ROUGHNESS OF OVERLAYS ON BRIDGE APPROACHES AS AFFECTED BY PAVEMENT MILLING

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SUMMARY

Evaluation was made of the effectiveness of milling old asphaltic concrete surfaces for a short distance at bridge approaches in preparation for resurfacings. The results showed that such preparatory milling is highly effective in maintaining or improving pavement ride quality in the approach area.

While geometrics or other considerations might preclude its use, the milling method is recommended for consideration as a procedure for preparing bridge approach areas for the placement of overlays.

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INTRODUCTION

One of the most prevalent features of highway pavements that contributes to poor ride quality is that known as the "bump at the end of the bridge." While fill settlements etc. are generally recognized to cause undesirable distortions at bridge approaches, the roughness associated with asphaltic concrete resurfacing or multiple resurfacings in the approach area often is ignored. Such roughness occurs at the end of the overlay mat where it is necessary to abruptly stop the paving operation to avoid overlaying the concrete approach slabs or abutment areas.

The roughness associated with interstate bridges and their approaches became evident during the 1981-82 inventory of the condition of interstate pavements. During that inventory, Mays meter roughness tests were conducted on the entire system, including bridges. The analysis of the data showed that while the pavements on the interstate system average about 75 in./mi. roughness, the bridges and approaches average well over 100 in./mi.* This finding stimulated the researchers' interest in identifying procedures to alleviate the bridge roughness problem.

PURPOSE AND SCOPE

The purpose of the present study was to examine the effectiveness of one method used in an effort to minimize the roughness on asphaltic concrete overlays at bridge approaches (Figure 1a). The treatment consisted of milling and removing a section of existing pavement beginning 1-2 in. deep at the bridge abutment and tapering to nothing at about 10 ft. from the abutment (Figure 1b). Thus, a gradual transition was provided for the overlay. The procedure has been used occasionally in various areas of the state for some time and will be required on some resurfacing contracts during 1984. No realistic cost data are available, but can be developed from contract documents.

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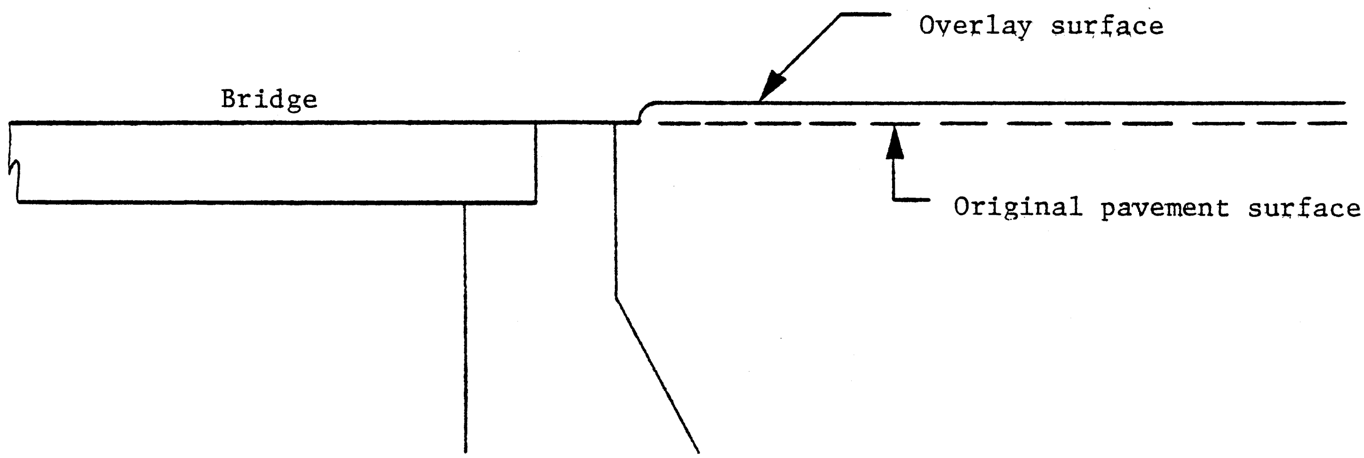
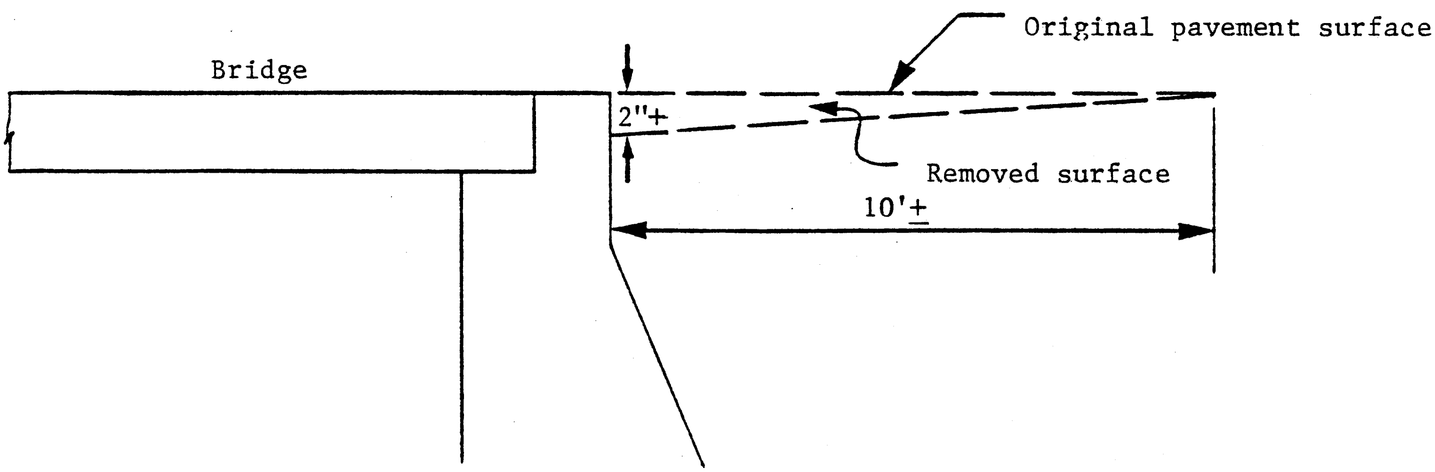
*Memorandum from H. H. Newlon, Jr. to Leo E. Busser III, August 12, 1982.



(a) Without treatment



(b) With treatment

Figure 1. Overlay on bridge approach.

EVALUATION PROCEDURE

To establish an evaluation procedure, twelve interstate bridges within the confines of 1983 scheduled pavement resurfacings were chosen for roughness testing prior to any preparatory treatment or resurfacings. Six bridges were scheduled for the preparatory treatment while six were chosen as control bridges to receive only resurfacing.

Each bridge and from 250 to 500 feet on either side of it, as indicated in Figure 2, were tested for roughness. The distance on either side is dictated by the nature of the Mays meter strip chart output, an example of which is shown in Figure 3. On that output, longitudinal distances are measured in 0.05-mi. increments. At least one full increment on either side of each bridge was considered as part of the bridge and approach area. Roughness tests were again conducted subsequent to the overlay in each case.

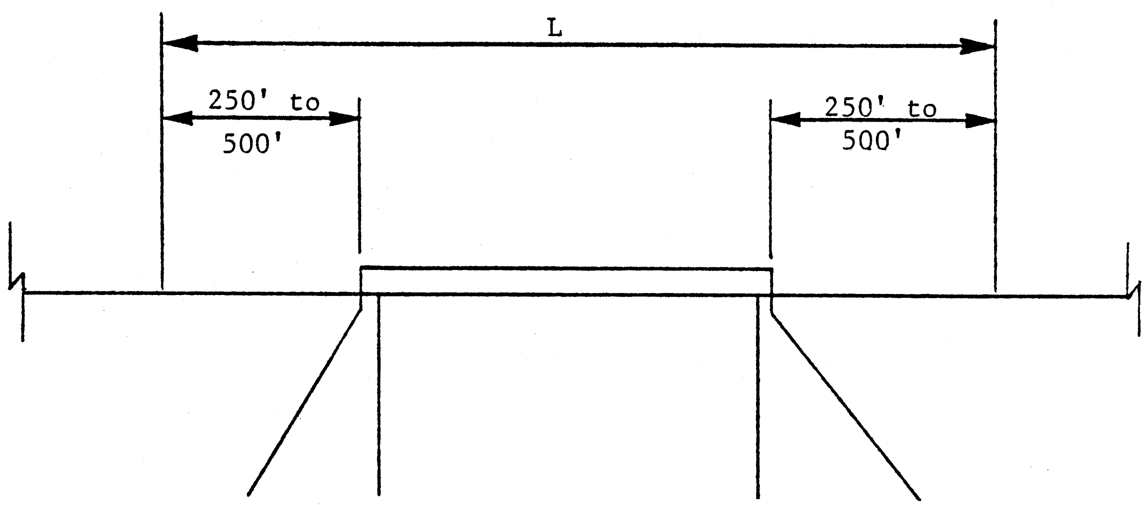


Figure 2. Bridge and approach area.

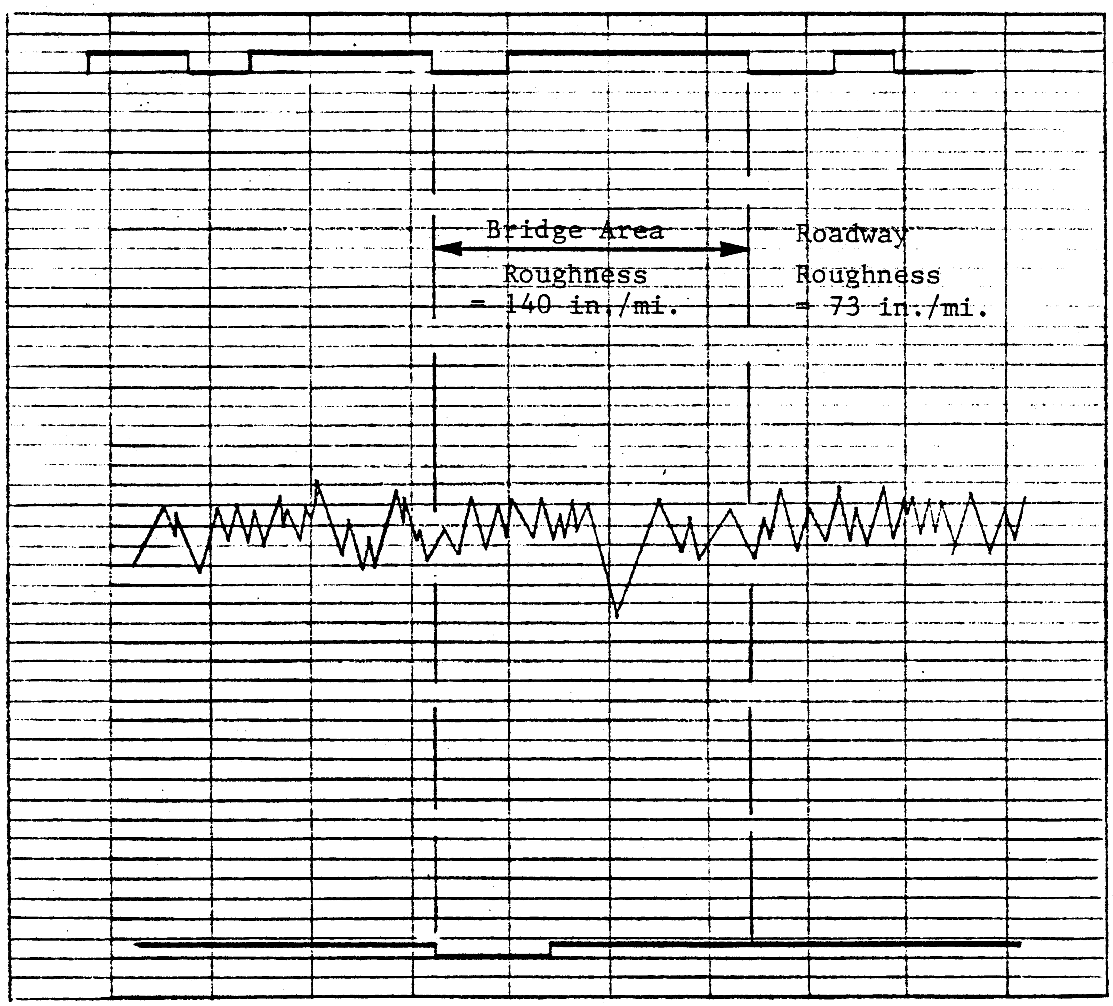


Figure 3. Typical Mays meter strip chart for bridge and approach area.

RESULTS AND DISCUSSION

The results of roughness tests conducted both before and after resurfacing on each of the twelve bridge approaches are shown in Table 1. Tabulated roughness values are averages of two repeat runs for each condition at each site. Fortuitously, the prepared and control sets of approaches had identical average roughness values before resurfacing began.

Table 1

Roughness Test Results

	Prepared Bridges		Control Bridges	
	Before (in./mi.)	After (in./mi.)	Before (in./mi.)	After (in./mi.)
	116	108	117	108
	90	93	95	104
	94	89	108	115
	91	91	83	97
	111	100	104	148
	123	101	116	114
Avg.	104	97	104	114

Note that in 4 of 6 cases the milling-resurfacing process resulted in a smoother ride than on the original surface. The average reduction in roughness was 7 in./mi., or about 7%. For the overlay only or control sites, 4 of 6 cases were significantly rougher after the overlay, while the average roughness increase was 10 in./mi., or about 10%. Statistical analyses showed that there was a 98% probability that the difference in roughness between the prepared and control bridges after resurfacing was real and not the result of chance variation.

While the method described is highly effective in improving the ride quality of bridge approaches, it is important to note that in all cases studied a previous overlay had been applied. In all probability the milling-resurfacing process would be even more effective if applied to the first overlay in bridge approach areas.

Finally, it should be noted that only interstate bridges were studied. It is entirely possible that geometrics, construction features of the bridge approach, or other factors might preclude use of the method in some instances.

CONCLUSION

The data discussed above show that pavement milling at bridge approaches in preparation for asphaltic concrete resurfacings is a highly effective means of retaining pavement ride quality in those areas.

RECOMMENDATION

While geometric or other considerations might preclude its use, the milling of asphaltic concrete surfaces at bridge approaches is recommended for consideration as a procedure for preparing those areas for resurfacing.