



The Ohio Department of Transportation Office of Research & Development Executive Summary Report

AUTOMATED LABORATORY TESTING METHODS FOR SPECIFIC GRAVITY AND ABSORPTION: VERIFIED TO MATCH THE CURRENT METHODS

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*Principal Investigators:
Dr. Arudi Rajagopal*

ODOT Contacts:

*Technical:
Lloyd Welker, P.E.
Administrator, OMM*

*Administrative:
Monique R. Evans, P.E.
Administrator, R&D
614-728-6048*

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<http://www.dot.state.oh.us/divplan/research>
or call 614-644-8173*

*Ohio Department of Transportation
Office of Research & Development
1980 West Broad Street
Columbus, OH 43223*

Problem Statement

In recent years, a number of agencies are exploring automated laboratory testing methods for the measurement of specific gravity and absorption of aggregates. The primary intent of such efforts is to obtain faster results while, at the same time, improving the accuracy of results. Two automated devices that are commercially available are the InstronTek CoreLok and Thermolyne SSDetect. CoreLok is a vacuum sealing device. Unlike the traditional ASTM procedure, the CoreLok method bypasses the saturated surface dry (SSD) weight measurement on its way to determine the specific gravity and absorption of coarse and fine aggregates. The SSDetect system uses infrared light to trace surface water on fine aggregate particles. While the CoreLok device has been designed to bypass the SSD condition, the purpose of SSDetect device is to produce SSD sample using an objective procedure. This report outlines an experimental plan to review the CoreLok and SSDetect devices for their potential use in Ohio.

Objectives

Conduct a comparative evaluation of the CoreLok, SSDetect and ASTM test procedures in determining the specific gravity and absorption values of representative coarse and fine aggregates sources in Ohio.

Methodology

Twenty six coarse aggregate (12 gravel, 10 lime stone, 4 slag) and nine fine aggregate (4 lime stone, 3 natural sand, 2 slag sand) materials were collected from various sources in Ohio. Specific gravity and water absorption tests were

conducted on three replicate samples from each source. The coarse aggregate samples were tested using the CoreLok and ASTM C 127 procedures.



Fine aggregate samples were tested using the CoreLok, SSDetect and ASTM C 128 procedures.

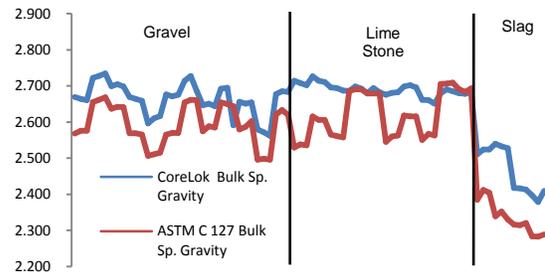


Conclusions:

The results of statistical analysis led to the following conclusions:

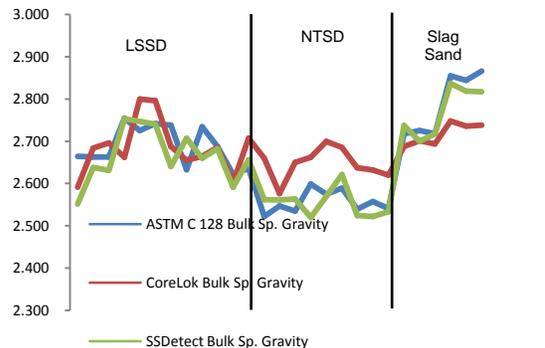
Coarse aggregates:

- The CoreLok G_{sb} values are 0 to 8% higher than the ASTM C 127 values. At 95% confidence interval, the difference between the test procedures is statistically significant.
- The difference between CoreLok and ASTM C 127 G_{sa} values vary from 0 to 12%; this difference is statistically significant at 95% confidence interval.
- The CoreLok absorption values are 1 to 81% lower except for two slag samples.



Fine Aggregates:

- The SSDetect G_{sb} results closely follow the ASTM C 128 values. CoreLok G_{sb} values are moderately higher than ASTM and SSDetect for natural sand, but lower for slag. These differences are not statistically significant.



- G_{sa} results of all the three test procedures follow each other closely.
- The difference in absorption values between CoreLok and ASTM C 128 procedure ranges from 1.5% to 243.7%. In case of SSDetect vs. ASTM, this difference is 0.9% to 124.2%.
- An in-depth absorption study of coarse aggregates using CoreLok highlighted some deficiencies in the procedure.

Implementation Potential:

The CoreLok and SSDetect devices are promising and user-friendly. In terms of the amount of time reduced in performing specific gravity and absorption tests, they are unequivocally satisfying. However, there are still inconsistencies that have to be addressed before these devices can be routinely used in Ohio.