

0-7025: Develop Surface Aggregate Classification of Reclaimed Asphalt Pavement

Background

Pavement skid resistance is critical for public safety. Crashes on wet pavements are related to inadequate pavement skid resistance. To improve pavement skid resistance, the use of Surface Aggregate Classification (SAC)-A aggregate has increased significantly to meet pavements' friction demand.

Texas Department of Transportation (TxDOT) specifications allow for the use of reclaimed asphalt pavement (RAP) to conserve natural resources and save costs. The unknown is the contribution of RAP to the skid resistance of the pavement surface, especially when pavements constructed with SAC-A are reclaimed and used for production. Intuitively, the RAP must contribute to friction, but this contribution has not been evaluated and quantified. TxDOT needs to determine the potential of conserving SAC-A resources using RAP and develop guidelines for using RAP in surface mixes to enhance skid resistance.

What the Researchers Did

Focusing on skid resistance and texture, three types of tests were performed on aggregates, mixtures, and pavement surfaces:

- The circular track meter (CTM) laser test for macro-texture determination.
- The aggregate ring texturing system (ARTS) laser test for micro-texture determination.
- The dynamic friction tester (DFT) test for friction number determination (Figures 1 and 2).

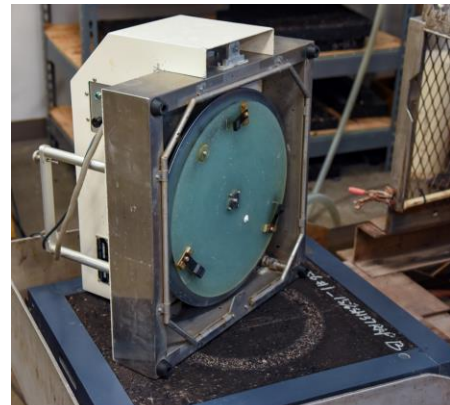


Figure 1. DFT Test on Mixture Slab.



Figure 2. DFT Test on Aggregate (Virgin or RAP).

Research Performed by:

Texas A&M Transportation Institute

Research Supervisor:

Sheng Hu, TTI

Researchers:

Fujie Zhou, TTI

Tom Scullion, TTI

Emmanuel Fernando, TTI

Mena Souliman, University of Texas at Tyler

Project Completed:

4-30-2022

The researchers conducted the following investigations:

- Field evaluation of pavements with skid problems reported by districts.
- Assembly and characterization of virgin aggregates, RAP aggregates, and mixtures to identify the cause of the low skid numbers.
- Designing and testing 20 asphalt mixtures to study the impact of different RAP types and percentages on the skid resistance of asphalt mixtures.
- Developing preliminary criteria and guidelines for using RAP in surface mixes to enhance skid resistance.

What They Found

The key findings are as follows:

- The relationship between pavement texture (CTM macro-texture or ARTS micro-texture) and friction is not unique or consistent.
- The DFT test can be used to evaluate the skid resistance of both mixtures and aggregates (Figures 1 and 2).
- A blended DFT calculation method was proposed to estimate the skid resistance of the combined aggregate and the mixture.
- RAP may significantly influence the skid resistance of the asphalt mixture, depending on the RAP percentage and the RAP aggregate DFT values.
- The addition of high-skid-resistant RAP increases the mixture slab DFT values, while low-skid-resistant RAP decreases the mixture DFT values.

- These results confirm the potential of using high-skid-resistant RAP (e.g., reclaimed from the previous high-skid-resistant SAC-A pavement) to conserve SAC-A virgin aggregate resources.

What This Means

The aggregate blended DFT value provides a good indication of the skid resistance of the corresponding mixture or pavement surface. A higher aggregate blended DFT implies a higher skid resistance for a given gradation or mixture type.

According to the findings, the recommendations are as follows:

- The measured RAP aggregate DFT was suggested to be employed to develop the RAP material SAC rating criteria.
- The minimum required DFT values for RAP aggregate and blended aggregate were determined and recommended.
- Accordingly, the preliminary criteria and guidelines for determining the blended aggregate SAC were proposed.
- The proposed criteria and guidelines provide a quantitative way to evaluate and compare the aggregate and mixture skid resistance.

For More Information

Project Manager:

Tom Schwerdt, TxDOT, (512) 466-4186

Research Supervisor:

Sheng Hu, TTI, (979) 317-2317

Project Monitoring Committee Members:

Edward Morgan, Enad Mahmoud, Roberto Flores, Lewis Nowlin, and Michael Dawidczik

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov

Keyword: Research

Technical reports when published are available at
<http://library.ctr.utexas.edu>.