LTRC RESEARCH PROJECT CAPSULE

JULY 2009

09-5C

TECHNOLOGY TRANSFER PROGRAM

JUST THE FACTS

Evaluation of Non-Destructive Technologies for Construction Quality Control of HMA and PCC Pavements in Louisiana

Start Date:
July 1, 2009

Duration:
15 months

End Date:
September 30, 2010

Funding:
SPR: TT-REG/TT-REG

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SPECIAL POINTS OF INTEREST:

- Problem Addressed
- Objectives of Research
- Methodology Used
- Implementation Potential

PROBLEM

Current roadway quality control and quality acceptance (QC/QA) procedures for Louisiana include coring for thickness, density, and air void checks in hot mix asphalt (HMA) pavements and thickness and compressive strength for Portland cement concrete (PCC) pavements. In-situ devices, such as the Light Falling Weight Deflectometer (LWD) and Portable Seismic Pavement Analyzer (PSPA), are able to measure the modulus of the surface layer of a pavement quickly. These devices are non-destructive and portable, which allow for fast in-place determination of pavement properties, resulting in a sizable data set in a small amount of time. This would give the Department a tool for checking the consistency of in-place pavements and supplementing current QC/QA practices. This research will determine the ruggedness and consistency of each device as well as develop an operating procedure for running tests. Also, it will compare in-situ modulus values and mechanical properties measured in the lab. This research is intended to serve as a guide for further research regarding the LWD and PSPA.

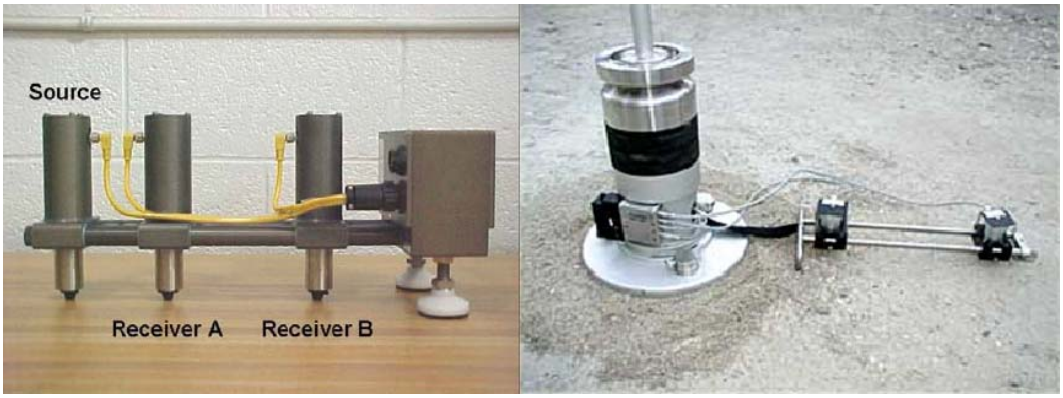

Figure 1
PSPA (left) and LWD (right)

OBJECTIVES

The objectives of this research are to develop procedures for operating the LWD and PSPA devices, perform a ruggedness test on the LWD and PSPA devices, determine the consistency of the LWD and PSPA, and compare lab properties obtained from cores to field properties obtained from the LWD and PSPA devices.

METHODOLOGY

A ruggedness test, ASTM E1169, will be conducted for each device to determine any environmental factors or test conditions that cause variation in the data, such as orientation of the receivers/geophones and the presence of small cracks and vehicle/construction vibrations. Data will be collected from three hot-mix asphalt projects and three Portland cement concrete projects. The collected data will be statistically analyzed to determine if the in-situ modulus values are adequately consistent within each project. This will consist of a series of paired t-tests and analysis of variance (ANOVA) tests to compare variations between factors and data sets. In addition to a ruggedness test, laboratory and field material properties will be collected from loose mix, cores, or cylinders. This will include the following tests: Dynamic Modulus of HMA, Indirect Tensile Resilient Modulus of HMA, Compressive Strength of PCC, and Modulus of Elasticity of PCC. The collected data will be used to confirm correlations from previous research for HMA as well as establish new correlations between the in-situ data and laboratory properties for PCC.

IMPLEMENTATION POTENTIAL

This research will steer the Department toward a performance-based specification for the use of the PSPA and LWD devices as QC/QA tools on both HMA and PCC pavements. If these devices prove to be consistent within each field project, technicians will be able to perform in-situ tests to identify potential weak points or other inconsistencies in a pavement with more data points, quicker sampling times, and faster results than traditional coring and laboratory tests. Confirming correlations between in-situ field tests and mechanical lab tests means field properties could be predicted from lab properties.

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