Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6619: Evaluation of Skid Measurements Used by TxDOT

Background

Accurate estimates of wet roadway friction are critical to the safety of the traveling public, project selection, and management of the wet weather accident reduction program. Currently, Texas is the only state that uses a one-channel, torque-type wheel transducer to measure the drag force. The Texas Department of Transportation (TxDOT) uses the measured horizontal drag force and the computed value of the dynamic vertical wheel load to determine the skid number from its ASTM E274 friction measurement system. This research project evaluated TxDOT's existing method for measuring pavement surface friction.

What the Researchers Did

The researchers:

- Conducted a literature review of past projects that investigated the accuracy of one-channel locked-wheel skid systems.
- Developed a test plan for collecting data to investigate differences between one- and two-channel locked-wheel skid measurement systems.
- Conducted full-scale field tests to compare skid numbers between one- and two-channel systems.
- Analyzed the experimental data.
- Conducted a comparative evaluation of locked-wheel and fixed-slip systems.
- Identified options and provided recommendations for improving TxDOT's current method of collecting skid data to support pavement management activities based on findings from the comparative field evaluations.

What They Found

The researchers found:

- In a tangent mode of operation, the TxDOT E274 systems meet all requirements of the ASTM E274 standard in flat, straight sections with cross-slopes of 1 percent or less.
- Horizontal curves were found to produce significant differences, with the data showing a difference of about 6 percent per 0.1 g of lateral acceleration between one- and two-channel locked-wheel skid numbers. Thus, to remain under the 2 percent tolerance of ASTM E274, the lateral acceleration would need to be less than 0.033 g.
- On vertical curves, both computed and empirical data show a difference of about 10 percent in skid number per 0.1 g of acceleration between the one- and two-channel methods. Thus, to remain under 2 percent, the vertical acceleration would need to be less than 0.02 g.
- Skid numbers (SNs) from locked-wheel trailers and highway friction tester friction numbers showed reasonable correlations on sections that covered a good range of friction values.
- SNs from locked-wheel trailers are consistently lower than corresponding numbers from the fixed-slip system by a

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factor of about 0.67 from the tests conducted in this project. Considering data from other tests, this factor was found to vary over a narrow range, from 0.62 to 0.70.

- Pairwise comparisons of the friction values from the locked-wheel and fixed-slip systems showed better correlations on tests performed at the skid calibration pads, which provided a more controlled test environment in comparison to the runs made on in-service pavement sections.
- The international friction index standard transforms the friction values from the locked-wheel and fixed-slip systems to a comparable scale.

What This Means

With respect to improving the department's current skid measurement capability and reducing maintenance requirements, the researchers recommend that TxDOT:

- Convert the current fleet of one-channel locked-wheel skid trailers to two-channel systems that provide direct measurement of vertical load. In this regard, the researchers recommend that TxDOT consider replacing the existing systems with commercially produced ASTM E274 systems that are designed to meet all ASTM requirements. Figure 1 illustrates a commercially available ASTM E274 system.
- Purchase at least one fixed-slip system to support project-level forensic investigations. In the researchers' opinion, continuous friction measurements are most useful for this type of investigation as well as other project-level applications.

Figure 1. New ASTM E274 Skid Measurement System.

For More Information

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