Standard Method of Test for

Evaluation of Superpave Gyratory Compactor (SGC) Internal Angle of Gyration Using Simulated Loading

AASHTO Designation: T 344-22[1,2]

Technically Revised: 2022

Technical Subcommittee: 2d, Proportioning of Asphalt–Aggregate Mixtures

ASTM Designation: D7115-05

American Association of State Highway and Transportation Officials
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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 an instrument capable of simulating loading conditions similar to those created by a hot mix asphalt (HMA) specimen.

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.*

1.3. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENT

2.1. *AASHTO Standards*:

- M 339M/M 339, Thermometers Used in the Testing of Construction Materials
- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

2.2. *ASTM Standards*:

- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

2.3. *International Electrotechnical Commission Standard*:

■ IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances

3. TERMINOLOGY

3.1. *Definitions*:

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

3.1.2. *internal angle*—the angle formed between the internal mold diameter and a mold end plate as a mold is gyrated in an SGC.

3.1.3. *top internal angle*—the angle formed between the internal mold diameter and the upper mold end plate as a mold is gyrated in an SGC.

3.1.4. *bottom internal angle*—the angle formed between the internal mold diameter and the lower mold end plate as a mold is gyrated in an SGC.

3.1.5. *effective internal angle*—the average of the top internal angle and the bottom internal angle.

3.1.6. *tilting moment*—a force (F) acting at one end of an SGC mold platen in a direction parallel to the axis of gyration, but acting at some distance (e) away from that axis. The tilting moment at one end of the mold platen is computed as the product of this distance (e) and force (F).

3.1.7. *total moment*—the sum total (M) of the tilting moment acting at the top of the mold and the tilting moment acting at the bottom of the mold.

3.1.8. *eccentricity*—the distance (e) away from the axis of gyration at which a force (F) is acting at one end of an SGC mold. This use of the term *eccentricity* is consistent with previous published reports describing the mechanics of gyratory compaction.

3.1.9. *standard SGC volumetric specimen*—a standard-sized HMA specimen prepared using an SGC for purposes of volumetric mix design. Such a standard specimen, prepared in accordance with T 312, has a diameter of 150 mm and a final compacted height of 115 ± 5 mm.

4. SUMMARY OF PRACTICE

4.1. The internal angle of gyration of an SGC is measured dynamically with an instrument inserted into the SGC mold.

4.2. A load (moment) is induced on the SGC while the internal angle is simultaneously measured. The simulated loading conditions are similar to those created by compaction of a standard SGC volumetric specimen.

4.3. The internal angles at each end of the mold are measured and then averaged to obtain the effective internal angle of gyration.

5. SIGNIFICANCE AND USE

5.1. SGCs are used to produce hot mix asphalt (HMA) mixture specimens in the laboratory to assess and predict pavement performance. 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