Standard Practice for

Evaluation of the Superpave Gyratory Compactor (SGC) Internal Angle of Gyration

AASHTO Designation: PP 48-03 (2005)

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1. SCOPE

1.1. This practice covers the procedure for the evaluation of the Superpave Gyratory Compactor (SGC) internal angle of gyration using the U.S. Federal Highway Administration Dynamic Angle Validation Kit (DAV).

1.2. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 231, Weighing Devices Used in the Testing of Materials
- R 35, Superpave Volumetric Design for Hot-Mix Asphalt (HMA)
- T 166, Bulk Specific Gravity of Compacted Hot-Mix Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 168, Sampling Hot-Mix Asphalt Paving Mixtures
- T 209, Theoretical Maximum Specific Gravity and Density of Hot-Mix Asphalt Paving Mixtures
- T 312, Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor

3. TERMINOLOGY

3.1. *Definitions*:

3.1.1. *internal angle*—the angle formed between the internal mold diameter and the mold end plates during the compaction of a specimen in a Superpave Gyratory Compactor.

3.1.2. *external angle*—the angle formed between the external mold diameter and a stationary reference axis of the machine frame.

3.1.3. *top angle, $\alpha(top, h)$*—the top (uppermost) internal angle resulting from a single measurement on an HMA specimen with a final height h.

3.1.4. *bottom angle, α(bottom, h)*—the bottom (lowermost) internal angle resulting from a single measurement on an HMA specimen with a final height *h*.

3.1.5. *effective angle, α(effective, h)*—the operative internal angle of gyration for an SGC when compacting HMA specimens with a specimen final height *h*.

3.1.6. *available mold height*—the internal height available within the mold to compact HMA while the mold is inserted into the SGC and the ram head or mold end plates are in the maximum open position that will still permit gyration.

4. SUMMARY OF PRACTICE

4.1. The internal angle of gyration of a Superpave Gyratory Compactor (SGC) is measured dynamically with an instrument inserted into the mold while hot-mix asphalt is compacted. The internal angles at each end of the mold are measured, then averaged to obtain an effective angle of gyration. Analysis Method A is intended for use in SGCs with molds of insufficient height to accommodate a 115 ± 5 mm tall specimen with the instrument. Analysis Method B is intended for use in SGCs with molds of sufficient height to accommodate 115 ± 5 mm final height HMA specimens with the instrument. Analysis Method A can also be used universally in lieu of Analysis Method B on all SGCs.

5. SIGNIFICANCE AND USE

5.1. Superpave Gyratory Compactors (SGCs) are used to produce hot-mix asphalt (HMA) mixture specimens in the laboratory to assess and predict pavement performance. SGC specimens are cylindrical with a diameter of 150 mm and a final height of 115 mm. In the fabrication of an SGC specimen, loose HMA is placed inside a metal mold, which is then placed into an SGC. A constant consolidation pressure is applied to the sample while the mold gyrates at a nominally constant angle (referred to as the angle of gyration) and rate. Consistency in the density of the asphalt specimens produced is very important to the validity of the tests performed. Specimens of a consistent density are produced when an SGC maintains a constant pressure and a known constant angle of gyration during the compaction process.

5.2. There are several manufacturers and models of SGC. Each model employs a unique method of setting, inducing, and maintaining the angle of gyration. Each model also employs a unique calibration system to measure the angle of gyration externally in relation to the mold. These existing calibration systems can not be used universally on all of the different SGC models commercially available. Inconsistencies in asphalt specimens produced on different SGC models have been attributed to variations in the angle of gyration.

5.3. This practice, along with the DAV, provides an independent uniform process to validate the angle of gyration of any manufacturers' SGC model.

6. INTERFERENCES

6.1. Debris on the SGC mold, base plates, ram head, reaction surfaces, or on the instrument can cause errant measurement results. Extreme care should be taken to thoroughly clean the SGC, mold, instrument, and any work areas that will be utilized during the measurement procedure. Scarring or irregular surfaces on mold walls and end plates is also known to cause incorrect results. Do not use any equipment that shows signs of damage. The precision required in the execution of this practice necessitates that extreme care must be taken to avoid errors from damaged or improperly maintained equipment.