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Evaluation of MIT-SCAN-T2 for Thickness Quality Control for PCC and HMA Pavements

INTRODUCTION

Thickness is currently a pay item for PCC pavements and a quality control item for both PCC and HMA pavements. A change in pavement thickness of 0.5 in. can result in a change of multiple years of service. Current thickness measurements are performed by destructively coring the finished pavement and measuring the thickness of the core. Many times this is performed at the end of the project construction and only five representative samples are collected for each lot. Today, multiple non-destructive pavement evaluation tools are available and the accuracy of such devices has significantly increased in recent years. Non-destructive thickness measurements will allow the Department a more efficient and effective method of maintaining pavement quality without damaging the pavement.

OBJECTIVE

The objective of this research was to evaluate the MIT-SCAN-T2 as a non-destructive pavement thickness measuring device for quality control and quality assurance purposes. A ruggedness study was performed in the laboratory to determine factors of influence on thickness measurements. Field evaluations were performed to test the device in actual production conditions.

SCOPE

To meet the objectives of this project, researchers undertook a ruggedness study. Factors considered included: measurement depth, plate size, geometry, orientation, skew, steel-toe boot influence, and plate manufacturer. Three field sites were used with varying thicknesses to validate the technology. The first site was a roller compacted concrete test section built at the Accelerated Pavement Testing Facility in Port Allen, LA, with thicknesses ranging from 4 to 8 in. thick. The second site was a project located on I-49 north of Shreveport, LA, with a pavement thickness of about 11 in., and a third project was constructed at LTRC with thicknesses ranging from 8 in. to almost 13 in.

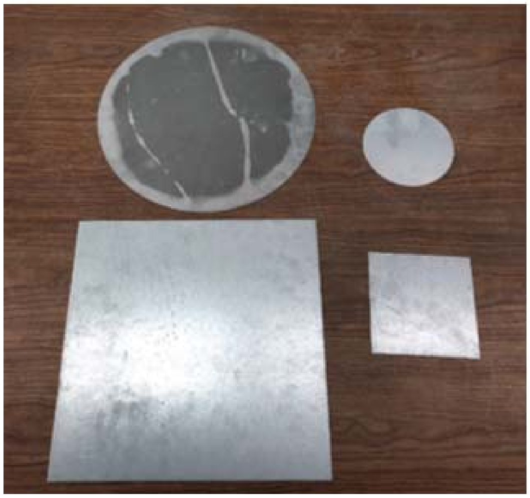

Figure 1
MIT-SCAN-T2 reflectors

METHODOLOGY

Reflector shapes and sizes were analyzed for pavement thicknesses up to 13 in. A ruggedness study was conducted and the results were analyzed according to ASTM E1169. Factors measured in the ruggedness study included: reflector depth, surface area, dimension/target shape, source (manufacturer provided vs. in-house fabricated reflector), orientation, skew, and the presence of steel toed boots.

LTRC Report 587

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CONCLUSIONS & RECOMMENDATIONS

The results of this study warrant the following conclusions. The ruggedness test showed that the presence of steel-toe boot, surface area, plate manufacturer, and depth could be potentially significant factors. However, the influence of these factors on the measured depth was large, causing significant errors in the depth readings. An additional factorial was performed with a control sample and additional runs, varying only one factor at a time. The readings obtained with this factorial were significantly more accurate, with an error of 0.2 in. for the control sample. These results show that the device is capable of accurately measuring thickness if used within the parameters recommended by the manufacturer.

The field results support the finding of the ruggedness study. If all of the negative influencing factors are controlled the MIT-SCAN-T2 can accurately measure the in-place depth of pavement. If any of these factors are present, then results can be skewed heavily.

The authors recommend that the Department consider implementing the MIT-SCAN-T2 when the number of projects being constructed as full-depth replacements warrants the cost. Implementation would be one to two machines purchased and then loaned from the Materials Lab when conducting thickness verifications on specific projects.