AASHTO T30  Mechanical Analysis of Extracted Aggregates
AASHTO T166  Bulk Specific Gravity
AASHTO T209  Maximum Specific Gravity
AASHTO T269  Percent Air Voids in Compacted Specimens
VTM 102  Ignition Method (no oven calibration)
AASHTO T312  Gyratory Compaction (pill only using gyro)
Mechanical Analysis of Extracted Aggregate
AASHTO T30 (1998)

1. Nest of Sieves: upper sieve No. 10 or 16 (2.00 or 1.18mm) sieve.
   lower sieve a No. 200 (0.075mm) sieve.

2. Wetting agent on hand.

3. Oven or hot plate capable of maintaining 230 ± 9°F (110 ± 5°C).

4. Balance capable of weighing to 0.1 % of sample mass (sensitive to 0.1 gram).

5. Sample consisting of all aggregate after extraction and weighed to nearest 0.1 grams.

6. Minimum mass of mix sample based on nominal maximum size.

7. Sample placed in container and covered with water.

8. Wetting agent added.


10. Wash water poured through nest of sieves.

11. Washing continued until wash water is clear.

12. Material placed in pan.

13. Material dried to constant mass at 230 ± 9°F.

14. Material weighed to nearest 0.1 gram.

15. Material sieved on specified sieve sizes.

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

17. Each fraction of aggregate weighed.

18. Does summation of aggregate mass check against total washed dry mass within 0.2 percent?

19. All calculations performed correctly.
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 (sensitive to 0.1 g).
      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.

   b. Water Bath:
      1. Equipped with overflow outlet.
      2. Deep enough to completely immerse holder and sample.

   c. Room Temperature Definition:
      1. Room temperature 77 ± 9°F (25 ± 5°C).

2. Procedure
   a. Molded specimens cooled to room temperature.
   b. Mass of dry sample in air (A) determined in grams.
   c. Sample immersed in water bath.
      1. Immersed for 4± 1 minutes.
      2. Water at 77± 1.8 °F (25 ± 1°C).
      3. Specimen weight in water (C) determined.
   d. Sample removed and blotted with damp towel.
   e. Saturated surface-dry mass determined (B).
   f. Percent water absorbed determined to be less than 2 percent.
      \[ \% \text{ Water absorbed} = \frac{(B-A)}{(B-C)} \times 100 \]
   g. Bulk specific gravity calculated: \( \frac{A}{(B-C)} \).
   h. Bulk specific gravity reported to nearest 0.001.
Maximum Specific Gravity of Bituminous Mixtures
AASHTO T209

1. Flask or bowl calibrated.
   a. Flask or Bowl weighed suspended in water until it reaches a constant weight (B).

2. Sample obtained by splitting or quartering. [Indicate method used]

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). [Indicate particle & sample sizes used]

<table>
<thead>
<tr>
<th>Largest Particle Size</th>
<th>Minimum Sample Size (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 in (50 mm)</td>
<td>6000</td>
</tr>
<tr>
<td>1½ in (37.5 mm)</td>
<td>4000</td>
</tr>
<tr>
<td>1 in (25 mm)</td>
<td>2500</td>
</tr>
<tr>
<td>3/4 in (19 mm)</td>
<td>2000</td>
</tr>
<tr>
<td>1/2 in (12.5 mm)</td>
<td>1500</td>
</tr>
<tr>
<td>3/8 in (9.5 mm)</td>
<td>1000</td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>500</td>
</tr>
</tbody>
</table>

4. Particles of sample separated.

5. Care used not to fracture mineral fragments.

6. After separating, fine aggregate particles not larger than ¼ in (6.3 mm).

7. Sample at room temperature.

8. Flask or Bowl weighed in air (C).

9. Sample placed in flask or bowl and weighed in air (A).

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 60mm Hg (8 kPa) per second.

16. Bowl and contents immersed in water for 10 ± 1 minutes

17. Weight recorded (D).

18. Maximum specific gravity calculated and reported to nearest 0.001.
   Max. specific gravity = (C-A) / (C-A) - (D-B)
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:

\[
\text{Percent air voids} = 100 \times \left(1 - \frac{\text{bulk sp gr}}{\text{max sp gr}}\right)
\]
Ignition Method
Virginia Test Method 102 (VTM-102)

1. Ignition Oven Calibration Factor Procedure

2. Sample Preparation:
   a. If necessary, mixture warmed in pan (257 ± 9°F) to constant weight.
   b. Sample obtained by splitting or quartering. [Indicate method used.]
   c. Size of Sample

<table>
<thead>
<tr>
<th>Nominal Maximum Aggregate Size</th>
<th>Minimum Sample Mass in grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½ in</td>
<td>4000*</td>
</tr>
<tr>
<td>1 in</td>
<td>3000*</td>
</tr>
<tr>
<td>3/4 in</td>
<td>2000</td>
</tr>
<tr>
<td>1/2 in</td>
<td>1500</td>
</tr>
<tr>
<td>3/8 in</td>
<td>1200</td>
</tr>
<tr>
<td>No 4</td>
<td>1200</td>
</tr>
</tbody>
</table>

* Sample may be split and results combined using weighted average

   d. Sample weight does not exceed 500 grams of the minimum sample weight.
   e. Sample baskets tared and weight recorded.
   f. Sample divided into equal portions for top and bottom basket.
   g. Baskets set in drip pan when loading and care taken not to lose fines.
   h. 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 (calibration) factor for specific mix design entered.
   c. Sample weight with baskets determined 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.
Ignition Method
VTM-102  (continued)

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

 g. 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

1. Gyratory Compactor  
   a. One from approved list.

2. Molds (at room temperature)  
   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 capable of weighing pills readable to 1 gram.

5. Forced draft oven thermostatically controlled to ± 3°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 speed  
   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 Gyratory 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. Preparing Mix in Lab (not required for Asphalt Plant Level II)

10. Preparation of Mixture - Plant Prepared HMA
    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. (height 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.