INDIANA DEPARTMENT OF TRANSPORTATION
Division of Materials and Tests

Directive 303

Plate Sample Preparation and Superpave Gyratory Compactor (SGC) Specimen Fabrication

Roadway plate samples are taken from behind the paver in accordance with ITM 580 and placed in approved cardboard transport containers for delivery to a Production Laboratory. The samples require being conditioned for 2 hours, sample reduction to specimen quantity, heating to compaction temperature, compaction in accordance with AASHTO T 312 and removal and cooling prior to subsequent testing for volumetric properties. The SGC specimen fabrication will be completed in a continuous sequence upon initiating sample heating. A checklist for the lubrication and maintenance schedules of the gyratory compactor is included in Appendix A. The procedures will be as follows:

Plate Sample Conditioning

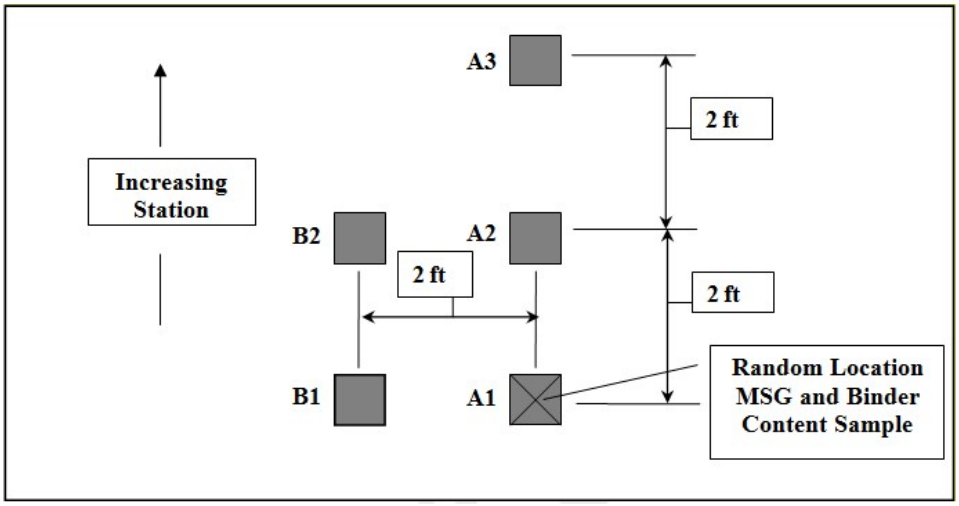

Plate samples A1, A2, and A3 (and corresponding back up samples, B1 and B2) shall be conditioned, from ambient temperature, for a minimum of 2 hours prior to any sample reduction or testing. Conditioning more than 2 hours is acceptable as aging of the binder does not affect the maximum specific gravity, binder content, gyratory pill height, bulk specific gravity, or aggregate properties.

The cardboard sample transport container shall be closed, placed in a 300 ± 9^{O}F (dense-graded HMA and SMA) or 260 ± 9^{O}F (open-graded HMA) oven and conditioned from ambient temperature for 2 hours. If overnight timers are applied and samples preloaded, the

2 hour conditioning time starts once the oven reaches temperature (300 ± 9^{O}F or 260 ± 9^{O}F).

Gyratory Compactor Maintenance and Calibration/Verification Procedures

The procedures for the maintenance of the Pine SGC Model #AFG1A and #AFG2A gyratory compactor and the calibration/verification procedures are required prior to compaction of any gyratory specimens. These procedures include:

1. The SGC Operations Manual recommended maintenance schedule is completed in accordance with the established checklist.
2. Verification of calibration settings for the gyratory compactor is in accordance with ITM 908 on a one month schedule.
3. Verification of the dimensions of the gyratory molds, top plates, and base plates is in accordance with AASHTO T 312 on a 12 month schedule.
4. Verification of the internal angle of the gyratory compactor is in accordance with AASHTO T 344 simulated loading on a 12 month schedule.
5. All SGC surfaces, rollers, plates, and molds are kept as clean as possible.
6. The molds and top and bottom plate surfaces are cleaned with WD 40 and wiped dry after each use.

Gyratory Sample Reduction

The procedures for reducing the sample to the quantity required for the gyratory specimen are as follows:

NOTE: If the cardboard transport container has been exposed to water, grease, solvents, oils, etc., the container contents will be transferred to a rectangular sample pan and covered before placement in the oven.

1. After conditioning, the mixture from the cardboard transport container is placed on the splitting board and reduced in accordance with ITM 587, section 7.0, to the target weight listed on the DMF form.

    - A reasonable effort shall be made to remove any significant amount of remaining material that does not fall from the container. It shall be thoroughly mixed back into the sample.
    - The splitting board and tools can be made nonstick by the application of PAM® Original cooking spray or an approved anti-adhesive material that is diluted and used per the manufacturer's recommendations. The material shall not contain any solvents or petroleum-based products that could affect asphalt binder properties.
    - The splitting board will be any flat surface free from contaminants such as HMA, aggregate, liquid asphalt, dirt, grease, excess solvents, etc., and may be preheated with heat lamps.

2. The split samples are placed in a silicone laminate paperboard carton. The carton lid and end flap are then closed.

Sample Heating and Temperature Measurements

The sample is heated to the required compaction temperature as follows:

1. The cartons are placed in a 300 ± 9^{O}F (dense-graded HMA and SMA) or 260 ± 9^{O}F (open-graded HMA) oven.
2. A thermometer is inserted into the carton and left for continuous reading of the mixture temperature by external digital display.
3. The mold and bottom plate are placed separately in the compaction oven or oven of the same temperature.
4. The mold and bottom plate are kept in the oven for 90 minutes or until the bottom plate temperature, as verified by a dial contact surface thermometer, is 300 ± 9^{O}F for dense-graded HMA and SMA or 260 ± 9^{O}F for open-graded HMA.
5. Once the mixture temperature has been achieved, the mold will be assembled and charged.

Sample Mold Charging

The sample is charged into the gyratory mold as follows:

1. The sample, mold and bottom plate are removed from the compaction oven.
2. The bottom plate is assembled in the bottom of the mold.
3. A gyratory paper disk is placed on top of the bottom plate inside the heated mold assembly so that the specimen will be in contact with the non-print side. Pine gyratory paper disks are to be used.
4. The carton lid will remain closed while the end flap is released prior to sample transfer.
5. The carton is placed into the mold and the sample is deposited with one quick motion.
6. A paper disk is placed on top of the sample with the non-print side in contact with the specimen.
7. The mold with sample is placed into the SGC and compacted to the specified design gyrations listed on the DMF form.

Sample Extraction and Cooling

Dense-Graded and SMA

1. The specimen is raised level to the top of the mold and the paper disk is removed.
2. The specimen and base plate are extruded from the mold, lifted with specimen lift handles, and placed on a flat surface.
3. The specimen is left on the base plate in front of a fan for a minimum of 5 minutes.
4. The specimen is lifted from the base plate and inverted on a flat surface.
5. The paper disk is removed.
6. The specimen is cooled overnight or until the surface temperature measured

with a non-contact digital infrared thermometer is 77 ± 9^{O}F.

Open-Graded

1. The specimen is raised level to the top of the mold.
2. The specimen is initially cooled in the mold for 10 minutes by directing a fan towards the top of the mold in the compactor.
3. The paper disk is removed.
4. The specimen is extruded approximately 1.25 inches and the specimen is cooled with a fan for five minutes.
5. The specimen is extruded an additional 1.25 inches (2.50 inches total) and cooled with a fan for five minutes.
6. The specimen is extruded an additional 1.25 inches (3.75 inches total) and cooled with a fan for five minutes.
7. The specimen and base plate are extruded from the mold and placed on a flat surface.
8. The specimen is lifted from the base plate and inverted on a flat surface.
9. The paper disk is removed.
10. The specimen is cooled overnight or until the surface temperature measured with a non-contact digital infrared thermometer is 77 ± 9^{O}F.

Specimen Requirements

Two specimens are prepared from one roadway plate sample and the Bulk Specific Gravity (G_{mb}) is determined for each sample in accordance with AASHTO T 166. The two G_{mb} results are averaged to obtain one G_{mb} value. The gyratory specimens are checked for the following requirements:

1. The compacted height of each specimen is required to be 115 ± 5mm. If the height of a specimen is not within these tolerances, the specimen is discarded.

2. Two specimens prepared by the same operator should have Gmb values within 0.020 of each other. Please refer to Directive 304 if the values have a difference more than 0.020.

FABRICATION OF HOT MIX ASPHALT SPECIMENS BY MEANS OF THE SUPERPAVE GYRATORY COMPACTOR

APPARATUS

- [ ] Superpave Gyratory Compactor
  - [ ] Maintenance schedule in accordance with recommended frequency
  - [ ] ITM 908, Verifying Calibration Settings for SGC, done monthly
  - [ ] AASHTO T 312, Verifying SGC molds, top plates and bottom plates, done
  - [ ] AASHTO T 344, Evaluation of SGC Internal Angle of Gyration using Simulated Loading, done annually
  - [ ] All SGC surfaces, rollers, plates and molds are clean
  - [ ] Molds and plates wiped clean after each use with WD40
- [ ] Oven themostatically controlled to ± 5°F
- [ ] Digital infrared thermometer
- [ ] External digital thermometer
- [ ] Dial contact surface thermometer

PROCEDURE – SAMPLE REDUCTION

- [ ] Transport container closed or sample covered and placed in oven
  - [ ] 300 ± 9°F for dense-graded HMA or SMA
  - [ ] 260 ± 9°F for open-graded HMA
- [ ] Sample conditioned from ambient temperature for 2 hrs
- [ ] Mixture placed on contaminant free splitting board or flat surface
- [ ] Mixture reduced by ITM 587, section 7.0, to target weight from DMF
- [ ] Split samples placed in silicone laminate paperboard carton
- [ ] Carton lid and end flap closed

PROCEDURE – HEATING AND TEMPERATURE MEASUREMENTS

- [ ] Carton placed in oven
  - [ ] 300 ± 9°F for dense-graded HMA or SMA
  - [ ] 260 ± 9°F for open-graded HMA
- [ ] Thermometer placed in carton and mixture temperature determined by external digital display
- [ ] Mold and bottom plate placed separately in compaction oven or oven of same temperature for 90 minutes or until the bottom plate temperature is verified by a dial contact thermometer
  - [ ] 300 ± 9°F for dense-graded HMA or SMA
  - [ ] 260 ± 9°F for open-graded HMA
- [ ] Mixture temperature verified
  - [ ] 300 ± 9°F for dense-graded HMA or SMA
  - [ ] 260 ± 9°F for open-graded HMA

PROCEDURE – MOLD CHARGING

[ ] Sample, mold and bottom plate removed from oven
[ ] Mold assembled
[ ] Pine paper disk placed inside mold with non-print side in contact with mixture
[ ] Carton lid closed and end flap released
[ ] Carton placed into mold and sample deposited in one quick motion
[ ] Paper disk placed on top of sample with non-print side touching mixture
[ ] Mold placed in SGC and compacted to specified gyrations per DMF within two hours of reaching compaction temperature

PROCEDURE – COOLING (Dense Graded and SMA)

[ ] Specimen raised level to top of the mold and paper disk removed
[ ] Specimen and base plate removed from mold, lifted with specimen lift handles, and placed on flat surface
[ ] Specimen and base plate cooled in front of fan for 5 minutes
[ ] Specimen lifted from base plate and inverted
[ ] Paper disk removed
[ ] Specimen cooled overnight or until surface temperature measured with non-contact digital infrared thermometer is 77 ± 9°F

PROCEDURE – COOLING (Open Graded)

[ ] Specimen raised level to top of the mold
  [ ] Fan directed toward top of mold in compactor
  [ ] Specimen and mold cooled by fan for 10 min
  [ ] Paper disk removed
[ ] Specimen extruded approximately 1.25 in. and cooled with a fan for 5 min
[ ] Specimen extruded a total of approximately 2.50 in. and cooled with a fan for 5 min
[ ] Specimen extruded a total of approximately 3.75 in. and cooled with a fan for 5 min
[ ] Specimen and base plate extruded from mold and placed on flat surface
[ ] Specimen lifted from base plate and inverted on flat surface
[ ] Paper removed
[ ] Specimen cooled overnight or until surface temperature measured with non-contact digital infrared thermometer is 77 ± 9°F

NA - Not Applicable
X - Requires Corrective Action
√ - Satisfactory

_____
Acceptance Technician

_____ _____
INDOT Date

Comments_____

SUPERPAVE GYRATORY LUBRICATION/MAINTENANCE SCHEDULE

LUBRICATION SCHEDULE

Component	Daily	Initial 5 Hours	Every 25 Hours
Ram Foot	B		
Ball Screw Bearings		A	A
Ball Screw		A	A
Actuator Bearings		A	A
Mold Clamp Pivot			B
Mold Top Clamps			B

Type of Lubrication: A -- Grease (NLGI Grade 2 Lithium Soap)
B -- Anti-Seize Lubricant

Component	Hours on SGC at Time of Lubrication					
Ball Screw Bearings						
Ball Screw						
Actuator Bearings						
Mold Clamp Pivot						
Mold Top Clamps						

MAINTENANCE SCHEDULE

Component	Daily	Initial 5 Hours	Every 25 Hours
Clean Compaction Chamber	X		
Clean Mold Top	X		
Inspect Ram Key			X
Check Mold Base Clamps		X	X
Timing Belt Tension		X	X
Inspect Mold Clamps		X	X
Inspect Ram Foot for Wear			X

Component	Hours on SGC at Time of Maintenance					
Inspect Ram Key						
Check Mold Base Clamps						
Timing Belt Tension						
Inspect Mold Clamps						
Inspect Ram Foot for Wear						

Remarks: _____

Verified by: _____

Date: _____ Next Date Due: _____