Kentucky Method 64-435-~~03~~05
Revised ~~1/14/03~~12/28/04
Supersedes KM 64-435-~~02~~03
Dated ~~12/13/01~~1/14/03

# METHOD FOR ACCEPTANCE OF ASPHALT MIXTURES BY MIXTURE PROPERTY ANALYSIS

1. SCOPE: This method documents the procedure for volumetric analysis of selected properties of plant-produced asphalt mixtures.

2. EQUIPMENT AND FACILITIES: Furnish all resources including equipment, lab facilities, and personnel necessary to comply with the Quality Control Plan.

   2.1. Ensure the laboratory facility conforms to the requirements of Subsection 401.02.01 A) of the Department of Highway's (Department) *Standard Specifications for Road and Bridge Construction* (Specifications).

   2.2. Provide a Superpave gyratory compactor, four accompanying molds, paper disks, and specimen-extruding system conforming to AASHTO T 312, *Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor*.

   2.3. Maximum specific gravity ($G_{mm}$) equipment. Provide a vacuum device, pycnometer, mechanical agitator, and manometer conforming to AASHTO T 209, *Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.*

   2.4. Asphalt content (AC) determination equipment. Depending on the selected method of AC determination, provide equipment suitable to determine the AC by Kentucky Method (KM) 64-405, *Extraction of Binder From Asphalt Paving Mixtures*; KM 64-436, *Asphalt Binder Content Determination of Asphalt Mixtures by Plant Recordation*; KM 64-437, *Determination of Asphalt Binder Content of Asphalt Mixtures Using the Nuclear Asphalt Content Gauge*; KM 64-438, *Asphalt Binder Content Determination of Asphalt Mixtures Based on the Maximum Specific Gravity*; or AASHTO T 308, *Determining the Asphalt Binder Content of Hot-Mix Asphalt (HMA) by the Ignition Method*.

   2.5. Oven. Furnish suitable ovens of sufficient size, providing adequate maintenance of temperature, and in a convenient location.

   2.6 Scales. Provide scales having a capacity of 10 kg and an accuracy of 0.1 g.

   2.7 Water bath. Furnish a suitable water bath of sufficient size, providing adequate maintenance of temperature at 77 $\pm$ 1.8 $^{o}$F, and with a constant water level for determining the unit weight of compacted specimens.

   2.8 Miscellaneous equipment. Provide other items including pans, thermometers, hot plates,

and spoons needed to prepare volumetric specimens and to determine the $G_{mm}$ of asphalt mixtures.

3. SAMPLING:

3.1. Obtain samples at a frequency of one per each 1000-ton sublot according to Section 402 of the Department's Specification. Select the sublot sample according to KM 64-113, *Sampling Materials by Random Number Sampling*.

3.2. Select the sample location, and obtain the sample, according to KM 64-425, *Sampling Asphalt Mixtures*.

3.3. Obtain a field sample size of approximately 70 $lb_m$.

3.4. Use the specimen test portion weights specified in the mix design on the "Asphalt-Mixture-Design Results" form, or "MixPack" spreadsheet, if available. If no weight is available, use 4600 g. Adjust the specimen test portion weights according to the following formula, if necessary.

$$Corrected\ Specimen\ Weight\ (g) = \frac{115\ (Estimated\ Specimen\ Weight\ in\ g)}{Height\ of\ Specimen\ in\ mm}$$

3.5. Use $G_{mm}$ test portions conforming to the minimum sample sizes in AASHTO T 209.

4. PROCEDURE:

4.1. Thoroughly blend the field samples with a large spoon or scoop.

4.2. Compact and test two gyratory specimens.

4.2.1. Weigh into a tared bowl, pan, or onto a durable piece of paper, the required test portion for each specimen.

4.2.2. Place a paper disk in the bottom of the preheated mold assembly; then, carefully pour the weighed test portion into the mold in one complete mass.

4.2.3. Allow the specimen to cool until the temperature of the specimen is at the required compaction temperature. If the temperature of the specimen is below the required compaction temperature, place the specimen in an oven set at 100 $^{o}F$ above the compaction temperature. Check the temperature of the specimen after 30 $\pm$ 5 minutes. If the temperature of the specimen is at the required compaction temperature, proceed to the next step. If the temperature of the specimen is still below the required compaction temperature, discard the specimen, and obtain more mixture for another volumetric specimen. If this reheating is required, document on the *Asphalt Mixtures Acceptance Workbook* (AMAW) that the randomly

selected sample was not utilized due to temperature loss and the random number for the sample for that sublot was adjusted.

4.2.4. Place a paper disk on top of the specimen, and compact it immediately. Use the number of gyrations as indicated by the ESAL class in the mixture's bid item.

4.2.5. Remove the paper disk from the top of the specimen after compaction. Set the specimen aside to cool. When the specimen has cooled sufficiently to not be damaged by the removal effort, extrude it from the mold; remove the paper disk from the bottom of the specimen, and label the specimen appropriately.

4.2.6. Determine the bulk specific gravity ($G_{mb}$) of the specimens according to AASHTO T 166, *Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens*.

4.2.7. Determine the unit weight of the specimens by multiplying the $G_{mb}$ of the specimens by the density of water at 77 °F (normally considered to be 62.4 $lb_m/ft^3$).

4.3. Perform the $G_{mm}$ analysis.

4.3.1. Weigh ~~two~~ three $G_{mm}$ samples from the remainder of the field sample after placing the volumetric specimens in the molds. Use the sample size as stated in Subsection 3.5 of this method.

4.3.2. Determine the $G_{mm}$ of two of the samples according to AASHTO T 209. When performing a $G_{mm}$ test on materials considered to be absorptive (e.g., mixtures containing slag, some dolomites, etc.), follow the "Supplemental Procedure for Mixtures Containing Porous Aggregate" of AASHTO T 209. Retain the third $G_{mm}$ sample for potential testing at a later time.

4.4. Retain at the compaction temperature, and appropriately label, the remaining portion of the field sample for possible additional testing.

5. ACCEPTANCE TOLERANCES:

5.1. Average the unit weight of the two specimens to determine a single test result.

5.1.1. Ensure the two specimens have a unit weight within ± 1.5 $lb_m/ft^3$ of each other. If the specimens have unit weights outside of this tolerance, obtain more mixture from that quantity of material retained earlier, and compact and analyze another volumetric specimen.

5.1.2. Next, average the unit weights of all three specimens. Ensure each individual

specimen has a unit weight within ± 1.5 $lb_m/ft^3$ of the average value. Consider any specimen outside this tolerance invalid. In this case, average the remaining two specimens for a single test result.

Example #1: Specimen #1: 148.7 $lb_m/ft^3$
Specimen #2: 148.1 $lb_m/ft^3$ (tolerance satisfied, use both specimens)

Average = 148.4 $lb_m/ft^3$

Report this test result (148.4 $lb_m/ft^3$) on the AMAW.

Example #2: Specimen #1: 147.3 $lb_m/ft^3$
Specimen #2: 150.5 $lb_m/ft^3$ (tolerance not satisfied, compact another specimen)
Specimen #3: 148.4 $lb_m/ft^3$

Average = 148.7 $lb_m/ft^3$

Specimen #2 is 1.8 $lb_m/ft^3$ from the average; therefore, delete it, and report the new average as 147.9 $lb_m/ft^3$. Report this test result (147.9 $lb_m/ft^3$) on the AMAW.

Example #3: Specimen #1: 147.0 $lb_m/ft^3$
Specimen #2: 148.6 $lb_m/ft^3$ (tolerance not satisfied, compact another specimen)
Specimen #3: 150.2 $lb_m/ft^3$

Average = 148.6 $lb_m/ft^3$

Due to the variations from the average, consider this sample invalid, and obtain another field sample for testing.

5.2. Average the two $G_{mm}$ test results for each field sample to obtain one result for further calculations.

5.2.1. After determining the $G_{mm}$ values from the field sample, ensure the difference between the two results is no more than 0.015.

5.2.2. When the $G_{mm}$ values vary more than 0.015, perform a third $G_{mm}$ test to determine which of the two previous $G_{mm}$ values may be in error. When performing a third test, use the third portion of the same field sample as used for the previous $G_{mm}$ samples.

5.2.3. ~~After completing the third test, use~~Use the following examples to determine which results to use for the final calculations:

Example #1: $G_{mm}$ #1 = 2.500
$G_{mm}$ #2 = 2.514 (tolerance satisfied, use both specimens)
Average = 2.507

Example #2: $G_{mm}$ #1 = 2.500
$G_{mm}$ #2 = 2.516 (tolerance not satisfied, perform a third test)
$G_{mm}$ #3 = 2.504 (average $G_{mm}$ #1 and $G_{mm}$ #3)

Average = 2.502 (use this value)

Example #3: $G_{mm}$ #1 = 2.500
$G_{mm}$ #2 = 2.516 (tolerance not satisfied, perform a third test)
$G_{mm}$ #3 = 2.508 (average all three)

Average = 2.508 (use this value)

Example #4: $G_{mm}$ #1 = 2.500
$G_{mm}$ #2 = 2.540
$G_{mm}$ #3 = 2.522

Due to the variability, consider these test results invalid, and obtain additional test portions from the field sample if sufficient material remains. If insufficient material remains, obtain another field sample, and repeat the $G_{mm}$ analyses.

6. CALCULATIONS: Perform all volumetric calculations in accordance with AASHTO ~~PP 28~~R 35, *Superpave Volumetric Design for Hot-Mix Asphalt (HMA)*.

7. REPORT:

7.1. Report results on the appropriate AMAW.

7.2. Report the percentage of air voids (% AV), percentage of voids-in-the mineral aggregate (% VMA), and AC to the nearest 0.1 %.

7.3. Report the $G_{mm}$ values to the nearest thousandth (e. g., 2.459).

Approved _____
Director
Division of Materials

Date _____~~1/14/03~~12/28/04_____

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