Superpave Gyratory Compactor
Recommended Practices for Maintenance and Calibration

1. **Know and follow the applicable governing agency specifications.** Each governing agency may have requirements that differ from these guidelines, such as more frequent equipment inspection intervals or different specific setting or tolerance requirements. This document does not represent the varied requirements of specific agencies but simply outlines Pine's minimum recommendations. Where conflicts arise, the governing agency specifications take precedence.

2. **Read the Operator's Manual**. There is no substitute for a good understanding of the particular maintenance and calibration issues discussed in the manual for a particular SGC model.

3. **Lubricate all wear surfaces** periodically as directed by the operator's manual. Failure to lubricate wear surfaces often causes premature wear and increased repair costs.

4. **Keep the SGC clean**. Immediately clean any debris or buildup of asphalt binder. Debris and binder buildup often interfere with proper SGC operation and can cause premature wear and increased repair costs.

5. **Clean molds and end plates** after every specimen. Debris and binder buildup on mold end plate surfaces and on critical mold contact points can alter the angle of gyration applied to the specimen.

   DO NOT use an ignition oven to remove binder residue from the mold bore. The extreme heat will damage the mold beyond repair by causing it to go out of round. To clean heavy residue, warm the mold to 60°C (140°F) and use a solvent to remove the residue. WD-40 works well and provides a residual coating that inhibits corrosion.

6. **Calibration Terminology:** The following terms are used to describe calibration of machine parameters.

   Standardize: a process to bring a measuring instrument or measurement system into conformance to a known standard (i.e.: force, height, angle, etc.).

   Verify: a process that establishes whether the results of a previously calibrated measurement instrument or measurement system are stable. Verification is used to maintain the traceability of a system and to determine when to recalibrate. If the machine response is in conformance, no correction is required.

   Calibrate: a process that establishes the relationship (traceability) between the results of a measurement instrument or measurement system and the corresponding values of a reference standard.

7. **Standardize the ram pressure** measurement system a minimum of every six months or every forty (40) hours* of operation, whichever comes first. Use the certified proving ring or load cell appropriate for the SGC model to verify the ram pressure. Electronic load cells should be calibrated annually and mechanical proving rings calibrated every two years.

8. **Standardize the height** measurement system a minimum of every six months or every forty (40) hours* of operation, whichever comes first. Use the certified gage block(s) appropriate for the SGC model. Gage blocks should be certified every two years. If blocks are visibly damaged, they should be repaired and recertified.

9. **Standardize the internal angle** of gyration. Standardize the internal angle of gyration** a minimum of once per year or every eighty (80) hours* of operation, whichever comes first. Follow the AASHTO TP71 procedure using molds at room temperature. Top and bottom angles should be within 0.10° of each other.

   Note: The AFGB1 model SGC exhibits a predictable shift between room temperature mold and compaction temperature mold angle of gyration. For this model SGC, a room temperature internal angle of 1.19° represents a 1.16° internal angle at typical compaction temperatures. The Pine SGC models AFG1, AFG2, and AFGC125X do not exhibit the shift. Standardize these SGC models at the target angle (1.16°) with room temperature molds.

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* The term *hour of operation* applies only to the amount of time the SGC is actually compacting specimens. It is the amount of time required to prepare about ~18 specimens (1800 gyrations).

** The *internal angle of gyration* is the angle between the mold wall and the end plates, as measured from the inside of the SGC mold. Beginning in 2003, AASHTO T 312 permitted the option of specifying an internal angle of gyration of 1.16° in lieu of an 1.25°external angle. Beginning in 2009, AASHTO T312 requires a 1.16° internal angle measured using the AASHTO TP 71 procedure.

10. **Monitor the external angle** of gyration. A shift in the external angle can indicate a shift has occurred in the internal angle as well. Monitor the external angle of gyration a minimum of every three months or every twenty (20) hours* of operation, whichever comes first. On models which display the angle of gyration, the display readout provides the desired information. On models which don't display the angle, refer to the Operators Manual for instructions on checking the external mold angle.
11. **Standardize the speed of gyration.** Standardize the speed of gyration a minimum of once per year or every eighty (80) hours* of operation, whichever comes first.
12. **Verify mold dimensions** a minimum of once per year or every eighty (80) hours* of operation, whichever comes first. Measurement of the inner diameter of the mold should be at three locations along the length of the mold using a bore gage. Two of these locations should be within any observed wear areas (*i.e.* where the HMA material is compacted). The outer diameters of end plates should be verified using calipers or outside micrometers. Mold bores and end plates should also be checked for damage (deep gouges). Consult the SGC Operation Manual for information regarding other mold dimensions (such as flange thickness) that are critical for certain SGC models.
13. **Verify internal angle of gyration for each mold** a minimum of once per year or every eighty (80) hours* of operation, whichever comes first. Each SGC model has specific requirements for the molds to apply a correct and consistent angle of gyration. Measuring the internal angle with each mold confirms the angle is being applied consistently on each mold used with a given SGC. One top and one bottom angle is sufficient for this check. Each mold internal angle should be within +/-0.02° of the average of all molds used with a given SGC.
14. **Maintain a log book**. Create and maintain a log book to record the results of routine SGC standardization and major service events. Monitoring trends in standardization results often permits early detection of machine performance issues.
15. **When a compactor is moved to a new location**, standardize pressure, height, and internal angle after relocation. While SGC units have been moved and used successfully without being standardized, there is a risk of incorrect compaction results if any critical parameters changed from handling during transport.
16. **Turn your SGC off** when not in use for extended periods (i.e.: overnight, weekends, etc.). Saving energy saves you money.

SGC Compaction Sensitivity

The following are general statements about the sensitivity of bulk specific gravity to various compaction parameters:

- **Angle of Gyration**. A low angle of gyration leads to less compaction and higher air voids. A tenth of a degree drop in the angle of gyration lowers the bulk specific gravity by 0.010 to 0.015 (10 to 15 kg/m^3).
- **Ram Pressure**. Low ram pressure leads to less compaction and higher air voids. A 10 kPa decrease in the ram pressure lowers the bulk specific gravity by 0.002 to 0.004 (2 to 4 kg/m^3).
- **Mold Wear**. As a mold wears, the clearance between the mold and its end plates increases. For each millimeter of additional clearance, the bulk specific gravity decreases by about 0.020 (20 kg/m^3).
- **Lubrication and Paper Disks.** Excessive lubricant on end plates (especially the interface between the specimen papers and the metal end plates) leads to less compaction and higher air voids. Use non-glossy release disks.

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