2017RIC02TS
Published January 2018

LRRB
LOCAL ROAD RESEARCH BOARD

IMPLEMENTATION SUMMARY

Technical Liaison:
Ben Worel, MnDOT
Ben.Worel@state.mn.us

Project Coordinator:
Bruce Holdhusen, MnDOT
Bruce.Holdhusen@state.mn.us

Principal Investigators:
Daniel Wegman, Braun Intertec Corp.
Renae Kuehl, SRF Consulting Group, Inc.

LRRB PROJECT COST:

$29,476

Before and after images of a MnROAD asphalt pavement test section. The stabilized full-depth reclamation section (bottom) shows no cracking after 10 years of service at double the expected design load.

DEPARTMENT OF TRANSPORTATION
RESEARCH SERVICES & LIBRARY

Putting Research into Practice: Guidebook Helps Local Engineers Select Stabilizers for Recycled Road Bases

A base stabilization guidebook will help city and county engineers select the most promising stabilizing additives for individual road reclamation projects. The guide describes base stabilization, its benefits and best uses, and the best stabilizers for rehabilitating their roads.

What Was the Need?

Base stabilization entails mixing a stabilizing additive into an acceptable base aggregate material, imported with or without recycled material or from reclaimed hot-mix asphalt (HMA), creating a new bound pavement layer.

The fundamental value of stabilizing base materials is achieving similar pavement structures more economically. Stabilizing base aggregates can allow pavement designers to develop stronger, deeper pavement structures with reduced subcut depths and thinner surfacing lifts of HMA.

This approach can fully rehabilitate cracked, poorly performing asphalt roadways at a cost that is comparable to common rehabilitation techniques used today and with performance that is similar to new pavement structures. However, this technology has not yet become a common practice. Most engineers still prefer mill-and-fill practices, which involve grinding off some of the cracked asphalt layer and replacing it with a new asphalt surface. This practice typically results in good pavement for a couple of years until the existing cracks reflect through. In contrast, stabilized full-depth reclamation allows for the complete breakup of the existing cracks so that a new, crack-resistant asphalt layer can be placed.

Given that over 200 base-modifying products may be used for stabilization in Minnesota, engineers would benefit from a more complete understanding of base stabilization techniques and materials, and the method's best use in roadway rehabilitation.

What Was Our Goal?

The Local Road Research Board (LRRB) commissioned a guidebook for engineers to promote better understanding of base stabilization, its benefits and best uses. Guidance would focus on choosing suitable stabilization additives instead of appropriate construction methods.

What Did We Implement?

Investigators worked with a Technical Advisory Panel (TAP) that included seven MnDOT officials, six county representatives, one city engineer, one university instructor and five members of the consulting industry to develop the new guidebook. Drawing on discussions and research, investigators refined guidebook information and components during several TAP meetings.

How Did We Do It?

To identify appropriate content for the guidebook, investigators selected base stabilization products that can be used in Minnesota, and reviewed MnDOT specifications and base modification knowledge with TAP members. Panelists interested in but unfamiliar with base stabilization identified information about the process that would be helpful to local engineers.

continued

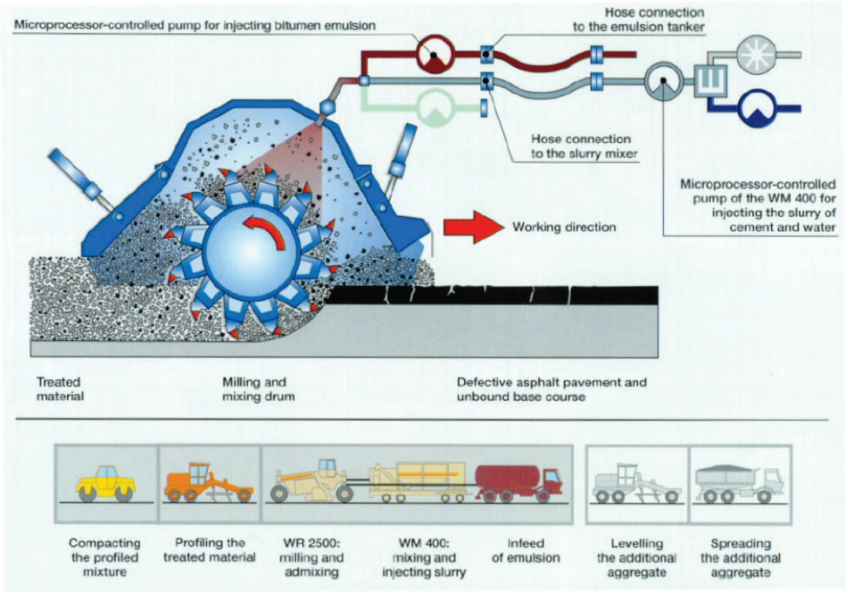
"In the past, rehabilitating pavement meant removing the asphalt or overlaying it, which was not cost-effective. Pavements with a strong base created through base stabilization might not need overlaying again for 25 years."

—Guy Kohlnhofer,
County Engineer,
Dodge County

"Base stabilization is the future of asphalt road rehabilitation. This guidebook brought common language to the topic of base stabilization and provided a common approach to its use. It will be helpful for road owners who are not experts but want more information on base stabilization and what it can do for their roadways."

—Ben Worel,
MnROAD Operations Engineer, MnDOT Office of Materials and Road Research

Produced by CTC & Associates for:
Minnesota Department
of Transportation
Research Services & Library
MS 330, First Floor
395 John Ireland Blvd.
St. Paul, MN 55155-1899
651-366-3780
www.mndot.gov/research



In stabilized full-depth reclamation projects, recycling trains first grind base courses and pavement, and then mix bituminous stabilizers with the recycled material to create a new, fully stabilized base for asphalt pavements.

In considering proprietary products, investigators relied on the distinction between a base modifier and a base stabilizer. They decided not to include base modifiers since these products do not have long-term, lab-tested evidence and data supporting stabilization.

Known stabilizers were categorized as either chemical or bituminous. Chemical stabilizers such as fly ash, lime and cement are most applicable in sands and gravels in which organic materials like clay and silt are present. Asphalt emulsions and other bituminous stabilizers are considered most applicable in sands and gravels with lower amounts of fine particles and uncontaminated by organic materials. The guide provides a table linking stabilizer selection to the American Association of State Highway and Transportation Officials (AASHTO) aggregate classifications, soil classification, plasticity, sand equivalence and aggregate size.

Steps toward successfully stabilizing roadway bases are addressed, including road assessment, pavement design, additive selection, and mix design and construction guidelines. The guide also offers information on troubleshooting poorly performing, stabilized-base roadways.

What Was the Impact?

This resource, which is available online, describes stabilized bases along with their components and benefits. It also discusses base stabilizers, the difference between a modifier and a stabilizer, a process for selecting a suitable stabilizer and detailed conditions that best suit certain stabilizers. A pathway in which producers of modifiers may demonstrate the viability of their product as a recognized base-stabilizing agent is also included.

The guidebook was presented at the November 2017 Center for Transportation Studies conference and will be shared at future Minnesota conferences and events.

What's Next?

Further research will consider how different stabilizers have been used in the field and how to determine the amount of stabilizers that should be used in various field conditions.

This Implementation Summary pertains to the LRRB-produced Report 2017RIC02, "Base Stabilization Guidance and Additive Selection for Pavement Design and Rehabilitation," published December 2017. The full report can be accessed at mndot.gov/research/reports/2017/2017RIC02.pdf.