RESEARCH
PROJECT CAPSULE [12-5P]
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TECHNOLOGY TRANSFER PROGRAM

Evaluation of DOTD Aggregate Friction Rating Table by Field Measurements

JUST THE FACTS:

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POINTS OF INTEREST:

Problem Addressed / Objective of Research / Mehodology Used / Implementation Potential

PROBLEM

To ensure sufficient pavement skid resistance, the Louisiana Department of Transportation and Development (DOTD) currently uses the aggregate friction rating table (Table 1), which is based on the polished stone value (PSV) of coarse aggregates, as the only surface friction guideline in a wearing course mixture design. However, this practice has two drawbacks. First, the PSV is only one of many factors that can affect pavement surface friction. Field applications have shown that some aggregates with lower PSVs performed satisfactorily during a 10-year service period on an interstate highway in Louisiana. Second, the PSV test has a poor reproducibility and is time-consuming. The aforementioned first weakness was also confirmed by the research results of the recently completed LTRC research project 09-2B: Development of Surface Friction Guidelines for DOTD. The laboratory results of that study indicated that low skid-resistant aggregates could be used for a wearing course mixture design and produce a satisfactory level of surface friction as required when blended with high skid-resistant aggregates. Therefore, there is a need to modify the current aggregate friction rating table by using the indices that can reflect the real field friction performance with proper threshold values. In this way, the Department will have the flexibility to specify aggregates for asphalt mixtures with various qualities to achieve better cost-benefit ratios.

Table 1
Aggregate friction rating
[after Louisiana Standard Specifications for Roads and Bridges (2006), Table 502-3]

Friction Rating	Allowable Usage
I [(a)]	All mixtures
II [(b)]	All mixtures
III [(c)]	All mixtures, except travel lane wearing courses with plan ADT greater than 7000
IV [(d)]	All mixtures, except travel lane wearing courses

Note: (a) PSV > 37; (b) 35 ≤ PSV ≤ 37; (c) 30 ≤ PSV ≤ 34; (d) 20 ≤ PSV ≤ 29

OBJECTIVE

The objective of this research is to evaluate the current DOTD coarse aggregate friction rating table and provide recommendation/revision of frictional mix design guidelines based on a new set of laboratory friction measurement devices—the dynamic friction tester (DFT) and circular texture meter (CTM).

METHODOLOGY

Field tests will be carried out to collect the pavement surface friction and texture data from a number of selected pavement sections with typical wearing course mix types currently used in Louisiana, such as Superpave, stone matrix asphalt (SMA), and open-graded friction course (OGFC). The coarse aggregate type, traffic volume, and geographic location will also be included

in the selection of pavement sections. Each field test section will be 1000-ft. long without a sharp curve, steep grade, or intersection. A suite of field friction and texture testing devices (Figure 1), including the Locked-wheel Skid Trailer (LWST) with both smooth and ribbed tires, high speed laser profiler, DFT, and CTM, will be used in this study. Figure 2 presents a proposed field testing plan on a typical test section. In addition to the field tests, a number of new pavement construction projects will be chosen to investigate the differences of surface frictional characteristics between the laboratory and field compaction methods.

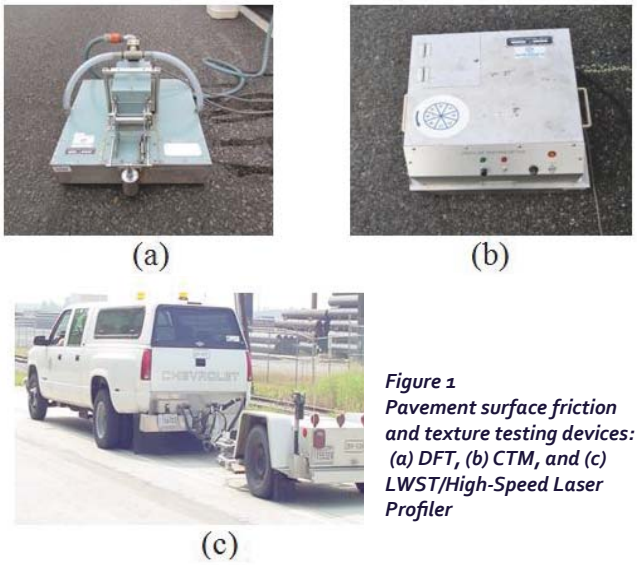

Figure 1
Pavement surface friction and texture testing devices: (a) DFT, (b) CTM, and (c) LWST/High-Speed Laser Profiler

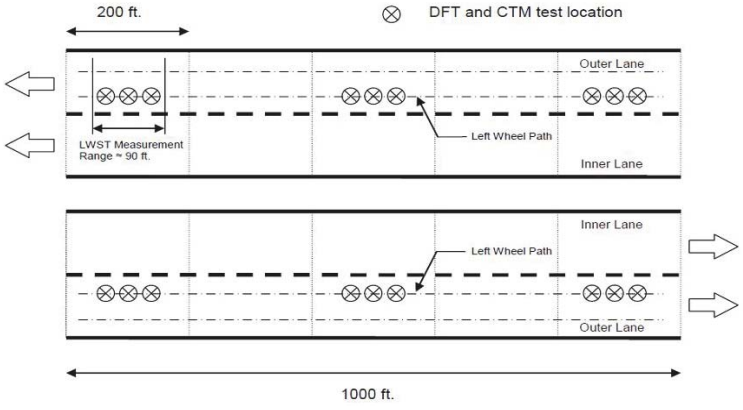

Figure 2
Field testing plan on a typical test section

A comprehensive statistical analysis will be performed on the data collected. First, the degradation of pavement friction and texture due to traffic polishing will be evaluated based on different types of mixes and aggregates. The results will be used to evaluate the current DOTD friction rating table. Second, a number of necessary statistical correlations will be developed: (1) the correlation between the pavement surface textures measured from the high-speed laser profiler and the CTM; (2) correlations among different friction numbers [e.g., F60, skid number (SN), and DFT] and surface textures; (3) correlations among the skid number measurements obtained from both ribbed and smooth tires at different speeds; and (4) the relationship of the measured surface frictional characteristics between the laboratory- and field-compacted asphalt concrete mixtures. Finally, the aforementioned correlations and analysis results will be used to (1) validate and update the correlations developed under the 09-2B study; (2) provide recommendation/ revision of frictional mix design guidelines based on the measurements from both DFT and CTM; and (3) develop useful correlations to assist in analyzing field test data and historical friction and texture test data for DOTD.

IMPLEMENTATION POTENTIAL

By the end of this study, a new friction mix design criteria table based on DFT and mean profile depth (MPD) measurements will be developed. This new friction criteria table may be directly implemented into the design procedure by DOTD. In addition, a calibrated friction mix design procedure for typical wearing course mix types in Louisiana may be used in the analysis of pavement preservation projects and implemented into the pavement management system for the purpose of providing a safer asphalt pavement surface.