TECHBRIEF

Reducing Roughness in Rehabilitated Asphalt Concrete (AC) Pavements

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Introduction

How much do different rehabilitation treatments reduce roughness? The answer to this question can be found in a recently completed study entitled, “The Investigation of Development of Pavement Roughness.” Initiated by the Long Term Pavement Performance (LTPP) program, a component of this study investigates selected asphalt concrete (AC) rehabilitation treatment factors in reducing roughness. Specific factors considered include: overlay mix type (recycled and virgin), overlay thickness, and surface preparation of the existing AC surface prior to overlay (minimal and intensive preparation).

Key Findings

- Regardless of the roughness before overlay, the roughness for each test section at a site after the overlay fell within a relatively narrow band. The range of this band varied from project to project.
- Even thin overlays substantially reduced the roughness of a pavement.
- 85 percent of the sections that received either a 50-mm or 125-mm AC overlay had an the International Roughness Index (IRI) of less than 1.2 m/km.

Roughness Before and After Overlay

Figure 1 (on the following page) shows the roughness before and after rehabilitation for four Special Pavement Study (SPS)-5 projects. As you will note, regardless of the roughness before the overlay of a section, the roughness after the overlay for all treatments fell within a narrow band, which varied from project to project. Factors that could determine the range of this band include construction procedures, contractor capabil-

The Long-Term Pavement Performance (LTPP) program is a 20-year study of inservice pavements across North America. Its goal is to extend the life of highway pavements through various designs of new and rehabilitated pavement structures, using different materials and under different loads, environments, subgrade soil, and maintenance practices. LTPP was established under the Strategic Highway Research Program, and is now managed by the Federal Highway Administration

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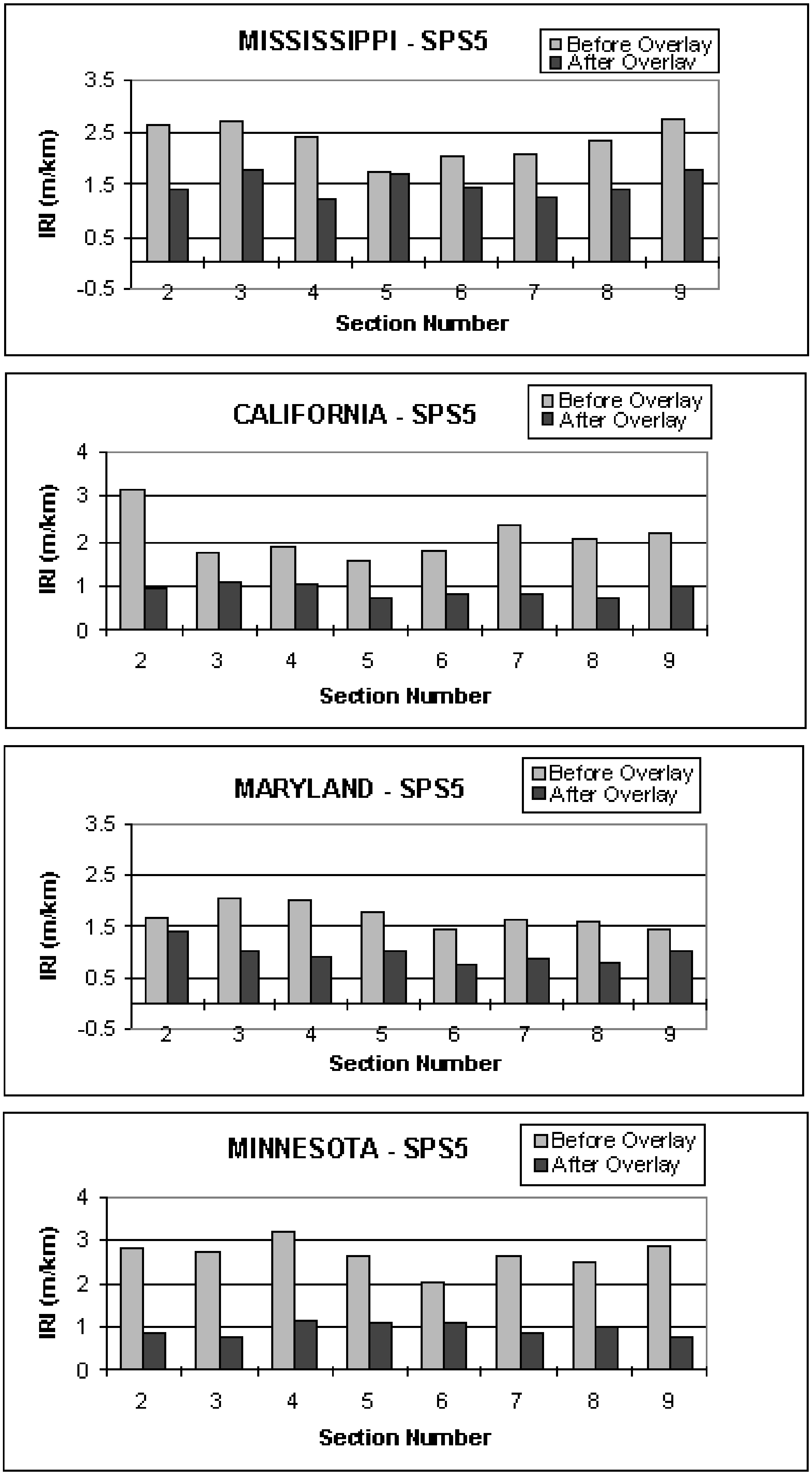
Figure 1. IRI before and after overlay for four SPS-5 projects.



ity, and the predominant wavelengths that contribute to roughness and are present in the pavement prior to overlay.

A comparison of the roughness after overlay for the test sections that received minimum and intensive surface preparation prior to overlay is shown in figure 2. The roughness values presented in this figure for each category of surface preparation is the average roughness computed from four test sections that are in each category. Overall, the average IRI values for the minimum and intensive surface preparation sections were close to each other, with the intensive surface preparation sections having a slightly lower IRI value for a majority of the sections.

Figure 3 shows the relationship between roughness before and after overlay for all sections. The sections that have an IRI before overlay of less than 1.4 m/km are from two projects. If the sections in these two projects are not considered, and only the sections that have an IRI greater than 1.4 m/km before overlay are considered, data in figure 3 show that there is no relationship between the IRI before and after the overlay. Thin overlays are seen to be capable of reducing the roughness of a pavement by a substantial amount in some cases. For example, figure 3 shows that in three sections that had IRI between 2.5 and 3 m/km, a 50-mm-thick overlay reduced the IRI to approximately 0.8 m/km.

Roughness After Overlay

A frequency distribution of the IRI after overlay for the test sections

Figure 2. Average IRI after overlay for sections receiving minimum and intensive surface preparation prior to overlay.

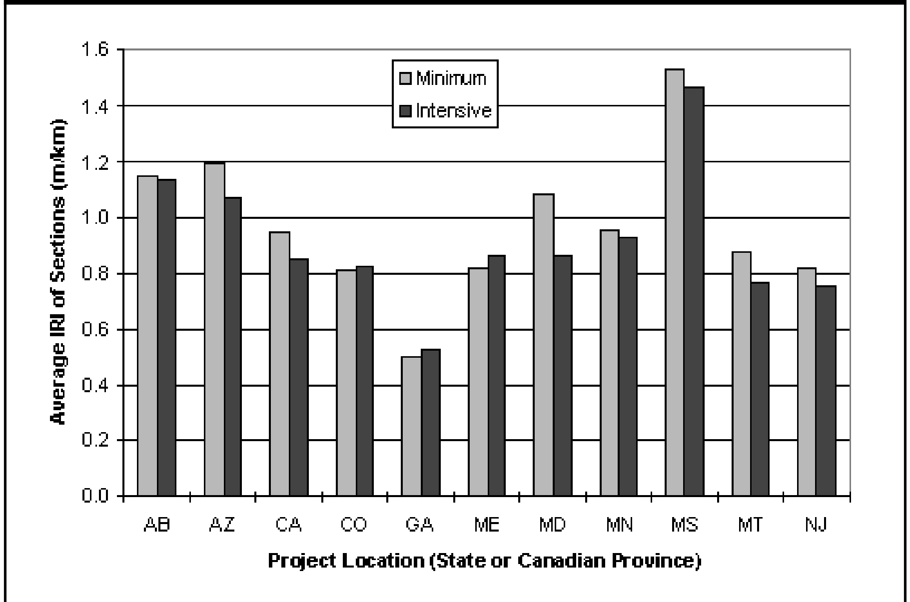


Figure 3. IRI before and after overlay.

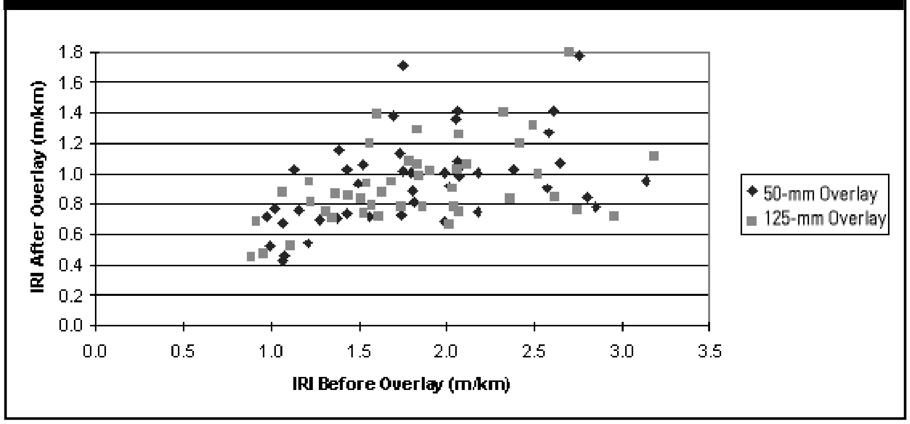


Figure 4. Frequency distribution of IRI after overlay for sections that received a 50-mm overlay.

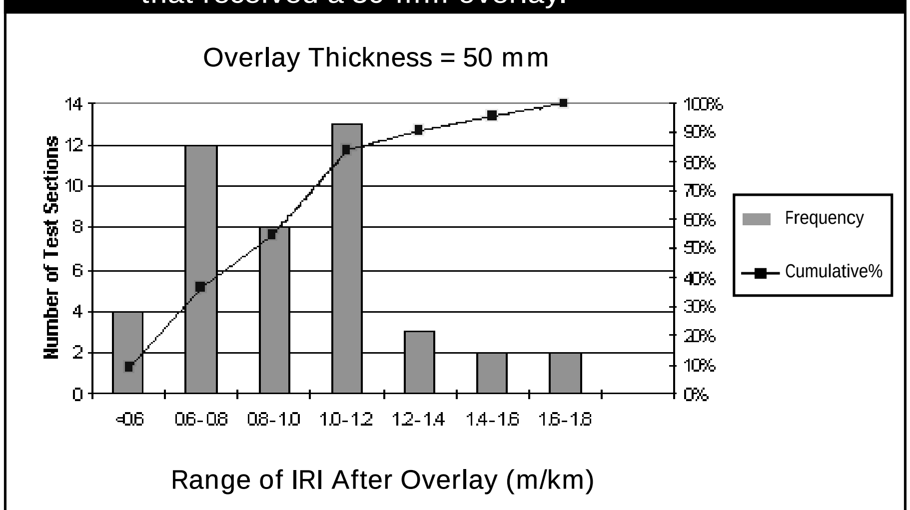
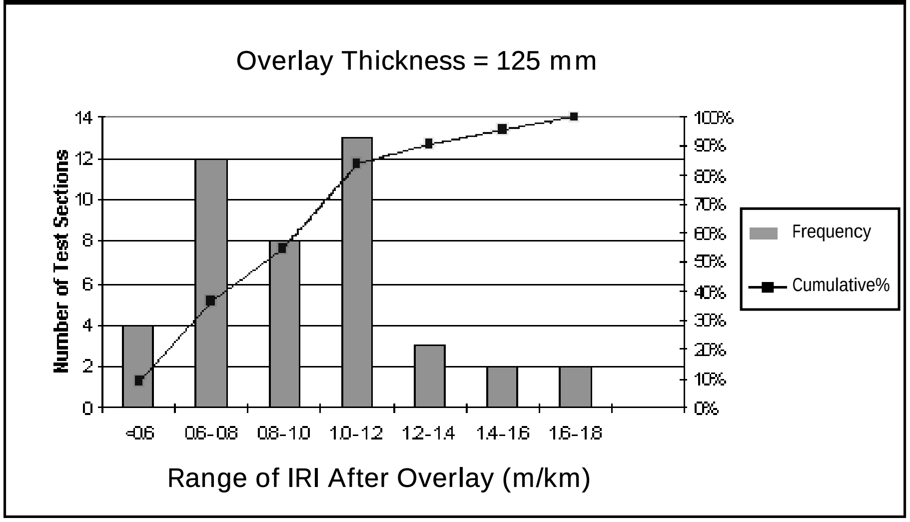


Figure 5. Frequency distribution of IRI after overlay for sections that received a 125-mm overlay.



that received a 50-mm overlay are shown in figure 4. This figure also presents the cumulative frequency curve, and shows that approximately 55 percent of the test sections had an IRI value of less than 1 m/km, while 85 percent of the test sections had an IRI value of less than 1.2 m/km.

A frequency distribution of the IRI after overlay of the test sections that received a 125-mm overlay is show in figure 5. The frequency distribution curve in this figure shows that approximately 65 percent of the test sections had an IRI after overlay of less than 1 m/km, while 85 percent of the test sections had an IRI after overlay of less than 1.2 m/km. These data indicate that in 85 percent of the cases the IRI of an overlaid pavement would be less than 1.2 m/km.

Summary

In general, overlays reduce pavement roughness. When specific rehabilitated SPS-5 project test sections were analyzed, roughness values fell within a relatively narrow band, regardless of the treatment type. The range of this band varied from project to project. Factors that are expected to influence the roughness value of an overlaid section include: profile of the pavement prior to overlay, the predominant wave lengths in the section that contribute to roughness, and the capability of the contractor placing the overlay.

Researcher: This study was performed by Soil and Materials Engineers, Inc., 43980 Plymouth Oaks Blvd., Plymouth, MI 48170-2584, Telephone: (734) 454-9900, Fax: (734) 454-0629. Contract No. DTFH61-95-C-00124.

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Availability: Copies of Report No. FHWA-RD-97-147, *Investigation of Development of Pavement Roughness*, are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. A limited number of copies are available from the R&T Report Center, HRD-11, FHWA, 9701 Philadelphia Court, Unit Q, Lanham, MD 20706, Telephone: (301) 577-0818, Fax: (301) 577-1421.

Key Words: Asphalt concrete pavement, overlays, pavement roughness.