

## 0-7135: Synthesis of Best Application and Verification Practices for Long-Life Pavement Markings

### Background

Pavement markings can be used as supplements for other traffic control devices or alone to effectively convey regulations, guidance, or warnings that can reduce traffic crashes in both daylight and darkness. Proper application of pavement markings plays an important role in enhancing the safety of roadway users and reducing on-road fatal and injury crashes. The amount and selection of marking materials can directly affect their longevity and life cycle cost, and it is therefore critical for transportation agencies to control key parameters in various pavement marking practices.

The main possible limitations of current pavement markings are poor visibility and relatively short service durability. There was thus a need for research to:

- (1) synthesize information on the usage of different types of pavement marking materials such as thermoplastic, traffic paint, preformed tape, multipolymers, profiled markings, and newer materials (i.e., photoluminescent nanocomposite paints and translucent concrete-based smart lane separators), and
- (2) synthesize practices regarding marking quality control approaches, marking specifications types, application rate verification, marking equipment ability, and markings payment bases.

Further, the 2004 TxDOT Pavement Marking Handbook needed to be revised to reflect the recently available marking technologies and specifications so as to enhance the efficiency of TxDOT practices for long-life pavement markings.

### What the Researchers Did

To perform this project, the researchers followed five steps.

In **Step 1**, the researchers collected information necessary for identifying best-case examples of quality control of liquid and thermoplastic pavement marking material applications. They reviewed practices across the U.S. and other countries using various sources, such as government manuals, reports, guidebooks, research papers, and other publications; conducted a survey via SurveyMonkey.com to obtain the views of pavement marking field practitioners in the U.S. and other countries; and then synthesized the collected information.

In **Step 2**, the researchers identified the best-case examples and reviewed practices for various marking materials used across the U.S. and other countries. They also investigated reasons for using particular marking materials on different pavement types. They also identified quality control approaches and methods, including verifying selected thickness or quantity of markings in

**Research Performed by:**  
Texas Southern University

**Primary Investigator:**  
Fengxiang Qiao, TSU

**Researchers:**  
Sayed Abuzar Kazimi, TSU  
Emmanuel Ekezie, TSU  
Jianbang Du, TSU

**Project Completed:**  
8-31-2022

and outside Texas.

In **Step 3**, the researchers studied various specifications and different approaches to application rate verification for pavement markings in Texas and other states. They reviewed and synthesized a variety of documents from several state DOTs and other transportation agencies. In addition, the research team investigated issues and problems associated with specifications for each marking type and its respective application rate verification.

In **Step 4**, the researchers identified the equipment required for installation and quality control of marking materials and recommended possible modifications to existing equipment used in Texas. The research team synthesized a variety of documents from state DOTs and other transportation agencies and investigated pavement marking payment base calculation practices in other states and countries.

In **Step 5**, the researchers revised the 2004 TxDOT Pavement Marking Handbook based on the findings in Steps 1–4.

### What They Found

The researchers' major findings include: (1) the application thicknesses of thermoplastic pavement markings could vary based on different factors, including the remaining service life; (2) the performance of new marking materials needs to be evaluated via laboratory/field tests and their usage in future projects can be considered; (3) installers and inspectors of pavement markings need to be certified; (4) materials specifications for

preformed thermoplastic could be developed; (5) materials specifications from other states can be carefully reviewed; (6) the usage of recently available technology (i.e., stripe scan and marking thickness gauge) for measuring marking thickness can be considered; (7) the installation of data logging systems on striping trucks could be considered in Texas; (8) straightedge tools can be used for measuring the width of markings; (9) removal techniques (flailing and high-pressure water blasting for thermoplastic) can be combined on asphalt and concrete surfaces; (10) inclusion of the cost for mobile retro-reflectometer in the marking payment is a worthwhile consideration; and (11) a software tool could be developed for marking material selection.

### What This Means

The TxDOT 2004 Pavement Marking Handbook should be revised to account for the new technologies and practices developed in recent years. Based on the researchers' suggestions, (1) the equipment information should be updated; (2) the pavement marking material application needs to be enriched; (3) new marking materials and technologies should be added; (4) the material selection guide can be enriched; (5) striping equipment should be enriched for pre-installation inspection; (6) thickness, width, and color inspection approaches can be enriched; and (7) recent material and special specifications should be added to Appendix B of the 2004 Handbook.

#### For More Information

**Project Manager:**

Chris Glancy, TxDOT, (512) 416-4747

**Primary Investor:**

Fengxiang Qiao, TSU, (713) 313-1915

Technical reports when published are available at <https://library.ctr.utexas.edu>

Research and Technology Implementation Office

Texas Department of Transportation

125 E. 11<sup>th</sup> Street

Austin, TX 78701-2483

[www.txdot.gov](http://www.txdot.gov)

Keyword: Research

This research was performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented here. The contents do not necessarily reflect the official view or policies of FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and not for product endorsement.