

APPENDIX E

PROFICIENCY TESTS

AASHTO T30 Mechanical Analysis of Extracted Aggregates

AASHTO T166 Bulk Specific Gravity

AASHTO T209 Maximum Specific Gravity

AASHTO T269 Percent Air Voids

VTM - 102 Asphalt Content by Ignition *

AASHTO T312 Preparing & Determining Density of HMA Specimens by
Gyratory Compactor **

* No demonstration of "Oven Calibration Factor Procedure" required for Asphalt Plant Level I certification.

** No demonstration of "Preparation of Mixture - Lab Prepared Specimens" required for Asphalt Plant Level I certification.

**Mechanical Analysis of Extracted Aggregate
AASHTO T30 (1998)**

- 1. Equipment
 - a. Nest of Sieves: upper sieve No. 10 or 16 (2.00 or 1.18mm) sieve.
lower sieve a No. 200 (0.075mm) sieve. _____
 - b. Oven or hot plate capable of maintaining $230 \pm 9^{\circ}\text{F}$ ($110 \pm 5^{\circ}\text{C}$). _____
 - c. Balance capable of weighing to 0.1% of sample mass. _____
 - d. Woven wire- cloth sieves conforming requirements of M 92. _____

- 2. Procedure
 - a. Sample consisting of all aggregate after extraction. _____
 - b. Minimum mass of mix sample based on nominal maximum size. _____
 - c. Sample placed in container and covered with water. _____
 - d. Wetting agent added. _____
 - e. Contents agitated vigorously. _____
 - f. Wash water poured through nest of sieves. _____
 - 1. Washing continued until wash water is clear. _____

- 12. g. Material placed in pan. _____

- 13. h. Material dried to constant mass at $230 \pm 9^{\circ}\text{F}$. _____

- 14. i. Material weighed to nearest 0.1 percent. _____

- 15. j. Material sieved on specified sieve sizes. _____

- 16. 1. Sieving continued until not more than 0.5 percent by mass of total sample passes a given sieve in 1 minute. _____

- 17. k. Each fraction of aggregate weighted. _____

- 18. n. Summation of aggregate mass check total washed dry mass within 0.2 percent? _____

**Bulk Specific Gravity of Compacted Bituminous Mixtures
Using Saturated Surface-Dry Specimens
AASHTO T166 - 00 Method A**

- 1. Equipment
 - a. Balance and Suspension:
 - 1. Conforms to M231 for class required for principle sample mass of samples tested. _____
 - 2. Suspension from center of balance pan. _____
 - 3. Suspension wire of smallest practical size. _____
 - 4. Holder and sample completely immersed. _____
 - 5. No trapped air bubbles exist under specimen _____
 - 6. Can determine constant mass of specimen to 0.1 percent _____
 - b. Water Bath:
 - 1. Equipped with overflow outlet. _____
 - 2. Deep enough to completely immerse holder and sample. _____
 - c. Room Temperature:
 - 1. Room temperature $77 \pm 9^{\circ}\text{F}$ ($25 \pm 5^{\circ}\text{C}$). _____
- 2. Procedure
 - a. Molded specimens cooled to room temperature and weighed. _____
 - b. Mass of dry sample in air determined in grams. _____
 - c. Sample immersed in water bath. _____
 - 1. Immersed for 4 ± 1 minutes _____
 - 2. Water at $77 \pm 1.8^{\circ}\text{F}$ ($25 \pm 1^{\circ}\text{C}$) _____
 - 3. Specimen water height recorded for each specimen. _____
 - d. Sample removed and blotted with damp towel. _____
 - e. Saturated surface-dry mass determined. _____
 - f. Percent water absorbed determined to be less than 2 percent. _____
 - g. Bulk specific gravity calculated $A/(B-C)$. _____
 - h. Bulk specific gravity reported to nearest 0.001. _____

Maximum Specific Gravity of Bituminous Mixtures AASHTO T209

1. Flask or bowl calibrated _____
- b. Bowl weighed suspended in water after 10 ± 1 minutes. _____
2. Sample obtained by splitting or quartering. _____
3. Mass of sample as follows (samples larger than the capacity of the container may be divided into suitable increments, tested and the results averaged). _____

Largest Particle Size	Minimum Sample Size (g)	
2 in (50 mm)	6000	_____
1-1/2 in (37.5 mm)	4000	_____
1 in (25 mm)	2500	_____
3/4 in (19 mm)	2000	_____
1/2 in (12.5 mm)	1500	_____
3/8 in (9.5 mm)	1000	_____
No. 4 (4.75 mm)	500	_____

4. Particles of sample separated. _____
5. Care used not to fracture mineral fragments. _____
6. After separating, fine aggregate particles not larger than $\frac{1}{4}$ in (6.3 mm) _____
7. Sample at room temperature. _____
8. Bowl weighed in air. _____
9. Sample placed in flask or bowl and weighed. _____
10. Water at approximately 77°F (25°C) added to cover sample. _____
11. Vacuum increased until manometer reads 27.75 ± 2.25 mm Hg. _____
12. Entrapped air removed using partial pressure for 15 ± 2 minutes. _____
13. Container and contents agitated vigorously by mechanical device or manual shaking at intervals of 2 minutes. _____
14. Release of entrapped air facilitated by addition of wetting agent. (optional) _____
15. Release of vacuum by increasing pressure at a rate not exceeding 8 kPa per second. _____
16. Bowl and contents immersed in water for 10 ± 1 minutes. _____
17. Weight recorded _____
18. Maximum specific gravity calculated and reported to nearest 0.001. _____

**Percent Air Voids in Compacted Specimens
AASHTO T269**

1. Bulk specific gravity determined according to AASHTO T166 _____
2. Maximum specific gravity determined according to AASHTO T209 _____
3. Percent air voids calculated in accordance with the following: _____

$$\text{Percent air voids} = 100 \times (1 - (\text{bulk sp gr} / \text{max sp gr}))$$

Ignition Method
Virginia Test Method 102 (VTM-102)

1. Ignition Oven Calibration Factor Procedure **Not required for Level I**

2. Sample Preparation

a. If necessary, mixture warmed in pan ($221 \pm 9^\circ\text{F}$) to constant weight. _____

b. Sample obtained by splitting or quartering. _____

c. Size of Sample _____

Nominal Maximum Aggregate Size	Minimum Sample Mass in grams	
1-1/2 in	4000*	_____
1 in	3000*	_____
3/4 in	2000	_____
1/2 in	1500	_____
3/8 in	1200	_____
No 4	1200	_____

* Sample may be split and results combined using weighted average

d. Sample baskets tared and weight recorded. _____

e. Sample divided into equal portions for top and bottom basket. _____

f. Baskets set in drip pan when loading and care taken not to lose fines. _____

g. Sample spread with heated spatula into thin even lift _____

3. Determination of Asphalt Content by Ignition Method

a. Furnace preheated to 538°C (1000°F). _____

b. Correction factor for specific gravity entered. _____

c. Sample weight entered and recorded to nearest gram. _____

d. Initial sample weight entered and verified in furnace controller. _____

e. Sample loaded into furnace and total weight (including baskets) verified prior to initiation of test. _____

f. Proper safety equipment worn when loading sample. _____

g. Sample removed promptly when audible stable indicator indicates constant weigh achieved. _____

Ignition Method
Virginia Test Method 102 (VTM-102)
(Continued)

- h. Proper safety equipment worn when removing sample. _____
- i. Sample allowed to cool to room temperature in safety enclosure. _____
- 4. Gradation Determination
 - a. Entire contents of sample baskets and drip pan emptied into flat pan, sample baskets cleaned into flat pan with a wire brush. _____
 - b. Sample weight determined to nearest 0.1 percent (1 gram for sample sizes greater than 1000 grams) for gradation _____
 - c. Gradation analysis performed in accordance with AASHTO T30 _____

**Standard Method for Preparing & Determining the Density of
Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory
Compactor
AASHTO T 312 (Was AASHTO TP 4)**

- 1. Gyratory Compactor
 - a. One from approved list _____
- 2. Molds
 - a. Inside diameter 149.90 to 150.00 mm _____
 - b. At least 250 mm high _____
 - c. Walls at least 7.5 mm thick _____
- 3. Ram and base plate faces
 - a. Ground flat _____
 - b. Diameter of 149.50 to 149.75 mm _____
- 4. Balance - G5 readable to 1 gram _____
- 5. Forced draft oven thermostatically controlled to $\pm 3^{\circ}\text{C}$ _____
- 6. Thermometers armored, glass or dial-type with metal stems _____
- 7. Verification of calibration (following items checked periodically)
 - a. Ram pressure _____
 - b. Angle of gyration _____
 - c. Gyration frequency _____
 - d. LVDT or other continuous height recorder _____
 - e. Mold dimensions _____
 - f. Plate faces _____
 - g. Oven temperature _____

**Standard Method for Preparing & Determining the Density of
Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyrotory
Compactor
AASHTO T 312 (continued)**

- 8. Preparation of Apparatus
 - a. Main power switch turned on for required warm up period. _____
 - b. Angle, pressure and gyration level set. _____
 - c. Bearing surfaces lubricated per manufacturer's instruction _____
- 9. Preparation of Mixture – Lab Prepared Specimens **Not required for Level I** _____
- 10. Preparation of Mixture - Field prepared samples
 - a. Loose mix brought to compaction temperature by uniform heating. _____
- 11. Compaction of Specimens
 - a. Mold, base plate, and upper plate(when required) removed from oven and paper disk placed on bottom of mold. _____
 - b. mixture placed in mold in one lift, leveled and paper disk and upper plate (when required) added. _____
 - c. Mold loaded into compactor and compaction started. (recorded to nearest 0.1 mm) _____
 - d. Compactor shuts off when completed. _____
 - e. Mold removed and specimen extruded. _____
 - f. Paper disks removed. _____
 - g. Specimens conform to height requirements of 115 ± 5 mm. _____

