

0-7103: Investigating Prime versus Curing: Where, When, and Why

Background

Questions concerning what materials are needed in a pavement structure that are not part of the structural design continue to arise. Materials typically considered nonstructural but integral to the pavement are prime coats, curing materials, seal coats, and tack coats. Some materials can be used for multiple purposes; however, the rates may change as well as the method of payment.

The objective of this research project was to determine where, when, and why a prime or cure is needed for a pavement layer. Some materials can be used for multiple purposes, such as to prime, bond, or help cure; however, the rates and timing of use may change depending on why the material is being used. Guidance is needed to help designers, inspectors, and construction personnel understand the materials and where, when, and why to use them.

According to *Merriam-Webster's Collegiate Dictionary*:

- *Prime* as a verb (in the context of this project) means to apply the first color, coating, or preparation.
- *Cure* as a verb (in the context of this project) means to prepare or alter, especially by chemical or physical processing, for keeping or use.

What the Researchers Did

The research team performed an extensive literature review along with a survey of Texas Department of Transportation (TxDOT) districts to assess the current state of the practice and emerging research to determine when, where, and why a prime or cure, or both, is needed within a pavement structure. A laboratory study and field observations were used to determine the benefits of prime. The research team developed guidelines for evaluating prime material properties based on the performance factors expected and their use.

What They Found

Where

Place prime on the top of a base course, both flexible and treated bases, for TxDOT Items 247, 251, 260, 275, 276, 290, 291, 292, and 351.

Research Performed by:
Texas A&M Transportation Institute

Research Supervisor:
Darlene Goehl, TTI

Researchers:
Carl Bierman, TTI
Jia-Lin Hsu, TTI
Stephen Sebesta, TTI
Kai-Wei Liu, TTI

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When

For untreated materials—TxDOT base course Items 247, 251, or 351—place prime after density is achieved and curing is complete.

For cement- or lime-treated materials—Items 260, 275, 276, 351—place prime after density is achieved and before curing starts.

For asphalt-treated materials—Items 290, 291, 314, 351—place prime as soon as practical after density is achieved at a rate low enough to not impede curing.

Why

As part of the flexible pavement design process, layers are assumed to be bonded. When comparing a prime to an unprimed base, researchers found that the prime improved the bond in all laboratory testing. The use of the prime minimizes the risk of debonding, which can lead to premature pavement failures. The major purposes of prime coat are as follows:

- For untreated materials, Items 247, 251, or 351:
 - Prime promotes bonding to the next successive layer.
 - Prime helps minimize raveling by binding or stabilizing the surface particles of the base course.

- Prime seals the surface pores in the base to prevent absorption of the subsequent application of surface treatment binder.
- Prime protects the underlying base from wet weather and, in some cases, the action of traffic by providing a temporary waterproofing layer.
- For treated materials, Items 260, 275, 290, 291, 292, or 351:
 - Prime promotes bonding to the next successive layer.
 - Prime helps minimize raveling by binding or stabilizing the surface particles of the base course.
 - Prime helps prevent moisture loss from the treated base during the curing process (reducing the drying rate).
 - Prime seals the surface pores in the base to prevent absorption of the subsequent application of surface treatment binder.
 - Prime protects the underlying base from wet weather and, in some cases, the action of traffic by providing a temporary waterproofing layer.

What This Means

The developed guidance for where, when, and why prime is needed in a pavement structure can be used by designers, inspectors, and construction personnel to help ensure the proper use of prime, which will lead to better pavement performance.

For More Information

Project Manager:

Martin Dassi, TxDOT, (512) 416-4730

Research Supervisor:

Darlene Goehl, TTI, (979) 317-2329

Project Monitoring Committee Members:

Andres Gonzalez, Frew Bogale, Rachel Cano, Sandeep Pandey, James Robbins, Pravat Karki, and Mohammad Ilias

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov

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