ALDOT-371-90
RAPID METHOD TO DETERMINE THE GRADATION OF ASPHALT PAVING MIXTURES USING BIODEGRADABLE EXTRACTANT

1. Scope

   1.1. This method is used routinely for determining the gradation of hot-mixed paving mixtures using a biodegradable extractant process.

2. Referenced Documents

   2.1. AASHTO M 92, Standard Specification for Wire-Cloth Sieves for Testing Purposes

   2.2. AASHTO M 231, Standard Specification for Weighing Devices Used in the Testing of Materials

   2.3. AASHTO T 30, Mechanical Analysis of Extracted Aggregate

   2.4. AASHTO T 164, Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt

   2.5. AASHTO T 168, Standard Method of Test for Sampling Bituminous Paving Mixtures

   2.6. ASTM E29, Indicating Which Places of Figures Are to Be Considered Significant in Specified Limiting Values

   2.7. ALDOT-354, Asphalt Content of Hot-Mix Asphalt by the Nuclear Method

   2.8. Materials Sources and Devices with Special Acceptance Requirements (MSDSAR) List II-19

3. Apparatus

   3.1. Apparatus as required in ALDOT-354.

   3.2. Pan, approximately 12 in x 8 in x 1 in deep (300 mm x 200 mm x 25 mm) deep or 10 qt, (L) rounded plastic pail.

   3.3. Balance: AASHTO M 231, Class D.

   3.4. Solvent: Biodegradable, high flash, non-toxic asphalt extractant. Solvent shall be from the approved MSDSAR List II-19.

   3.5. Oven: Capable of maintaining a uniform temperature of 230 ± 9°F (110 ± 5°C).

   3.6. Sieves: As required by the gradation specifications and meeting the requirements of AASHTO M 92.

   3.7. Liquid detergent (powder detergents are not permitted), optional.
4. Procedure

4.1. Secure a representative sample of the asphalt mixture in accordance with AASHTO T 168.

4.2. Determine the percent asphalt and moisture in accordance with ALDOT-354.

4.3. Select an extraction test sample of the size as required in Table 1, AASHTO T 164. Record mass to the nearest 0.1 g.

4.4. Place the extraction sample in pan or pail and cover with extractant. Gently agitate the sample frequently with a spatula or trowel allowing sufficient time (20-30 minutes for virgin mixtures, 45 min. - one hour for recycle mixtures) for the extractant to dissolve the asphalt from the aggregate.

4.5. Decant extractant, pouring over a No. 8 (2.36mm) sieve nested over a No. 200 (75 µm) sieve, continue decanting with water until wash water is clear.

Note: Care must be taken while agitating and decanting to prevent loss of particles.

4.6. Dry sample to constant mass in an oven at a temperature of 230 ± 9°F (110 ± 5°C).

5. Calculations

5.1. Calculate total extracted weight of mineral aggregate as follows:

\[ W_1 = W_s (1 - AC - W_m) \]

Where:
- \( W_1 \) = total extracted weight of mineral aggregate in grams.
- \( W_s \) = total sample weight in grams (AC and aggregate).
- \( AC \) = asphalt content expressed as a decimal number.
- \( W_m \) = Moisture in mix expressed as a decimal number.

5.2. The accumulative weights of material retained on each sieve from subsection 3.7 shall be converted to percentage by dividing by the weight of total aggregate (\( W_1 \)) as obtained in subsection 4.1, and multiplying by 100.

6. Reporting

6.1. The results of the sieve analysis shall be reported as total percentages passing each sieve. Percentages shall be reported to the nearest whole number in accordance with ASTM E-29 except for the percentage passing the No.200 (75 µm) sieve which shall be reported to the nearest 0.1 percent.
7. Product Evaluation

7.1. For product evaluation, Sections 4 through 6 shall be amended as follows:

7.1.1. Prepare an asphalt-aggregate mixture to the gradation and asphalt binder content as given below:

7.1.1.1. The aggregate shall be a limestone aggregate ALDOT Size 8910.

7.1.1.2. Obtain two 1200 g samples. Run AASHTO T 30 on one sample, to determine the control gradation.

7.1.1.3. The second aggregate sample shall be mixed with PG 76-22 liquid asphalt at an asphalt content of 5.5%.

7.1.1.4. After mixing, the asphalt sample shall be aged in the oven at 230°F overnight.

7.1.2. Perform steps in Section 4.2 through 4.6.

7.1.3. Screen the sample in accordance with AASHTO T 30 over the sieves used in determining the control gradation in Section 7.1.1.2.

7.1.4. Calculate the extracted weights as given in Section 5. Asphalt binder content shall be as given in Section 7.1.3.

7.1.5. The results of the sieve analysis shall be reported as total percentages passing each sieve to the nearest 0.1%.

7.1.6. The results of the sieve analysis shall be compared to the control gradation as determined in Section 7.1.1.2.

7.1.7. The results shall compare to within the tolerances given in Table 2 of AASHTO T-30 for a single-operator precision.