UNIVERSITY of HOUSTON

PROJECT SUMMARY

Texas Department of Transportation

0-6752: Study of Short-Term Skid Improvements by Light Texturing with a Milling Machine

Background

Skid problems on roads can result from flushing and bleeding where excessive road-mix binder can accumulate on a road's surface as well as general wear of the surface by traffic. This may result in a polished surface that may increase the chances of accidents due to the reduced skid resistance. Strategies to address this problem include mill and fill or overlay rehabilitation but another cost-effective solution is to remove only the top portion of the surface course using light-texturing or micro-milling. Unlike a typical mill-and-fill operation, there is not an additional step in laying a new wearing course after milling has been completed. Instead, the newly exposed surface will already have the desired final texture and noise properties, and can be opened to traffic sooner. Some Texas districts have already implemented this technology and have achieved substantially improved skid resistance and reduced rutting with no detrimental effects to the existing pavement. However, these texturing improvements have not been studied to determine how well they improve skid and how long that skid improvement lasts.

What the Researchers Did

An extensive literature review was conducted to find out the best practice and the effect of light texturing method. The research team conducted a survey across all the districts in Texas to find out the availability of milling machine in each district and availability of test sections for milling. Four districts gave a positive response and are a part of the research project. Light texturing of pavement had been conducted at 31 sections across Texas. The research team visited each test section during the milling and used different configurations of milling depths and machine forward speeds. While sand patch test, circular track meter and 3D laser scanner were used to obtain the pavement surface texture, British pendulum and skid truck were used to obtain the skid resistance before the milling and at 0, 3, 6, 12, and 18 months after the milling. The tests are repeated three times at every test section for better accuracy. The mean profile depth (MPD) value is measured for left wheel path, right wheel path, and middle wheel path.

What They Found

Influence of Drum Type

The statistical analysis shows that sections milled with fine drums exhibited a higher skid resistance after milling. The data suggests an average positive skid number difference of 20.58 between the sections milled with finer drums and the sections milled with standard drums, while keeping the other factors unchanged. The data also shows that sections milled with fine drums exhibited a higher macrotexture over time. An average difference in MPD of 0.19 was evident after milling, assuming that all other factors remain unchanged. It is

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Project Completed:
08-31-2014

interesting to note that the rate of deterioration of skid resistance is higher in the case of seal coat and hot-mix asphalt (HMA) sections milled with finer drums relative to that of standard drums. This suggests that finer drums should preferably not be used on sections with initial lower skid resistance.

Influence of Forward Milling Speed

The modeling results indicate that the forward milling speed is positively associated with both skid resistance and macrotexture. In other words, higher milling speeds tend to produce surfaces with higher skid resistance and macrotexture. The results suggest that seal coats are not as sensitive as the hot mix sections to the forward milling speed in terms of improving skid resistance and macrotexture. Higher milling speed is clearly more beneficial on HMA surfaces than on seal coats. The deterioration trends corresponding to different speeds are separated by a vertical shift in the case of HMA sections. On the other hand, the deterioration trends of the seal coat sections are overlapping. The results thus highlight the benefits of employing higher milling speeds, particularly on the HMA sections.

While the results indicate the benefits of high milling speeds, practical limits should be imposed on these speeds as very high milling speeds produce surfaces that tend to be noisy and potentially create adverse conditions for motorcyclists in particular. Thus, a maximum forward milling speed that ensures adequate skid resistance without adversely effecting pavement noise and safety should be employed.

Service Life

An analysis of the skid resistance measurements over time on the sections evaluated as part of the study indicate that milled seal coats deteriorate more rapidly than HMA sections. The data suggests that milling operations on average provide an additional service life of about 12 months on seal coats, whereas milling on HMA sections extends the service life beyond 18 months. Linear extrapolation of the skid number data on the HMA sections indicate that these values would fall below 20 after about 2 years.

What This Means

Based on the statistical analysis of the skid resistance and macrotexture data measured on the seal coat and HMA sections evaluated as part of the study, the following light texturing guidelines are recommended:

1. Finer milling drums are recommended over standard milling drums if the sections have higher initial skid resistance (above 25 SN).
2. A forward milling speed of 70–80 feet per minute is recommended.
3. A depth of milling cut between 0.25 and 0.5 inches may be used on both seal coat and HMA sections.

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Keyword: Research