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Project Summary

Technology Transfer Outreach Publication

Performance of Porous Pavement Materials with Recycled Materials and Warm Mix Asphalt Technology

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Sponsor
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Project Title
Durability of Porous Pavement Materials with Recycled Materials and Warm Mix Asphalt Technology

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This project integrates three innovations in the pavement engineering field, Permeable Pavements (porous pavements), Warm Mix Asphalt (WMA), and recycled materials. Porous pavements allow water to penetrate to the underlying surfaces so that drainage collection can be enhanced. Porous asphalt pavements are designed with increased air voids in the mixture which allow water to flow through the pavement. A reduction in construction and maintenance costs of drainage structures has been reported with this type of pavement construction. Hot Mix Asphalt (HMA) has been a traditional pavement utilized in pavement construction. It is produced at a discharge temperature of between 280°F (138°C) and 320° F (160°C). This results in high energy (fuel) costs and the generation of greenhouse gases. Environmental awareness and the need for improved energy efficiency has increased rapidly over the past few years and extensive measures such as air pollution reduction targets set by the European Union under the Kyoto Protocol have encouraged efforts to reduce greenhouse gas emissions. Warm mix asphalt (WMA) is one technology in response to these efforts. WMA is produced at a lower temperature. The goal for WMA is to use existing HMA plants and specifications to produce quality dense graded mixtures at significantly lower temperatures. When compared with conventional HMA, a reduction in emissions and energy consumption has been reported. Recycled materials, including recycled asphalt pavements (RAP), waste shingles, and recycled aggregates have been widely used in traditional HMA in several states; however, the integration of these three aspects of innovations has not been widely pursued.

Michigan Tech
Michigan Technological University

MiSTI
U.S. DOT University Transportation Center for Materials in Sustainable Transportation Infrastructure
Michigan Technological University

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University Facts (2008-2009)

Total Enrollment	7018
Graduate Enrollment	984
Number of Faculty	445
Placement Rate	96%

Michigan Technological University is located in Houghton, Michigan on the south shore of Lake Superior. This rural area is known for natural beauty, pleasant summers, abundant snowfall, and numerous all-season outdoor activities. In addition, the University maintains its own downhill and cross-country ski facilities and golf course. There are numerous cultural activities and opportunities on campus and in the community. Michigan Tech has also been rated as one of the safest college campuses in the United States, and the local community provides excellent resources conducive to an outstanding quality of life.

For more information, visit the University's website.

www.mtu.edu

Research Objective

The objectives of this research are to investigate porous asphalt mixture containing recycled materials such as RAP incorporating WMA technologies.

Methodology

This research will be conducted using the following methodologies:

Perform literature reviews on the integration of porous asphalt mixture, WMA and RAP.

Identify the critical tests needed and develop an experimental plan to evaluate the performance of asphalt mixture. The tests include: volumetric properties, dynamic modulus testing, NCAT ignition oven test, Superpave™ gyratory compaction, and tensile strength ratio (TSR) testing.

Collect the materials for the study consistent with the developed experimental plan.

Evaluate the rutting performance, freeze-thaw, and fatigue properties of asphalt mixture using simple performance and TSR tests.

Research Findings

The anticipated research findings will be the characterization and performance data of porous asphalt mixtures, porous asphalt mixtures containing RAP, and porous asphalt mixtures with the integration of WMA technology.

Anticipated Implementation

This project will assist researchers and engineers in identifying problems in designing porous pavements with RAP and WMA technologies. This will improve the sustainability of pavement construction and maintenance.

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