

# EVALUATION OF VARIABLE FRICTION PROPERTIES OF FDOT FRICTION COURSES: PHASE I

## PROBLEM STATEMENT

Friction courses are placed on state roadways in Florida to provide frictional characteristics to the pavement so that under normal conditions drivers will not experience loss of control as a result of roadway conditions. On high-speed, multi-lane facilities, open-graded friction courses (FC-5) are specified to provide an open texture to allow water to be transmitted away from tire contact surfaces. These surfaces help reduce hydroplaning and the amount of spray produced by vehicles, and thereby enhance safety. Dense-graded friction courses (FC-6) are typically specified for all other state-owned facilities.

Historically, the mean Friction Numbers ( $FN_{40R}$ ) for surface courses in Florida have generally been satisfactory. However, on occasion, these surfaces have exhibited less than desirable frictional properties, prompting costly remedial measures in some cases. Although in recent years specification revisions have been implemented to improve the performance of FDOT friction courses, some have speculated that there has been an increase in variability in  $FN_{40R}$ . This perceived increase in variability has not been confirmed, however.

## OBJECTIVES

Others have documented that the performance of friction courses, in relation to wet-weather crash rates, is a complicated function of driver and vehicle characteristics, pavement geometry, traffic volumes, environmental conditions, and other project specific variables; in addition to pavement mix design and material properties. Each of these variables is continuously being evaluated by FDOT in an attempt to improve safety. This phase of study focused primarily on test methods, materials, and mix design issues as they relate to  $FN_{40R}$ . The primary objective of this research effort was to conduct a thorough literature and in-house data review, and to document the statistical variability of existing  $FN_{40R}$  data, with an emphasis on the new FC-5 and FC-6 designs.

## FINDINGS AND CONCLUSIONS

The results of this study provide evidence that recent specification changes made to improve the performance of FDOT friction courses have not significantly increased the variability of  $FN_{40R}$  values on Florida roadways. *There is no statistical evidence of increased variability in  $FN_{40R}$  as a result of switching from FC-2 and FC-3 designs to the new FC-5 and FC-6 designs.*

Recent technological advances in mobile testing equipment, specifically lasers, now make it possible to measure pavement texture in conjunction with friction data. It is recommended that

further research into the measurement of pavement texture through instrumentation of a skid-test vehicle with state-of-the-art laser technology be pursued as soon as possible. This advanced technology will ultimately enhance the safety and productivity of the existing FDOT skid-testing program.

There is also great potential for implementation of supplemental laboratory testing to further characterize the polish/friction potential of aggregate sources throughout Florida. Recommended laboratory test methods to be considered include the Accelerated Polishing Wheel, the British Pendulum Tester, and petrography, among others. This testing is currently being performed extensively in other limestone states (e.g., Texas, Alabama) and has exhibited great promise in differentiating frictional performance of aggregates at the source. Such data will soon become exceedingly valuable as FDOT attempts to implement warranty specifications and seeks to define performance in terms that can be readily quantified.

Finally, based on the results of this evaluation, it is recommended that a comprehensive monitoring program be initiated to track the durability and performance of both FC-5 and FC-6 surfaces, as these mixes are increasingly placed throughout the state. FDOT State Materials Office personnel have boldly initiated such an effort already, but the amount of data to be collected will quickly become too cumbersome to manipulate in local spreadsheet applications. It is proposed that an interactive database be developed to readily provide authorized users access to project, mix design, aggregate mine source, and materials test data from a single location. The absence of such comprehensive data was found to be a significant impediment to this study.

## **BENEFITS**

The results of this study will ultimately benefit the Department through incremental improvements in advanced testing, data collection, and implementation of state-of-the-art technology related to pavement friction characteristics. Implementation of the recommended suite of laboratory tests for friction aggregate sources could provide both FDOT and contractors with added confidence in material selection. This added confidence could facilitate the implementation of contractor warranty and performance specifications. The development of the recommended interactive database could further provide authorized users access to project, mix design, aggregate mine source, and materials test data from a single location. This single source of data would greatly enhance the ability to identify causes of problems, if and when they arise. Finally, making use of state-of-the-art texture measurement technology will ultimately enhance the safety and productivity of the existing FDOT skid-testing program.

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