APPENDIX J

ANNUAL ASPHALT CONCRETE MIX DESIGN SUBMITTAL PROCEDURE

Prior to ANY Annual Mix Design Submittals:
Submit the following to the District Materials Engineer/Manager (DME/DMM):

1) Submit the most current aggregate bulk specific gravity (Gsb) values determined according to AASHTO T 84 and AASHTO T 85 for Fine Aggregate and Coarse Aggregate, respectively for each aggregate to be used in all the asphalt mixture producer’s JMFs for the upcoming or current calendar year. The most current Gsb values may have been determined by the aggregate producer, the asphalt mixture producer, or the MTD (current Bulletin 14 values). If the Gsb values are determined by the aggregate producer or asphalt mixture producer, perform the minimum number of tests as indicated in Table J-1 to determine the average specific gravity and absorption values submitted to the DME/DMM. When either the aggregate producer or asphalt mixture producer determined Gsb value differs from the MTD determined Gsb value by more than the tolerances in Table J-1, then follow-up testing is required and shall be performed.

<table>
<thead>
<tr>
<th>Material</th>
<th>Test Method</th>
<th>Minimum Number of Tests to Determine the Producer Average Aggregate Gsb Value</th>
<th>Maximum Difference Between Producer and MTD Average Aggregate Gsb Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine Aggregate</td>
<td>AASHTO T 84</td>
<td>3</td>
<td>0.038</td>
</tr>
<tr>
<td>Coarse Aggregate</td>
<td>AASHTO T 85</td>
<td>2</td>
<td>0.027</td>
</tr>
</tbody>
</table>

a) Follow-up testing: If either the aggregate producer or asphalt mixture producer average aggregate Gsb value(s) differ from the MTD average aggregate Gsb value(s) by more than the Table J-1 tolerances, the Department Representative will lift aggregate samples from current stockpiles that best represent the material that will be used for asphalt mixture production for specific gravity and absorption testing according to AASHTO T 84 or AASHTO T 85. The Department Representative will either witness the asphalt mixture producer perform the AASHTO T 84 and AASHTO T 85 testing on the aggregate samples in the presence of the Department Representative or submit the aggregate samples to the MTD for AASHTO T 84 and AASHTO T 85 testing. If the asphalt mixture producer performs the AASHTO T 84 or AASHTO T 85 testing, the
asphalt mixture producer shall perform the minimum number of tests as indicated in Table J-1. The average bulk specific gravity and absorption values from this follow-up testing will be the values used on the asphalt mixture producer’s JMFs.

2) Submit the current aggregate producer, asphalt mixture producer, or MTD determined aggregate consensus property values [Coarse Aggregate Angularity, Fine Aggregate Angularity, Clay Content (Sand Equivalent Test), and Flat & Elongated Particles] and aggregate physical property values [average gradation, Los Angeles Abrasion, Sodium Sulfate Soundness, Deleterious Material Content (Shale, Clay Lumps, Friable Particles, Coal or Coke)]. Determine consensus property and physical property test result values according to the requirements specified in Section 409.2(b), Section 419.2(b), Section 703, or other applicable Publication 408 Specification or special provision as appropriate.

3) Submit the previous calendar year’s asphalt mixture production quality control (QC) test results [gradation, asphalt content, F/A ratio, volumetric analysis (air voids, VMA, VFA), and maximum theoretical specific gravity] for each existing mix design intended to be submitted for approval in the upcoming or current calendar year. This may be done electronically using the Electronic State Book (ESB) files.

**New Mix Design - Submittal Process:**

Procedure: Follow Bulletin 27 Chapter 2A and applicable Appendices.

Software: Within the current version of the ESB, use the MS Excel filename: PA Superpave Design

**Existing Mix Design - Submittal Process:**

A. 0 to ≤ 4 Production Quality Control Volumetric Analysis Test Results from the Previous Calendar Year

Procedure:

1. Re-calculate the current combined Gsb for the JMF.
   a. If the current combined Gsb value differs by ≤ 0.015 from the previous calendar year’s combined Gsb value (value submitted with the annual or initial JMF submission) then, re-calculate the VMA, VFA, effective binder content, and F/A ratio using the previous year’s JMF Gmm value. If all these parameters meet Bulletin 27 criteria, calculate the Gmb to 4.0% air
voids using the average of the previous year’s QC Gmm values (if two or more QC Gmm values available). If there are less than two QC Gmm values for the JMF from the previous calendar year’s production, calculate the Gmb to 4.0% air voids using the JMF Gmm value from the previous calendar year and submit a new TR-448A with the re-calculated values. Otherwise, go to Section A.1.b.

b. If the current combined Gsb value differs by > 0.015 from the previous calendar year’s combined Gsb value (value submitted with the annual or initial JMF submission) or, the recalculated VMA or VFA from Section A.1.a do not meet the Bulletin 27 design requirements, perform laboratory testing of the existing JMF as indicated in Section C below.

**Existing Mix Design – Submittal Process:**

B. ≥ 5 Production Quality Control Volumetric Analysis Test Results from the Previous Calendar Year

Procedure:

1. Re-calculate the current combined Gsb for the JMF.

   a. If the current combined Gsb value differs by ≤ 0.015 from the previous calendar year’s combined Gsb value (value submitted with the annual or initial JMF submission) then, re-calculate the VMA, VFA, effective binder content, and F/A ratio. Ensure these values meet the design requirements of Bulletin 27. Then, go to Section B.2 below.

      i. If the recalculated VMA, VFA, effective asphalt content, or F/A ratio do not meet the Bulletin 27 design requirements, then make proportional or gradational adjustments to the JMF and perform laboratory testing of the adjusted JMF as indicated in Section C below.

   b. If the current combined Gsb value differs by > 0.015 from the previous calendar year’s combined Gsb value (value submitted with the annual or initial JMF submission), then perform laboratory testing of the JMF as indicated in Section C below.

2. If the previous calendar year’s production QC test results for the JMF in the ESB meet all of the following:

   a. average air voids are from 3.5% to 4.5%,
b. air voids PWL is $\geq 90$,

c. averages for asphalt content and gradation of all sieves meet the $n \geq 3$ tolerances in Pub. 408, Section 409, Table A, and

d. gradation (for all sieves) and asphalt content PWL are all $\geq 90\%$,

then, calculate the Gmb to 4.0% air voids using the average of the previous calendar year’s QC Gmm values. No other work is necessary. Submit a new TR-448A with the re-calculated values. Otherwise, go to Section B.3 below.

3. If the previous calendar year’s production QC test results for the JMF in the ESB meet all of the following:

   a. average air voids are $< 3.5\%$ or $> 4.5\%$, or air voids PWL is $< 90$

   b. average asphalt content and average gradation of all sieves meet the $n \geq 3$ tolerances in Pub. 408, Section 409, Table A, and

   c. gradation (of all sieves) and asphalt content PWL are all $\geq 90\%$,

then, make proportional or gradational adjustments to the JMF and perform laboratory testing of the adjusted JMF as indicated in Section C below. Otherwise, go to Section B.4 below.

4. If the previous calendar year’s production QC test results for the JMF in the ESB meet all of the following:

   a. average air voids are from 3.5% to 4.5%

   b. air voids PWL is $\geq 90$

   c. average asphalt content or average gradation of any sieve does NOT meet the $n \geq 3$ tolerances in Pub. 408, Section 409, Table A or the asphalt content PWL or gradation PWL of any sieve is $< 90\%$,

then, perform laboratory testing of the existing JMF as indicated in Section C below. Otherwise, go to Section B.5 below.

5. If the previous calendar year’s production QC test results for the JMF in the ESB meet all of the following:

   a. average air voids are $< 3.5\%$ or $> 4.5\%$, or air voids PWL is $< 90$
b. average asphalt content or average gradation of any sieve does NOT meet the \( n \geq 3 \) tolerances in Pub. 408, Section 409, Table A or the asphalt content PWL or gradation PWL of any sieve is \(< 90\%\),

then, produce a complete new mix design according to Bulletin 27 or contact the DME/DMM for other alternate requirements.

6. For any existing JMF with \( \geq 5 \) Production Quality Control Volumetric Analysis Test Results from the Previous Calendar Year and not falling under any of the above conditions, produce a complete new mix design according to Bulletin 27 or contact the DME/DMM for other alternate requirements.

7. If the PWL for any individual sieve is less than 90\%, the DME/DMM may elect for that sieve to require a change to JMF target value from the previous calendar year.

C. Laboratory Testing of the Existing JMF or Adjusted JMF.

Perform the following:

1. Collect samples of current production JMF component materials.

2. Laboratory mix the JMF component materials targeting the existing JMF or adjusted JMF as appropriate.

3. Prepare enough laboratory mixture for a minimum of 2 Gmm samples and a minimum of 2 gyratory compacted specimens.

4. Determine Gmm according to Bulletin 27, Appendix I on a minimum of 2 samples and average the results.

5. Prepare, compact, and determine Gmb on a minimum of 2 gyratory specimens according to AASHTO T 312 except condition the mixture according to Bulletin 27, Appendix I. Calculate air voids, VMA, and VFA according to Bulletin 27 on each specimen and average the results.

6. Analyze the volumetric properties of the laboratory mixed, laboratory compacted specimens.

   i. If the laboratory mixed, laboratory compacted specimen air void results meet Table J-2, Condition A (both single and multiple), and the calculated VMA and VFA meet the minimum design requirements in Bulletin 27, and all other Bulletin 27 mixture design requirements are met, no other work is necessary. Submit a new TR-448A with the adjusted JMF and the re-calculated values.
a. If the laboratory mixed, laboratory compacted specimen air voids meet Table J-2, Condition A (both single and multiple, but VMA and VFA do not meet the Bulletin 27 design requirements, make additional or different proportional or gradational adjustments to the JMF. Perform the laboratory testing of the adjusted JMF as indicated in Section C above.

ii. If the laboratory mixed, laboratory compacted specimen air void results meet Table J-2, Condition B (both single and multiple), then make additional or different proportional or gradational adjustments to the JMF. Perform the laboratory testing of the adjusted JMF as indicated in Section C above.

a. Immediately notify the DME/DMM when multiple adjustments to the JMF and multiple volumetric analyses of gyratory specimens continue to meet Table J-2, Condition B.

iii. If the laboratory mixed, laboratory compacted specimen air void results meet Table J-2, Condition C (both single and multiple), produce a new mix design using a selected design aggregate structure (Trial Blends are NOT necessary for this level of re-design), determine a design binder content, evaluate moisture susceptibility, and submit a new TR-448A.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range of Air Voids (Va) for each Single (n=1) Laboratory Mixed, Laboratory Compacted Specimen, %</th>
<th>Range of Air Voids (Va) for the Average of Multiple (n≥2) Laboratory Mixed, Laboratory Compacted Specimens, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0 ± 0.5</td>
<td>4.0 ± 0.2</td>
</tr>
<tr>
<td>B</td>
<td>4.0 ± 1.0</td>
<td>4.0 ± 0.5</td>
</tr>
<tr>
<td>C</td>
<td>N/A</td>
<td>&lt; 3.5 or &gt; 4.5</td>
</tr>
</tbody>
</table>
Note: For questionable mixes as determined by the DME/DMM, additional testing, as determined by the DME/DMM, may be required. See Bulletin 27, Chapter 2A, and the PennDOT modifications to AASHTO R 35, Section 4.5 Review of Job-Mix Formula (JMF) and Bulletin 27, Chapter 2A, and the PennDOT modifications to AASHTO R 35, Section 12.4 Evaluating Mix Characteristics for guidance. In addition, the DME/DMM may require an existing mix design to be redesigned due to poor performance in the field after placement.