Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

# 0-6746: Validation of TxDOT Flexible Pavement Skid Prediction Model

## Background

Pavement skid resistance is primarily a function of the surface texture, which includes both microtexture and macrotexture. Previously, under Texas Department of Transportation (TxDOT) Research Project 0-5627, researchers developed a method to predict asphalt pavement skid resistance based on inputs that describe aggregate texture before and after polishing, gradation of asphalt mixture, and traffic levels.

This study had two main objectives:

- Investigate and examine surface and friction characteristics of 35 test sections of asphalt mixtures and 35 test sections of surface-treated roads in Texas. The test sections covered a wide range of mixtures and aggregate types used in Texas.
- Validate and revise the skid prediction model for hot-mix asphalt (HMA) and develop a prediction model for skid resistance of seal coat surfaces.

## What the Researchers Did

Researchers developed an experimental design to validate and revise the existing skid prediction model for HMA pavements and developed a new skid model for seal coat surfaces. Researchers selected test sections covering a wide range of asphalt mixture types, seal coat sizes, aggregate sources, age of pavement, and traffic levels. Researchers measured pavement macrotexture and microtexture of the selected sections using the circular texture meter and dynamic friction tester. Skid numbers were obtained from TxDOT's Pavement Management Information System database and also measured using a skid trailer. Aggregate texture and angularity were quantified using the aggregate image measurement system before and after polishing with the micro-Deval device. Additionally, construction history and materials information was gathered.

Statistical methods were used to develop a prediction model for skid number, and the predicted values were compared to the measured ones in the field. The skid prediction model developed for HMA in TxDOT Research Project 0-5627 was revised. The revised model describes the skid resistance of asphalt pavements as a function of aggregate characteristics, mixture gradation, and traffic level. The researchers incorporated aggregate angularity as an additional parameter in the models. Similarly, the researchers developed a skid prediction model for seal coat surfaces using the same parameters.

Researchers developed a Microsoft Access®–based Visual Basic software application to incorporate the skid predictions models. Using this Windows®-based standalone application,

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users can input the basic aggregate characteristics and traffic level to predict the asphalt pavement's skid resistance during its service life. The application can save the inputs/outputs of different trial runs in a spreadsheet and print.

## What They Found

The results showed good correlations between the developed skid prediction models and experimental measurements. The models incorporate parameters that describe aggregate texture and angularity, aggregate gradation, the polishing susceptibility of the aggregates, and traffic level. This is why some aggregates performed poorly in certain mixtures, while their performance was acceptable in other mixtures. Asphalt mixtures prepared with coarse aggregate gradations had higher macrotexture and high skid resistance compared to asphalt mixtures with fine aggregate gradations. In addition, asphalt mixtures prepared with aggregates with rough surface texture had higher skid resistance. The seal coat Grade 3 was found to yield higher mean profile depth and skid number compared to other seal coat grades. Meanwhile, the skid value of seal coat sections depends highly on the quality of design and construction. Asphalt bleeding can drastically reduce the skid resistance on seal coat surface regardless of the quality of aggregate.

## What This Means

The revised skid model for HMA and the newly developed model for seal coat are promising methods to predict the asphalt pavement skid resistance over its service life. Using these methods, the design engineer can select appropriate aggregate source(s), mixture gradation, or seal coat gradation to ensure adequate skid resistance during the service life of the pavement. A pavement can also be classified based on the threshold skid numbers and the predicted skid number at certain point of it service life. A maintenance engineer can benefit by using this program to determine when a corrective measure is needed by predicting the skid numbers down the road.


### For More Information

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