SURFACE CHARACTERISTICS OF FLEXIBLE PAVEMENTS

Background

Pavement surface characteristics include ride quality, frictional resistance, hydroplaning potential, texture, sound absorption properties, and overall pavement performance. Growing interest in pavement surface characteristics and concerns about safety, traffic noise and performance has resulted in focused pavement research.

Research shows that porous pavements absorb more traffic noise than normal pavements. There is an optimal porosity for durability and sound attenuation characteristics. In general, pavements with smaller aggregates and more open surface textures provide more noise reduction than a typical dense-graded Hot Mix Asphalt (HMA) mixture. How they perform over time depends on their ability to maintain porosity.

In order to design durable pavements with the optimal characteristics for noise, safety and ride, the interaction among surface characteristics and their relationship to mixture type must be better understood.

Flexible pavements are distinct because they deform under loading and aging over time. This five-year study focuses on pavement surface characteristics of new flexible pavements. It will evaluate how they change over time and affect overall pavement performance. The study also hopes to investigate surface parameters in new pavement surfaces and optimize the most desirable of the characteristics.

The study was initiated by researchers in the Mn/DOT Office of Materials and Road Research and is being conducted in partnership with FHWA and the Minnesota Local Road Research Board.

Project Goals and Objectives

The goal of this research project is to measure and evaluate surface characteristics, especially the degree of noise attenuation provided by various HMA pavements at MnROAD.
Specific objective are:

- Create test sections of various HMA mixes to provide initial conditions that were not obtained in MnROAD Phase 1 cells that are also periodically monitored.
- Study friction, long-term flexibility, texture degradation, acoustic durability, ride quality, sound intensity, sound absorption, and hydraulic conductivity trends of various textures and surface types.
- Develop relationships and algorithms for optimization of friction, noise, smoothness, and long-term prediction models with the ultimate goal of designing safer and more durable HMA pavements.

The Experimental Plan

Several HMA cells were constructed at MnROAD in 2008, with various asphalt mix designs and surface types. These include:

- Porous Asphalt;
- Novachip;
- 4.75 mm Superpave, and;
- several fine graded mixes with various binders and aggregates.

Measuring sound absorption using Sound Impedance Tube

These cells were constructed for other research studies, but MnROAD staff will also study their surface characteristics for this project. One of the goals of this project is to track the change in pavement surface characteristics over time.

In order to do that, pavement sections will be monitored seasonally and annually throughout this five-year project. For example, MnROAD staff will measure noise with an on-board sound intensity system (OBSI), and will also measure friction. The project team will use laser-equipped devices to monitor texture and ride quality. They will use tools like a circular texture meter, and a lightweight pavement surface profiler. The team will also measure the amount of sound each pavement absorbs (see photo below). Other members of the project team will perform semi-annual long-term pavement performance surveys to monitor pavement wear (raveling and cracking) and assess pavement durability.

Project Status

The pavement test cells were constructed at MnROAD in 2008. Various surface characteristic measurements occurred in 2008 and 2009. Seasonal measurements of noise, texture, friction, ride quality, and durability are scheduled to occur throughout the life of the five-year project. Final project results will be published in 2013.

For more information:

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