Updates from the States: New York (June 2011)

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The New York State Department of Transportation (NYSDOT) addresses concrete pavement research needs through its Office of Technical Services. Within this division, state engineers consistently develop ways to improve concrete pavement safety, cost effectiveness, and environmental performance. In order to achieve these goals, NYSDOT currently partners with various researchers including Cornell University, the Ohio Research Institute for Transportation and the Environment (ORITE), the University of Texas at El Paso and Arlington, and private consultants. In addition to sponsoring research of its own, NYSDOT is an active participant in various Transportation Pooled Fund (TPF) Studies including TFP-5(185), which provides operational support for the CP Road Map.

To learn more about each of these research facilities, follow the links below:

NYSDOT: https://www.nysdot.gov/divisions/engineering/technical-services
Cornell Local Roads Program: http://www.clrp.cornell.edu/
Ohio Research Institute for Transportation and the Environment: http://www.ohio.edu/orite/
The University of Texas at El Paso: http://ctis.utep.edu/
The University of Texas at Arlington: http://www.uta.edu/ce/index.php
TPF: http://www.pooledfund.org/

Highlights

The following provides more detail on four concrete pavement research projects at the New York State Department of Transportation.

1. Environmental Effects of Early Age and Long Term Response of PCC Pavement
2. Evaluation of Rigid Pavement Rehabilitation Methods on I-86
3. Quantify the Energy and Environmental Effects of Using Recycled Asphalt and Recycled Concrete for Pavement Construction
4. Seasonal Variations of In-Situ Materials Properties for Pavement Design

Environmental Effects of Early Age and Long Term Response of PCC Pavement

A recent paper authored by Dr. Luis Julian Bendana and Jason Wise, *Environmental Effects of Early Age and Long Term Response of PCC Pavement*, investigates the impact of environmental (climatic) influences on the early-age response of PCC pavement placed during hot weather conditions. The researchers employed an instrumentation technique in two adjacent slabs in the westbound lane of I-490 in Rochester, New York in order to accurately measure concrete temperature, strain, and pavement deformation. This technique involved the placement of sensors in concrete during the paving process with minimal interruption to the contractor and no risk of damage to the pavement. These sensors included Linear Variable Differential Transformers (LVDTs), vibrating wire strain gauges, and thermocouples. In addition, Dipstick surveys were used to determine the shape of the slabs during curing, before and after joint sawing, and subsequently

after construction. Measurement results indicate that the pavement experienced significant curling and tensile stresses due to large temperature gradients. Furthermore, the slabs experienced a permanent loss of support, as determined through Falling Weight Deflectometer (FWD) testing.

Click here to download the report.

This research can be categorized under CP Road Map Track 3: High-Speed Nondestructive Testing and Intelligent Construction Systems.

Evaluation of Rigid Pavement Rehabilitation Methods on I-86

A paper recently released, *Evaluation of Rigid Pavement Rehabilitation Methods on I-86*, examines the effectiveness of various fracturing treatments applied to existing jointed reinforced concrete pavement (JRCP) prior to construction of an unbonded concrete overlay. This project was conducted through a joint effort between the Ohio Research Institute for Transportation and the Environment (ORITE) and the New York State Department of Transportation (NYSDOT) as part of Transportation Pooled Fund Study number TPF-5(121), entitled "Monitoring and Modeling of Pavement Response and Performance." The existing JRCP was divided into three experimental sections; one of which was untreated, while the other sections were subjected to rubblization and crack-and-seat (C/S) treatments. After the unbonded concrete overlay was constructed, long-term environmental and dynamic response data were collected, in addition to supplemental data gathered using a Weigh-in-Motion (WIM) unit and weather station. The untreated section was shown to exhibit the highest internal strains and stresses due to environmental influences, in addition to the largest loss of support. These traits were least significant in the rubblized section, and to only a moderate extent in the C/S section. However, it was shown that the rubblization treatment exhibited relatively low structural stiffness and poor load transfer efficiency compared to the untreated and C/S sections. Furthermore, it appears that the C/S treatment is a more economically effective rehabilitation technique than rubblization, although an examination of the pavement over its complete lifespan is necessary to make this prediction.

Click here to download the report.

This project is meeting research objectives outlined in CP Road Map Track 7: High-Speed Concrete Pavement Rehabilitation and Construction.

Quantify the Energy and Environmental Effects of Using Recycled Asphalt and Recycled Concrete for Pavement Construction

The New York State Energy Research and Development Authority and NYSDOT jointly sponsored the 2009 report, *Quantify the Energy and Environmental Effects of Using Recycled Asphalt and Recycled Concrete for Pavement Construction*, which aims to measure greenhouse emissions and energy consumption associated with the use of recycled concrete aggregate for highway construction. In this study, the energy requirements for concrete produced with virgin aggregate versus recycled aggregate were carefully analyzed. It was shown that energy savings are realized using recycled aggregate, but these savings are highly dependent on transport distances. In addition, the greenhouse gas emission benefits of recycled concrete were calculated by considering the process energy and transportation energy emissions. Avoidance of greenhouse gas emissions was demonstrated with recycled concrete; however the decrease in emissions is once again dependent on transport distances. To read more about this research, click on the link below:

https://www.nysdot.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-02%20Final%20Report%209-8-09.pdf

This research can be categorized under CP Road Map Track 13: Concrete Pavement Sustainability.

Seasonal Variations of In-Situ Materials Properties for Pavement Design

The report, *Seasonal Variations of In-Situ Materials Properties for Pavement Design*, authored by Drs. David Orr and Lynne Irwin, provides seasonal models that can be used to take into account in-situ characteristics

of pavement materials during the concrete pavement design process. Determining seasonal variations involved a substantial amount of Falling Weight Deflectometer (FWD) testing, along with the collection of weather and soils data. Four sites were monitored to determine both seasonal and spatial variations. From the analysis, statewide maps of seasonal inputs to pavement design were determined. Furthermore, the site-specific models and maps were used to create an overall, combined predictive seasonal model that includes final critical seasons defined in length based on various factors. However, in order for a statewide model to be developed, further testing must be completed in areas that vary from the initial sites in areas such as drainage, soil plasticities, and frost depths.

Click here to download the report.

This research is helping to fill knowledge gaps outlined in CP Road Map Track 2: Performance-Based Design Guide for New and Rehabilitated Concrete Pavements.

CP Road Map Track Status

Figure 1 depicts New York concrete pavement research projects, in addition to Transportation Pooled Fund participation. These projects are categorized according to the appropriate CP Road Map Track. Following Figure 1, titles for each of the projects are listed.

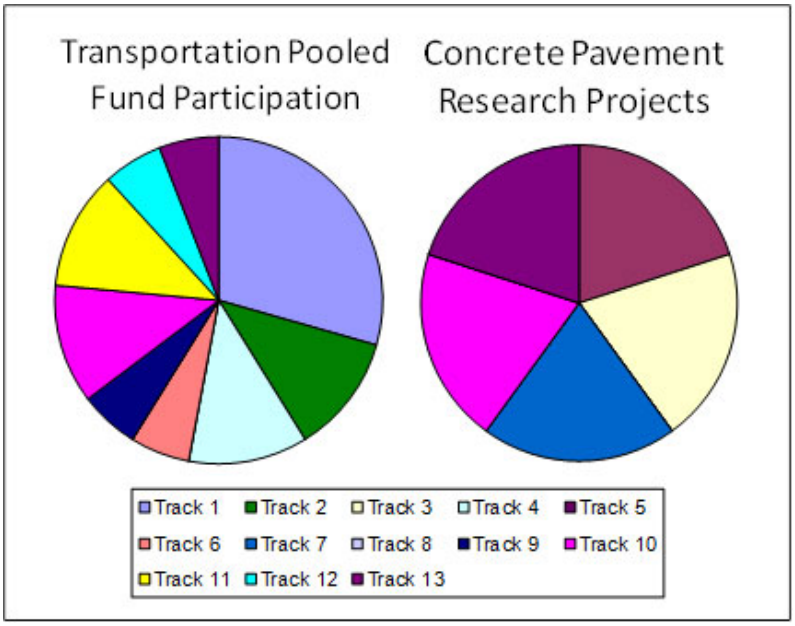

Figure 1. Concrete Pavement Research in New York Categorized by CP Road Map Track

Transportation Pooled Fund (TPF) Studies

Concrete pavement research in New York includes work done under various TPF projects. These projects, and how they align under the CP Road Map, are identified below.

Track 1: Performance-Based Concrete Pavement Mix Design System

- Self-Consolidating Concrete - Applications for Slip Form Paving
- Deicer Scaling Resistance of Concrete Pavements, Bridge Decks, and Other Structures Containing Slag Cement
- Evaluation of Test Methods for Permeability (Transport) and Development of Performance Guidelines for Durability
- Implementation of Concrete Pavement Mixture Design and Analysis (MDA) Track of Concrete Pavement Road Map

- Material and Construction Optimization for Prevention of Premature Pavement Distress in PCC Pavements

Track 2: Performance-Based Design Guide for New and Rehabilitated Concrete Pavements

- Soil Mixing Methods for Highway Applications
- Implementation of the 2002 AASHTO Design Guide for Pavement Structures

Track 4: Optimized Surface Characteristics for Safe, Quiet, and Smooth Concrete Pavements

- Improving the Quality of Pavement Profiler Measurement
- PCC Surface Characteristics: Tire-Pavement Noise Program Part 3 - Innovative Solutions /Current Practices

Track 6: Innovative Concrete Pavement Joint Design, Materials, and Construction

- Investigation of Jointed Plain Concrete Pavement Deterioration at Joints and the Potential Contribution of Deicing Chemicals

Track 9: Concrete Pavement Accelerated Testing and Long-Term Data Collection

- Midwest States Accelerated Testing

Track 10: Concrete Pavement Performance

- Effect of Multiple Freeze-Thaw Versus Deep Frost Penetration on Pavement Performance
- Monitoring and Modeling of Pavement Response and Performance

Track 11: Concrete Pavement Business Systems and Economics

- Technology Transfer Concrete Consortium
- CP Road Map Operations Support

Track 12: Advanced Concrete Pavement Materials

- Extending the Season for Concrete Construction and Repair, Phase III

Track 13: Concrete Pavement Sustainability

- Recycled Materials Resource Center

Concrete Pavement Research

Concrete pavement research in New York that is both currently in progress and recently completed is listed below, in addition to how they align under the CP Road Map.

Track 1: Performance-Based Concrete Pavement Mix Design System

- Seasonal Variations of In-Situ Materials Properties for Pavement Design

Track 3: High-Speed Nondestructive Testing and Intelligent Construction Systems

- Environmental Effects of Early Age and Long Term Response of PCC Pavement

Track 7: High-Speed Concrete Pavement Rehabilitation and Construction

- Evaluation of Rigid Pavement Rehabilitation Methods on I-86

Track 10: Concrete Pavement Performance

- A Rationale Approach to Estimating Damage to Pavements

Track 13: Concrete Pavement Sustainability

- Quantify the Energy and Environmental Effects of Using Recycled Asphalt and Recycled Concrete for

Pavement Construction

About the CP Road Map E-News

The ***CP Road Map E-News*** is the newsletter of the Long-Term Plan for Concrete Pavement Research and Technology (CP Road Map), a national research plan developed and jointly implemented by the concrete pavement stakeholder community. To find out more about the CP Road Map, or to get involved, contact Dale Harrington, dharrington@snyder-associates.com, 515-964-2020.

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