



RESEARCH PROJECT CAPSULE [15-1B]

November 2015

TECHNOLOGY TRANSFER PROGRAM

Evaluation of Crumb Rubber Modification of Louisiana Mixtures

JUST THE FACTS:

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24 months

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POINTS OF INTEREST:

*Problem Addressed / Objective of
Research / Methodology Used
Implementation Potential*

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PROBLEM

The Louisiana Department of Transportation and Development (DOTD) has been allowing crumb rubber modification (CRM) of asphalt mixtures since 2008. Initially, the performance of roadways constructed with CRM was adequate. The influence of CRM on the rutting characteristics of the mixture provided both performance and economic advantages to the public. Crumb rubber is typically used at a 10-12% modification rate. The modification reduces the required bituminous binder content as much as 0.5%. CRM stiffens the asphalt binder, resulting in an increased high temperature performance grade. The reduction in bitumen content and the increased performance grade results in a mixture with improved rutting performance. However, the bitumen content reduction may have adverse effects with regard to cracking and moisture sensitivity. In recent years, the durability and cracking resistance of CRM mixtures have been a source of concern.



Semi-Circular Bend testing

DOTD has partially implemented balanced design techniques into the specifications for asphalt mixtures. The newly implemented specifications require asphalt mixtures to pass laboratory rutting and cracking criteria. Rutting is evaluated using the Hamburg Loaded Wheel Tracking (LWT) test. The LWT test can also be used to assess moisture sensitivity. Cracking resistance is evaluated using the Semi-Circular Bend (SCB) test. Evaluation of CRM mixtures has led to some concerns with the implementation of the newly specified criteria. Dense-graded mixtures often do not meet the cracking criteria. Gap-graded mixtures, e.g., stone mastic asphalt (SMA) and open-graded friction course (OGFC), are sensitive to the LWT test. A balanced experimental evaluation of the effects of CRM on various mixtures is required to address these concerns.

Additionally, a quick and simple means of determining CRM binder content within asphalt mixtures is needed for quality control during production. The feasibility of using gel permeation chromatography (GPC) for this purpose will be evaluated.

OBJECTIVE

The objective of this research is to evaluate the effect of using CRM for Louisiana asphalt mixtures. The evaluation will include the impact of modification on design and performance. Dense-graded and gap-graded mixtures will be evaluated. This research will also evaluate potential methods for quality control/quality assurance (QC/QA) of CRM binders.

METHODOLOGY

This research study will include a literature review, development of an experimental program, material collection and mixture design, laboratory testing, an evaluation of impact on aging of CRM mixtures (support study by the LSU Chemistry Department), performing data analysis, evaluating feasibility of quality control measures, and preparation of a project report.

IMPLEMENTATION POTENTIAL

The Louisiana Transportation Research Center (LTRC) has been using the LWT test device and the SCB test device as research tools for many years. Both devices have been used to predict pavement performance. The LWT device has also been used as a forensics investigative tool.

DOTD has implemented the LWT and SCB tests for asphalt mixtures in its standard specs. The outcome of this study will allow for greater evaluation of the impacts resulting from use of CRM mixtures.

GPC has been implemented at the DOTD Materials lab as a means of determining polymer content of binders. This research will assist DOTD with evaluation of the GPC device as a quality control measure for determining CRM binder content in asphalt mixtures.



Hamburg Loaded Wheel Tracking specimens



Crumb rubber modified mixture