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

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.
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.

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