Florida Department of Transportation Research

Harmonization of Texture and Skid-Resistance Measurements
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Measuring friction has become an important tool in managing pavement surfaces and addressing state agencies' concerns about travel safety and efficiency. Friction measurements are being used to identify potentially hazardous conditions, to determine and monitor friction characteristics of in-service pavement surfaces, and to assess rehabilitation and maintenance needs. The Florida Department of Transportation (FDOT) typically assesses skid resistance of roads by measuring their Friction Number (FN) using a high speed locked-wheel testing device and surface mean profile depth (MPD) with an onboard 64 kHz laser. Measurments can also be made using site-specific equipment, such as the dynamic friction tester (DFT) for friction and circular track meter (CTM) for MPD. Whether high speed or site specific, both types of measurements are related to basic surface properties, such as macro- and microtexture. It would be ideal to relate friction number and texture methods and measures to develop an International Friction Index (IFI).

Friction varies with speed, and the standard speed for measuring FN is 40 mph (FN40R). However, safety often makes it impractical to tow the locked-wheel friction tester at that speed, and so testing at variable speeds has been investigated by FDOT. The American Society for Testing and Materials (ASTM) has endorsed this concept with the publication of a standard method for the calculation of the International Friction Index (IFI) as described in ASTM E 1960.

IFI can also be derived using the CTM and DFT. In previous work for FDOT, this project's researchers from the University of North Florida demonstrated that a 64-KHz, non-contact laser system could repeatably and accurately measure pavement macrotexture in terms of MPD at highway speeds. A repeatable measure of MPD and wet friction allows IFI to be approximated in accordance with ASTM E 1960.

This truck is hitched to the small trailer containing the locked-wheel device used to measure the Friction Number of a roadway surface.

In this project, researchers explored whether it was possible to "harmonize" the various approaches to skid-resistance measurements on Florida roads and whether IFI could replace FN as the primary characterization of skid-resistance.

The researchers confirmed that CTM results are highly correlated with the 64-kHz, high-speed laser texture measuring device. The DFT was also found to provide a reasonable correlation with the FDOT full-scale, locked-wheel friction tester. However, the speed gradient obtained from DFT test data was not found to be well-correlated with pavement texture (MPD). Since this correlation is fundamental to the use of IFI, as described in ASTM E 1960, the researchers concluded that IFI cannot be implemented in Florida at this time without significant reservations.

Results led to a practical method for measuring pavement friction and texture at variable highway speeds with the FDOT locked-wheel friction tester and the ribbed tire. Since ribbed-tire test results are strongly influenced by pavement microtexture, and MPD is a direct measure of pavement macrotexture, FN40R and MPD data may be readily used together to fully characterize frictional properties on Florida roadways.

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