the resultant of the diamond grinding process. The fins are developed due to the spacing of the gang mounted diamond blades. Typically, the fins are knocked down by traffic within tow to three months. However, on this project, the fins are still present, although to a lesser degree, after approximately 9 months. According to the project inspector this project was constructed within the required specifications. The pavement glare that exists on the finished pavement surface is a result of the diamond grinding process and has been experienced on all projects. In order to address the visibility of the lane stripes, the stripes on the 1997 project will be reapplied as part of the 1998 project with Durastripe, which will enhance the visibility of the lane markers. Visibility of the lane stripes may also be reduced due to variations in pavement surface texture and color.

Therefore, in order to minimize the amount of transverse motion, pavement glare, and improve the visibility on the lane stripes, texturing of the diamond ground surface with the Skidabrader will be evaluated for effectiveness.

PROJECT DESCRIPTION

At the time of this writing, the 1998 contract has not been submitted. However, the information provided below describes the 1997 contract to be Skidabradded as part of the 1989 project. If the Skidabrader provides an acceptable surface, it is anticipated that it will be used on the portion of the 1998 contract to be diamond ground, which is approximately 207,000 SY.

Contract Number:	4621
Title:	Tukwila to South Lucile Street HOV and SC&DI – Stage 3
Route Number:	5
Direction:	Southbound
County:	King
Location:	MP 153.94 to MP 162.48
F.A. Project Number:	ID-005-3(821) Unit 3 and IM-005-3(821) Unit 3
Lane Width:	varies

Plan Quantities:

Diamond Grinding:	75,806 SY
Skidabrader:	75,806 SY

CONTROL SECTION

A control section has not been established for this project. Diamond grinding has been performed on numerous projects across the state without significant problems with the corduroy surface, visibility of lane stripes, or pavement glare. Therefore, extensive data exists on this performance of a diamond ground surface.

TESTS

The desired result of a diamond ground surface is smoothness. However, in this case the main concern is the amount of lateral movement and pavement glare that is experienced by the users of the facility. WSDOT does not posses any equipment that is capable of measuring the degree of lateral movement or pavement glare due to a diamond ground surface. Therefore, the acceptance of this experiment will be based on the views and opinions of the Project Engineer.

REPORTING

A post construction report will be prepared that focuses on the ability of the Skidabrader to remove the lateral displacements and pavement glare that results from diamond grinding. This experimental feature will not add or reduce the performance life of a concrete pavement. The intended purpose of the Skidabrader is to improve the pavement texture.

STAFFING

The principal investigator for this study will be Linda M. Pierce, Pavement Management Engineer, FOSSC Materials Laboratory.

EQUIPMENT

The following is a list of equipment that will be used to accomplish this study:

1. Camera (35 mm)
2. State vehicle

CONSTRUCTION COSTS (ESTIMATE)

The material bid prices are as follows:

Item	Unit Cost	Quantity	Total Cost
Skidabrader	$1.25/SY	75,806 SY	$94,758
Skidabrader	$1.31/SY	206,829 SY	$270,946

Cost increase for the 206,829 SY is to mobilize additional equipment

DELIVERABLES

1. Post Construction Report