



# Project Summary

Texas Department of Transportation

## 0-4760: Evaluation of Methods to Measure Ride (Profile) and Cross Slope on New Base Course and Pavements

### *Background*

The Texas Department of Transportation (TxDOT) is implementing a ride specification that uses profile data collected with inertial profilers for acceptance testing of the finished surface. Since surface treatments comprise a significant percentage of the state highway network, improving the ride quality of these pavements is of concern to TxDOT engineers responsible for achieving ride quality standards. This project evaluated smoothness criteria for quality assurance (QA) testing of flexible base smoothness on surface treatment projects.

### *What the Researchers Did*

To assist TxDOT in developing and implementing a smoothness specification for surface treatments, researchers in this project:

- reviewed current district practices for quality assurance testing of ride quality during construction of surface treatments;
- collected ride data on finished flexible base courses and surface treatments to establish levels of ride quality that can be achieved on these pavements;
- conducted tests to verify the applicability of using inertial profilers for quality assurance testing of surface smoothness in a ride specification for surface-treated pavements;
- developed guidelines to account for the possible effect of surface texture on the international roughness indexes (IRIs) determined from profile measurements;
- provided guidelines for preparing the flexible base surface during construction; and
- participated in meetings between TxDOT engineers and industry representatives to discuss proposed provisions in the draft flexible base ride specification.

### *What They Found*

Based on analyses of laboratory and field test data, the following findings are noted:

- Contractors readily achieved the average IRI criterion of 125.0 inches per mile on construction projects tested by the districts. The projects covered 0.1-mile sections with average flexible base IRIs comparable to those of rehabilitated or newly constructed dense-graded hot-mix asphalt concrete pavements.

### *Research Performed by:*

Texas Transportation Institute (TTI),  
The Texas A&M University System

The University of Texas at Arlington (UTA)

### **Research Supervisor:**

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### **Researchers:**

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- While the proposed IRI criterion of 125.0 inches per mile is realistic to use for QA testing of flexible base ride quality, researchers found that a lower IRI criterion may be more applicable to specify, particularly for projects located in areas with conditions similar to those found in the Odessa District. Differences in soil support and terrain conditions between districts can appreciably affect the quality of placement of the base material. Additionally, the quality of workmanship will also affect the base roughness.
- Laboratory tests on specimens of simulated surface treatments demonstrated that the IRI determined from profile is influenced by surface texture. The same tests also demonstrated that TxDOT's new serviceability index (NSI) was insensitive to the texture of the specimens tested.
- The laboratory tests also showed that the IRIs computed from conventional and 19-mm wide-spot laser profiles showed a significant relationship with the mean texture depths of the specimens tested, whereas the NSIs computed from the same profiles showed no such relationship.
- The distributions of the NSIs computed on the flexible base layers and the surface course treatments exhibited more consistency between lifts compared to the corresponding distributions of the IRIs, which showed more differences between lifts.

## What This Means

The following conclusions and recommendations are made:

- The requirements for quality assurance testing as given in the draft specification are appropriate to implement for acceptance testing of the ride quality of flexible base on surface treatment projects.
- Researchers recommend an NSI check for 0.1-mile sections that fail to meet the average IRI criterion of 125.0 inches per mile. In some situations this criterion can be reduced to lower IRI levels. Specifically, if the NSI determined from the measured profiles is greater than 3.40, it is recommended that the engineer be given the option to accept the section. Otherwise, the section should be corrected as required in TxDOT's flexible base ride specification.
- Each district implementing the specification should create and maintain a database of IRIs and NSIs from QA tests done on flexible base ride projects. TxDOT can use the database in the next specification review cycle to determine if and what changes are needed.
- TxDOT engineers should monitor the placement of flexible base to ensure that techniques used to create a smooth base surface do not result in a weak interface that may be detrimental to the performance of the surface treatment.
- Given that the IRI criterion in the flexible base ride specification was established based on inertial profile measurements with conventional lasers, researchers recommend that TxDOT conduct comparative profiler testing to determine the applicability of using profilers equipped with wide-spot and multi-point lasers for QA testing under TxDOT's current ride specifications.

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