Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6676: Rapid Field Detection of Moisture Content for Base and Subgrade

Background

Properly applying water during compaction of roadway base and subgrade materials is important for achieving adequate compaction. Construction specifications determine the required water content, and field measurement historically takes place with a nuclear density gauge. However, with the regulatory requirements of using nuclear sources, and continued interest in stiffness or modulus-based compaction acceptance, researchers need to identify techniques to rapidly measure moisture content on base and subgrades without using a nuclear source.

What the Researchers Did

Researchers surveyed potential technologies for such rapid measurement. Researchers chose three non-nuclear tests, the nuclear gauge for comparison purposes, and the oven dry gravimetric water content for the reference value.

The last stage focused on the new devices including the Electrical Density Gauge (EDG), the DOT 600, and a moisture analyzer (see Figure 1). After collecting data on construction projects, researchers evaluated each test for bias, precision, and sensitivity, and then scored the devices according to bias, precision, sensitivity, cost, turnaround time, suitability for uncompacted materials, and suitability for compacted materials.

What They Found

With these scoring parameters, the data showed the moisture analyzer most suitable for implementation. Other important considerations included:

- Driving the EDG darts into materials significantly dry of optimum proved quite difficult.
- Some equipment reliability issues occurred with the DOT 600.
- The moisture analyzer only tests the passing No. 4 size fraction. To successfully implement this device, specifications would require modification to address the moisture content of the passing No. 4 fraction for materials (such as flexible bases) that retain a significant portion on the No. 4 sieve.

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What This Means

Researchers produced a draft test procedure for measuring moisture content with a moisture analyzer. Using this method, and with the materials tested in this project, test turnaround time with the moisture analyzer was typically between 15 and 30 minutes. This test could be considered for implementation for materials that pass the No. 4 sieve, while implementation for materials retaining significant amount on the No. 4 sieve would require changes to construction specifications to include the moisture content on the passing No. 4 material.

Figure 1. EDG, DOT 600, and Moisture Analyzer Tests.

For More Information

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