

WET-SIEVE ANALYSIS OF AGGREGATES USED IN ASPHALT MIXTURES

1. SCOPE:

- 1.1. This test method covers the procedure for the determination of the particle-size distribution of fine and coarse aggregates used in asphalt mixtures. Obtain the sample of aggregate for the wet-sieve analysis from one of the following sources:
 - 1.1.1. A sample of asphalt mixture extracted in accordance with Kentucky Method (KM) 64-405, *Extraction of Binder From Asphalt Paving Mixtures*.
 - 1.1.2. A sample of asphalt mixture ignited in accordance with AASHTO T 308, *Determining the Asphalt Binder Content of Hot-Mix Asphalt (HMA) by the Ignition Method*.
 - 1.1.3. The hot bins of the asphalt mixing plant.
 - 1.1.4. The cold feeds of the asphalt mixing plant.
 - 1.1.5. The stockpiles at the asphalt mixing plant.
- 1.2. Use the results to determine compliance of the particle-size distribution with the applicable specification requirements and to provide the necessary data for the control of the production of asphalt mixtures.

NOTE 1: As another option, use the procedure described in KM 64-620, *Wet Sieve Analysis of Fine and Coarse Aggregate*, in lieu of this method to determine the percentage of minus-No. 200 material by wet-sieve analysis.

2. APPARATUS:

- 2.1. Provide sieves conforming to AASHTO M 92, *Wire-Cloth Sieves for Testing Purposes*.
- 2.2. Provide scales capable of weighing 5000 g accurately, sensitive to 1.0 g.
- 2.3. As an option, provide a mechanical shaker.
- 2.4. Provide a hot plate or oven capable of drying material to a constant weight at 230 ± 9 °F.
- 2.5. Provide miscellaneous equipment such as drying pans; a spatula; small, stiff brush; small, soft brush; large, long-handled spoon; and syringe.
- 2.6. As an option, provide a wetting agent.
- 2.7. Provide a pan or container of a size sufficient to contain the sample, covered with water, and to permit vigorous agitation without a loss of any part of the sample or water.
- 2.8. Provide an adequate and reliable source of clean water.

3. SAMPLE:

- 3.1. Ensure the sample consists of the entire test portion of aggregate after completion of the asphalt binder content (AC) determination by KM 64-405. Conform to KM 64-425, *Sampling Asphalt Mixtures*, for the sampling procedure and test-portion size for testing by KM 64-405.
- 3.2. Ensure the sample consists of the entire test portion of aggregate after completion of the AC determination by T 308. Conform to T 308 for the sampling procedure and test-portion size when performing the ignition method.
- 3.3. When sampling aggregate from the hot bins or cold feeds of the asphalt mixing plant, conform to KM 64-407, *Sieve Analysis of Aggregate From Asphalt Mixing Plants*, for the sampling procedure and KM 64-425 for the test-portion size.
- 3.4. When sampling aggregate from the stockpiles at the asphalt mixing plant, conform to AASHTO T 2, *Sampling of Aggregates*, for the sampling procedure and KM 64-425 for the test-portion size.

4. PROCEDURE:

- 4.1. Dry the sample at 230 ± 9 °F to a constant weight, and record the weight.
- 4.2. Place the test portion, after drying and weighing, in a container, and cover it with water. If desired, add a sufficient amount of wetting agent to ensure a thorough separation of the material finer than the No. 200 sieve from the coarser particles. Use a large spoon to stir and agitate the aggregate in the wash water. Agitate the contents of the container vigorously to bring the material finer than the No. 200 sieve into suspension for removal by decantation of the wash water; immediately pour the wash water over a nest of sieves consisting of a No. 16 and No. 200 sieve, in that order. Take care to avoid, as much as possible, the decantation of the coarser particles of the sample.
- 4.3. Repeat the operation until the wash water is clear.
- 4.4. Return all material retained on the nested sieves to the container. Dry the washed aggregate in the container to a constant weight, and weigh it to the nearest 1.0 g.
- 4.5. Separate the dried aggregate into sizes, either by hand or a mechanical apparatus, using such sieves as are necessary to determine compliance with the specifications for the material in question. Perform the sieving operation by means of a lateral and vertical motion of the sieve, accompanied by a “jarring” action so as to keep the material moving continuously over the surface of the sieve. Do not manipulate aggregate fragments through the sieve by hand. Continue sieving until not more than 0.5 percent, by weight of the residue, on any sieve passes the sieve during a one-minute sieving time. When using a mechanical shaker, sieve the aggregate a minimum of five minutes. Verify the thoroughness of sieving by the “hand” method of sieving as described above.
- 4.6. Determine and record the weight of material retained on each sieve. Add the weight of dry material passing the No. 200 sieve by dry sieving to the weight of the material removed by washing in order to obtain the total passing the No. 200 sieve.

5. CALCULATION:

- 5.1. Determine the amount of material removed by washing with water using the following formula:

$A = B - C$, where:

A = weight of the material finer than the No. 200 sieve by washing;

B = original dry weight of the aggregate after the removal of the asphalt binder; and

C = dry weight of the sample after washing.

NOTE 2: Add the weight removed by washing to the weight of dry material passing the No. 200 sieve (pan material) by dry sieving to obtain the total passing the No. 200 sieve.

- 5.2. Perform the gradation calculation using one of the following two methods:

5.2.1. Individual weighing method

- 5.2.1.1. As an option, complete the sieve analysis using this method in which the percent retained on each sieve is calculated by dividing the weight of the material retained on a sieve by the original dry weight of the aggregate, as given below:

Percent Retained on a Given Sieve = $100 (X/Y)$, where:

X = the weight of material retained on a given sieve (g); and

Y = the original dry weight of the aggregate (g).

- 5.2.1.2. Calculate the percent passing a given sieve by subtracting the percent retained on that sieve from the total percent passing the next larger sieve in the sieve-series used, as given below:

Percent Passing Given Sieve =

Percent Passing Sieve Just Larger in Sequence – Percent Retained on Given Sieve

5.2.2. Cumulative weighing method

- 5.2.2.1. As an option, complete the sieve analysis using this method in which the cumulative percent retained for each sieve is calculated by dividing the cumulative retained weight on a given sieve by the total weight of the sample, as given below:

Cumulative Percent Retained on a Given Sieve = $100 (X/Y)$, where:

X = the cumulative weight of material retained on a given sieve (g); and

Y = the total weight of the sample (g).

- 5.2.2.2. Calculate the percent passing a given sieve by subtracting the cumulative percent retained on that sieve from 100, as given below:

$$\text{Percent Passing Given Sieve} = 100 - \text{Cumulative Percent Retained on Given Sieve}$$

6. WEIGHT LOSS: Ensure the maximum allowable loss incurred during the sieving operations is less than 0.5 percent of the total dry weight of the portion after washing with water. Add all losses of 0.5 percent or less to the weight of the material retained in the pan.
7. REPORT:
- 7.1. Report the final gradation result on all sieves, except the No. 200 sieve, to the nearest whole number. Report the gradation on the No. 200 sieve to the nearest 0.5 percent. For example, report a result calculated to be 3.2 as 3.0, but report a result calculated to be 3.3 as 3.5.
- 7.2. Although either the individual or cumulative weighing method is acceptable for calculating the gradation as described in Subsection 5.2 of this method, the *Asphalt Mixtures Acceptance Workbook* (AMAW), required for the submission of test data, uses the cumulative weighing method.

APPROVED

DIRECTOR
DIVISION OF MATERIALS

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