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Committee D04 on Road and Paving Materials
Subcommittee D04.21 on Specific Gravity and Density of Bituminous Mixtures

Research Report RR #D04-1021

Inter-Laboratory Study to Establish Precision Statements for ASTM D3549, Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens

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REPORT TO ASTM SUBCOMMITTEE D04.21
On the Round Robin for
Development of a Precision Statement for
ASTM D3549 Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens

Submitted by M. Stroup Gardiner

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INTRODUCTION

The measurements of sample heights and diameters are needed for verification of the proper sample size, normalization of test results to a standard sample height, and for general volumetric calculations. The ASTM D3549 Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens describes the procedure for obtaining four measurements at quarter points on the sample for either height or diameter measurements. However, this test method only contains a suggested precision statement based on a summary of various reported data. The purpose of this research program was to develop a sufficient data base from which to develop formal within- and between-laboratory precision statements.

RESEARCH PROGRAM

Objectives

The objective of this research was to develop a precision statement for Section 6.1, measurement of heights or diameters with tape, ruler, or calipers. Measurements by the jig method were not included in this study.

Scope

Two replicates of height and diameter measurements were obtained according to ASTM D3549 for five samples by twenty different operators. The five samples consisted of:

- Two samples were cored from pavements
- Two samples were gyratory-compacted samples
- One Marshall-compacted stone matrix asphalt (SMA)

These samples were selected to represent as wide a range as possible of typical samples encountered in laboratory testing that would require the measurements of either sample heights or sample diameters.

MATERIALS

The two cores were obtained from two different field projects previously evaluated for other National Center for Asphalt Technology (NCAT) research projects. One SMA sample was prepared with a Marshall hammer using 75 blows per side. The gyratory-compacted samples were prepared during a new compactor verification study that had a requirement on the difference bulk specific gravities of 0.01 or less. One was a fine graded 19 mm Superpave mix and the second was a coarse graded 25 mm Superpave mixture. Figure 1 shows the visual, as well as height, differences between the samples.

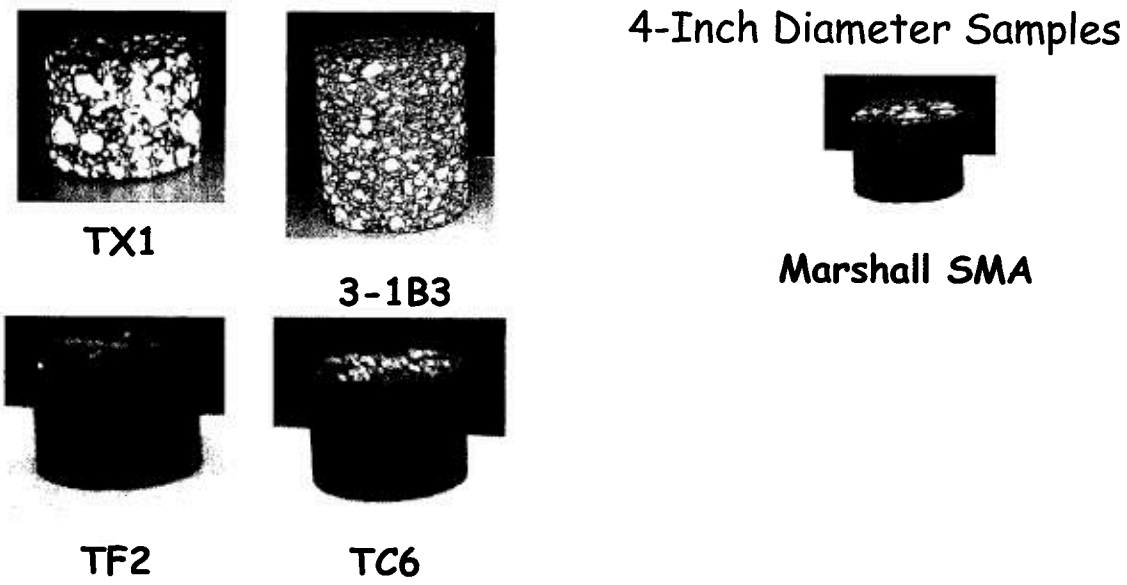

Figure 1. Samples used for determining D3549 precision.

TESTING PROGRAM

The AASHTO Materials Reference Laboratory (AMRL) circulated the samples for testing during routine on-site inspections at 12 laboratories. Additional testing was completed by eight AMRL personnel using one of 5 different measuring devices. This produced a total of 20 sets of replicate measurements on these five samples. Both heights and diameters were determined for all samples.