# Project Summary

Texas Department of Transportation

# 0-5310: The Evaluation of a System for Measuring Seal Coat Quality

## Background

Seal coating, a common preventive maintenance activity in Texas, is performed by most cities, counties, and rural districts. A seal coat increases pavement texture and surface friction properties. The primary defects in seal coats and surface treatments are loss of aggregate, poor adhesion, streaking, and flushing, among which, flushing and shelling are the most common. A flushed surface has a smooth and slick appearance where the aggregates are less visible, while shelling, on the other hand, is the loss of aggregate from the pavement's surface.

## What the Researchers Did

Current methods to determine performance indicators on seal coats, such as aggregate loss and flushing, can be very subjective, time consuming, and labor intense. Researchers in this project developed an accurate and rapid scanning laser device, which can be mounted on a vehicle and driven at high speeds, to quantify the defects that may occur in seal coats and the level of severity of these defects. This research had three major tasks: (1) development of criteria for catagorizing seal coat quality, based on mean profile depth (MPD) measurement, using existing laboratory equipment; (2) development of a point laser device for high speed seal coat quality inspection based on MPD; and (3) development of a scanning laser device for seal coat quality inspection based on MPD.

The texture laser (point laser) device uses a single laser beam to measure distance, and when stationary, it can measure a distance with resolutions as high as 2 mils. The texture laser can be mounted on a vehicle and driven at high speeds along highways. Its 1-D raw data can be collected for profile information, mean profile depth (MPD), or texture information calculation using proper digital processing steps.

The auto-synchronized scanning laser system is a more complicated device. It also can be mounted on a high speed vehicle, but in this case, theoretically, 3-D data can be collected for profile, texture, or MPD information. Because this device conducts 3-D measurements, it requires more complicated algorithms and digital processing methods.

In this project, the data processing work (software) consisted of 2 important parts. (1) development of a data conversion algorithm for the scanning laser, and (2) development of an MPD calculation algorithm.


## Research Performed by:

The University of Houston (UH)

The University of Texas at San Antonio (UTSA)

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The data conversion algorithm is especially important for the scanning laser system. Because the raw data collected from the scanning laser forms parabolic curves, it was necessary to develop this method to convert the curves into straight lines. The developed method was based on an empirical polynomial curve fitting technique and proved to be practical and useful in field tests.

The calculated MPD is a key parameter for distinguishing a pavement status of flushing, shelled, or normal. The MPD calculation algorithm was developed based on the ASTM standard and implemented at practical field test sites.

## What They Found

Developing a criterion for judging pavement conditions was the ultimate task of this project. Comparing the measured MPD data by the laser devices with the MPD data of a circular track meter (CMT) measurement device, researchers defined proper thresholds for each kind of pavement. A flushing pavement presents MPD values less than 40 mils. The MPD of a normal pavement is between 40 to 95 mils, while the MPD of a shelled pavement is larger than 95 mils. When comparing the laser-device-measured MPD of any target pavement to the MPD criteria table, the pavement condition can be identified immediately. Implementation of the laser devices will make it practical for TxDOT engineers to efficiently monitor many miles of highway pavements.

## What This Means

A point laser and an auto-synchronized scanning laser were developed in this project. Both are non-contact and high speed sealcoat quality measurement devices which are able to monitor highway pavement condition in real time. The criteria of different pavement conditions were obtained based on the MPD measured on selected typical pavements. In this project the MPD calculating software worked properly with the hardware system and gave good results at a couple of standard test sites in San Antonio and Conroe, Texas.

*For More Information:*

0-5310-1 Development of a Scanning Laser System for Measuring Seal Coat Quality
0-5310-2 Feasibility Study of Scanning Laser Systems for Measuring Seal Coat Quality
0-5310-3 Evaluation of Seal Coat Performance Using Macrotexture Measurements

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