RESEARCH
PROJECT CAPSULE
July 2023
[23-2B]
TECHNOLOGY TRANSFER PROGRAM

Evaluation of Non-Destructive Test Pilot Projects

JUST THE FACTS:

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August 22, 2022

Duration:
24 months

End Date:
August 21, 2023

Funding:
TT-Fed/TT-Reg-6

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POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used / Implementation Potential

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PROBLEM

Figure 1. Non-destructive density testing devices

Asphalt pavements are compacted to the required density during construction to enhance long-term field performance and durability. Conventionally, density and compaction levels have been assessed through destructive techniques that require coring and testing samples in the laboratory, which can be time-consuming, costly, and disruptive to traffic flow. Louisiana DOTD requires a specified number of verification, acceptance, and resolution field cores to be taken for quality assurance purposes, depending on the length of the newly constructed asphalt pavement. For example, a 37500-linear ft. lot will be divided into five 7500-linear ft. sublots, which will require the collection of a total of 15 acceptance cores, five verification cores, and five resolution cores. The collection of these cores is time consuming and leaves newly constructed roadways with unsightly patched holes. Advancements in technology have led to the development of non-destructive testing (NDT) methods, which offer a more efficient approach to assessing asphalt density. Non-destructive asphalt density testing methods utilize innovative techniques to evaluate the compaction levels of asphalt pavements without causing any damage. These methods leverage the physical properties of the material or use specialized equipment to measure parameters that correlate with the asphalt's density. Some commonly used NDT methods for assessing asphalt density include nuclear density gauges, ground-penetrating radar (GPR), intelligent compaction (IC), and infrared thermography. Although they have been shown to be effective tools for nondestructive density measurements, nuclear density gauges (NDG) have radioactive footprints, which may be hazardous to operators.

To address the problems caused by destructive and nuclear density testing, researchers at the Louisiana Transportation Research Center (LTRC) conducted a study to assess the potential for NDT with little to no radioactive footprint to replace NDG for field density testing. Based on the findings of the study, the researchers recommend the use of the nondestructive testing for both quality control and assurance testing. This recommendation was conditional on the assurance that the device manufacturer and AASHTO T343's recommendation to calibrate the device daily by applying an appropriate core-calibration offset is strictly followed. In addition, the researchers recommended a pilot project to evaluate the logistical application of using nondestructive density measurements for acceptance testing. The pilot project is underway and the asphalt research group seeks to collect and analyze data from the project.

OBJECTIVE

The objective of this research is to collect and analyze data from non-destructive testing (NDT) pilot projects proposed in LTRC project 17-2B for implementation in section 502 of the *Louisiana Standard Specifications for Roads and Bridges.*

METHODOLOGY

To achieve the findings of this study, the research team will visit pilot projects sites for in-place density measurements. Ten pilot project sites have been selected for evaluation. A pavement quality indicator (PQI), Model 380 non-nuclear density gauge (NNDG), will be used for this study. The PQI, an electrical density gauge, passes a small current through the pavement, which creates an electrical sensing field. The strength of the generated electric field is an indicator of the dielectric constant of the asphalt layer, which is directly correlated with the in-place density. For each pilot project considered, the PQI device will be calibrated daily in accordance with NDT Device Off-set Determination—Validation Day Procedures described in section 502.11.2 of the NDT pilot specification. PQI density readings will be compared to density readings taken by DOTD personnel, contractor, and densities obtained from field cores. Field in-place density data will be analyzed to assess the accuracy, precision, cost-effectiveness, and practicality of using the proposed NNDG in different construction scenarios. The research will be conducted following the proposed tasks listed below:

- Task 1: Record non-destructive test readings from pilot projects
- Task 2: Analyze test data
- Task 3: Prepare draft final report

IMPLEMENTATION POTENTIAL

It is anticipated that findings of this pilot project will help refine the testing procedures, establish standards, and determine the feasibility of implementing non-destructive testing on a larger scale.