



OKLAHOMA Transportation

Office of Research and Implementation FFY2027 Request for Proposals

Reference SPR Item # 2504

Research Problem Statement Title:

Evaluating Pavement Friction using Dynamic Friction Tester (DFT)

Problem Statement:

Pavement surface friction or skid resistance is critical for improving driving safety and/or reducing highway crashes, especially during wet weather. It is important to periodically evaluate the frictional characteristics of pavement surface to ensure driving safety. In addition, the statewide implementation of the Balanced Mix Design (BMD), which may necessitate increased binder and higher reclaimed asphalt pavement (RAP) content in surface mixtures, needs to be evaluated for frictional characteristics. However, the current asphalt mix design procedure of ODOT does not directly consider friction as a requirement.

Currently, ODOT uses OHD L-25 to determine the insoluble residue of aggregates as an indicator of aggregate friction. In this method, crushed aggregate samples are soaked in hydrochloric acid solution, followed by washing, sieving, and drying. Finally, the insoluble residue percentage is determined as the final parameter. A higher insoluble residue content indicates less polish-susceptible aggregates and, therefore, greater skid resistance. However, this method does not accurately represent the field friction-loss mechanism; thus, it is unrealistic to link it to actual skid resistance. The Dynamic Friction Tester (DFT) method (ASTM E1911) is a friction-testing system for both laboratory and in-place pavement surfaces. This method provides consistent measurements over a range of speeds. Additionally, the method is quick and easy to handle, making it popular with the paving community. Test specimens can be simulated or conditioned for various levels of

traffic loading using the Three Wheel Polishing Device (TWPD), developed by The National Center for Asphalt Technology (NCAT). The conditioned/polished slabs are then tested using DFT to evaluate friction. Recently, Maryland DOT started using a modified version of this test method to measure the Dynamic Friction Value for aggregates using the TWPD and DFT.

Proposed Research:

The primary focus of this research will be to evaluate frictional properties for asphalt mixes during the mix design phase and develop a potential friction threshold for ODOT asphalt mixtures. For this purpose, asphalt slabs with target air voids at construction will be evaluated using a DFT. Friction loss due to aging and wear will be simulated using a TWPD. Friction values of commonly used Oklahoma asphalt mixes with varying mixture types, aggregate mineralogy, and RAP contents will be determined. The effects of asphalt binders, aggregate, and mix properties will be investigated. Also, the applicability of the DFT method will be evaluated for in-place friction measurement. Several newly constructed field sections could be selected for this purpose. The changes in friction values in these field sections will be monitored over service life. A comparison between laboratory and field measurements will be conducted, and a threshold friction value will be proposed as a screening parameter during mix design. The study will also answer whether the insoluble residue values correlate with friction values.

Suggested Tasks (to include but not limited to):

To achieve the project objectives, the following tasks are proposed:

Task 1: Conduct a literature review on asphalt surface friction

Task 2: Collect representative mix samples.

Task 3: Evaluate the friction value using DFT at different polishing levels

Task 5: Conduct DFT on selected newly constructed field sections.

Task 6: Analyze laboratory and field friction with various mix properties

Task 7: Develop implementation guidelines on DFT use and potential revisions to specifications.

Implementation:

This work will provide DFT implementation guidelines that could lead to the revision of ODOT's Materials & Testing Guide for screening of asphalt mixes.

Benefits:

Ensuring adequate friction on the asphalt pavement surface can reduce traffic accidents, frequently observed in wet weather. Expanding ODOT's options for friction testing of asphalt mixes during the mix design stage and in-service pavement could provide a more comprehensive picture of friction performance. Using a friction threshold could be used to screen mixtures with greater skid resistance. With more tools to measure friction, safety can be evaluated more accurately and efficiently.

Deliverables:

All projects require the submission of the following reports:

- Monthly Progress Reports
- Multi-Year Projects require a Year-end Annual Report
- Copies of the project Draft Final Report in Microsoft Word and ADA accessible Adobe Acrobat .pdf electronic formats
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The Year-end Annual Report, Draft Final Report, Final Report and Color Article should be submitted to satisfy all federal and state requirements pertaining to the accessibility of documents including but not limited to:

- Oklahoma State Statute 62 § 41.5e and the Americans with Disability Act (ADA) of 1990, 42 USC 12.01 et seq.

The PI must also participate in the following project meetings:

- New project initiation meeting
- Semi-annual project meeting
- Close-out project meeting
- Continuing project meeting

Estimated completion time eighteen (18) months.