



TECHNICAL SUMMARY

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LRRB PROJECT COST:

\$86,036



Researchers recommend encouraging individual roadway counts to better determine traffic volumes and vehicle classifications.



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Putting Research into Practice: Enhancing Pavement Design Tools

What Was the Need?

MnDOT and Minnesota local agencies use numerous tools and methods for designing pavements to be strong, safe and cost-effective. Periodically, these tools need to be evaluated and enhanced so that they continue to meet the needs of engineers. Recently the Minnesota Local Road Research Board and MnDOT's State Aid Division were interested in evaluating and developing recommendations for updating a number of these tools to ensure that local agencies have the latest technologies for making pavement-related decisions. Research was also needed to develop recommendations for training and outreach for these tools.

The pavement design tools evaluated in this project help MnDOT and local agencies make more cost-effective use of their resources to design safer and stronger roads.

What Was Our Goal?

The objective of this project was to review existing methods, data and tools for pavement design, maintenance and rehabilitation, and to recommend implementation and in some cases training needs for each.

What Did We Implement?

Researchers leveraged existing LRRB and MnDOT research and methods related to [recycled asphalt pavement](#), [vehicle classification](#), [pavement design](#) and the [falling weight deflectometer Viewer Tool](#).

How Did We Do It?

Researchers evaluated several pavement-related areas of interest:

- An evaluation of RAP use in local pavement design.
- An update of vehicle classification data based on vehicle counts conducted in [Project 2010-17](#), which showed a fourfold increase in the proportion of semitrailers with more than five axles.
- An update based on industry feedback of 10-ton pavement design charts specifying minimum thicknesses for pavements with capacities of 10 tons per vehicle axle.
- Updating the FWD Viewer Tool, a spreadsheet that provides county engineers with FWD data collected in their county and incorporates several methods for calculating allowable axle loads during the spring thaw from this data.

For each area, researchers detailed recommendations for further development or implementation. They also implemented recommended changes to the FWD Viewer Tool.

What Was the Impact?

RAP Use in Local Pavement Design

Researchers developed the following recommendations related to RAP use:

- Develop a practical classification method for RAP products.
- Develop training for local agency pavement design engineers and technicians.
- Establish common testing protocols for evaluating RAP materials.
- Establish a link between design and performance for pavements constructed with RAP so that lessons learned can be developed into design and construction practices to improve future pavement performance.

continued

“The tools investigated in this project will help local agencies better evaluate their roads so that they can make more cost-effective uses of their resources.”

—Rich Sanders,
Highway Engineer,
Polk County

“The new FWD Viewer Tool allows engineers to estimate the thickness of the asphalt overlay required if they want to upgrade a road to allow higher axle loads.”

—W. James Wilde,
Professor, Minnesota
State University, Mankato,
Department of
Mechanical & Civil
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Photo courtesy of Virginia DOT

Researchers developed a number of recommendations related to RAP use in local pavement design, including training for local agency pavement design engineers and technicians.

Implementation of Vehicle Classification Update

Researchers developed vehicle classification recommendations, many of which have since been implemented by various MnDOT offices. These include:

- Updating the default vehicle classification data in the Pavement Design Manual.
- Encouraging individual roadway counts to better determine traffic volumes and vehicle classifications.
- Providing additional guidance and training on collecting and interpreting classification data.

10-Ton Pavement Design Charts

Researchers’ recommendations include:

- Maintaining a single design chart, providing training on how to conduct a proper pavement type selection and validating designs.
- Investigating the potential benefit of dividing the minimum average daily traffic range for pavement design into two categories.
- Consolidating concrete thickness recommendations, defining a standard paving platform for concrete designs and evaluating improved methods for analyzing subgrade soil strength.

Update of FWD Viewer Tool

Researchers enhanced the tool’s data and enabled display of multiple data sets at a time. The update also included a method for predicting the load ratings of pavements after the addition of a structural overlay. Recommendations for future enhancements of the tool based on user feedback include:

- Providing ongoing technical support to help users understand and use the tool for pavement analysis.
- Adding the capability for users to make corrections to the data.
- Considering developing a user interface similar to MnDOT’s MnPAVE software.
- Adding the ability to import additional data by the user.

What’s Next?

As part of this project, researchers delivered statewide training on the use of the FWD Viewer Tool to various engineers and technicians in Minnesota counties and MnDOT districts. The training materials were developed as part of [Project 2014RIC16](#), which also updated the tool to include an improved method for FWD data analysis, TONN2010. MnDOT and LRRB will also consider implementing other project recommendations.

This Technical Summary pertains to the LRRB-produced Report 2014RIC14, “Integrated Tools for Pavement Design and Management,” published February 2014. The full report can be accessed at <http://www.lrrb.org/PDF/2014RIC14.pdf>.