TERRA Transportation Engineering and Road Research Alliance
Partnering for Roadway Innovation
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TerraRoadAlliance.org

New Microsurfacing Specifications Improve Cold-Temperature Performance of Asphalt Pavements

When high-speed roadways in Europe began to experience wheel rutting, transportation practitioners turned to microsurfacing as a solution. In the 1980s, microsurfacing attracted interest in the United States as a maintenance treatment for pavement.

Microsurfacing consists of both developing the microsurfacing material and applying it to the road surface. Microsurfacing material combines fine, dense-graded aggregate—typically performance grade (PG) 64-22 asphalt cement (AC) as the base asphalt—with polymer-modified asphalt emulsion, water, polymer, mineral filler, and field additive.

The semi-liquid mixture then is applied in thin layers, usually through the use of specialized mixing and paving equipment, to serve as the wearing course on a roadway. It changes from semi-liquid material to a dense cold-mix material that can carry normal traffic within several hours of application.

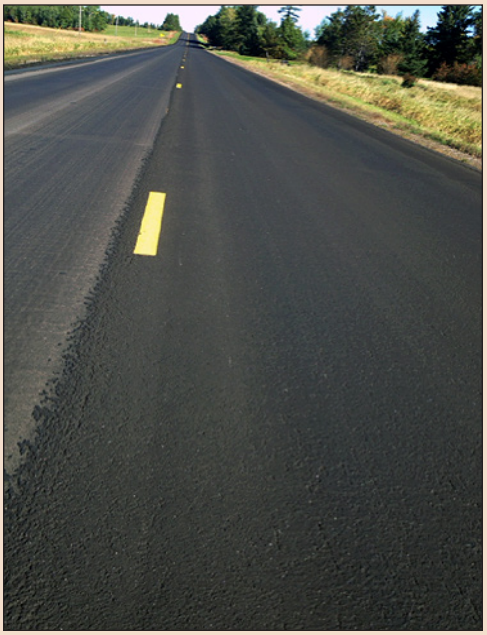
Agencies throughout Minnesota started using microsurfacing on a larger scale in the 1990s to fill ruts and smooth surfaces on high-volume roads. In cold temperatures, the mix becomes more brittle, which can increase the likelihood of cracking. In addition, snowplow damage has been noted on microsurfaced roads. These issues resulted in research and new projects to enhance its effectiveness in colder climates.

Benefits

Microsurfacing offers advantages as a surface treatment tool for high-volume roads:

- Fills ruts and corrects minor surface irregularities
- Reduces future oxidation, helping slow further aging of the underlying asphalt pavement
- Helps decrease raveling of the underlying asphalt pavement and reduce water infiltration
- Helps improve skid resistance
- As part of the preventive maintenance toolbox, offers one way to manage the life-cycle costs of a pavement

The microsurfacing material cures quickly on the road after application, which allows agencies to work at night and keep road closure times to a minimum. Both the quality of the material development and its application are important to ensuring benefits from the use of microsurfacing.



On the Trunk Highway System

In 2013, several projects were completed on the Minnesota trunk highway system—approximately 39 centerline miles—with a PG 58-28 base asphalt.

A 2014 project on Trunk Highway 64 in Morrison County, Minnesota, used the softer PG 49-34 base asphalt with the SBS polymer, a newer microsurfacing polymer option, to study the benefits of using even softer-based asphalt. This formulation has a higher residue penetration value than any previous microsurfacing projects. The roadway was micromilled before placing a microsurfacing scratch course and surface course.

The right lane in the photo above is the surface course one day after application and the left lane is the scratch course approximately three days after application.

Cold-Temperature Innovation

In 2005, the Minnesota Road Research Project (MnROAD) began research to explore whether changes to the mix of the microsurfacing material might improve its on-the-road performance in cold temperatures.

The research team used a softer grade of base asphalt cement, PG 49-34 AC, and performed pre-and post-construction evaluations of cracking, rutting, and smoothness. At six months, while 71 percent of the transverse cracking had reflected through the microsurface, reflected distress from longitudinal cracks and patched areas was negligible. At seven months, the rutting condition remained similar to post-construction, with microsurfacing achieving an overall 20 percent decrease in rutting.

The research helped pave the way for several recent projects and development of a new specification.

Microsurfacing project after two years: minor fatigue cracking

Project Implementation

In 2012, the Minnesota Department of Transportation (MnDOT) completed a microsurfacing project on a MnROAD test section using the softer PG 49-34 base asphalt, as well as a different polymer. MnDOT collaborated on the project with Flint Hills Resources, which supplied asphalt emulsion, and Asphalt Surface Technologies Corporation (Astech), which served as the contractor. MnDOT and Flint Hills Resources are TERRA members.

After two years, the road is showing improved cold-temperature performance while maintaining strength. Taken in 2014 after the severe winter of 2013, the photos show some minor fatigue cracking (*see photo, top right*) and the start of some underlying cracks through the surface layer (*see photo, right*). In addition, the softer base asphalt microsurfacing application appeared to better withstand damage from snowplows and better hold the painted-on stripes.

Based on the results of this and other projects, MnDOT has changed its microsurfacing specification to incorporate the softer base (PG 58-28 as an option to harder-based microsurfacing using PG 64-22). Currently, the specification is part of MnDOT special provisions and will be included in the new specification book scheduled for publication in 2016.

Microsurfacing project after two years: the start of underlying cracks through the surface layer

Next Steps

MnDOT has begun to share the results of this study nationally, including a presentation at the International Slurry Surfacing Association (ISSA) conference in January 2015. MnDOT plans to continue expanding the use of microsurfacing projects with the PG 58-28 base asphalt and evaluating completed projects.

Resources

Links to these resources are on the TERRA website at TerraRoadAlliance.org.

- *Flexible Slurry–Microsurfacing System for Overlay Preparation* (report about MnROAD 2005 research)
- International Slurry Surfacing Association (ISSA) (microsurfacing info)

For More Information

For more information about the research in this fact sheet, please contact:

- **Thomas Wood**, Materials and Road Research, MnDOT, 651-366-5573, thomas.wood@state.mn.us

About TERRA

The Transportation Engineering and Road Research Alliance, or TERRA, brings together government, industry, and academia in a dynamic partnership to advance innovations in road engineering and construction, including issues related to cold climates. More about TERRA is online at www.TerraRoadAlliance.org.

For more about TERRA, please contact:

- **Stephanie Malinoff**, Director, Outreach Services, Center for Transportation Studies, University of Minnesota, 612-624-8398, malinoff@umn.edu.
- **Chris Kufner**, Manager, Road Research Section, Office of Materials, Minnesota Department of Transportation, 651-366-5507, chris.kufner@state.mn.us.