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Standard Method of Test for

# Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

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**AASHTO Designation: T 329-05**



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# Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

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## 1. SCOPE

- 1.1. This method is intended for the determination of moisture content of hot mix asphalt (HMA) by drying in an oven.
- 1.2. The values stated in SI units are to be regarded as the standard.
- 1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

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## 2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- M 231, Weighing Devices Used in the Testing of Materials
  - T 168, Sampling Bituminous Paving Mixtures
  - T 328, Reducing Samples of Hot Mix Asphalt to Testing Size

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## 3. SUMMARY OF TEST METHOD

- 3.1. A sample of HMA is dried in a forced-air, ventilated, or convection oven at  $163 \pm 14$  °C ( $325 \pm 25$ °F).
- 3.2. The moisture content of the HMA is calculated by one of two methods depending upon agency standards for reporting the asphalt binder content of the HMA:
- 3.2.1. When the asphalt binder content is reported as a percent of the HMA, the moisture content is reported as a percent of the moist mass of the HMA, as shown in Section 7.1.1.
- 3.2.2. When the asphalt binder content is reported as a percent of the aggregate in the HMA, the moisture content is reported as a percent of the dry mass of the HMA, as shown in Section 7.1.2.

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## 4. APPARATUS

- 4.1. *Balance or Scale*—2-kg (4.4-lb) capacity, readable to at least 0.1 g and conforming to the requirements of M 231.

- 4.2. *Forced-Air, Ventilated, or Convection Oven*—capable of maintaining the temperature surrounding the sample at  $163 \pm 14^{\circ}\text{C}$  ( $325 \pm 25^{\circ}\text{F}$ ).
- 4.3. *Sample Container*—the container in which the sample is dried shall be of sufficient size to contain the sample without danger of spilling and to allow the sample to be evenly distributed in a manner that will allow completion of the test in an expeditious manner.

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## 5. SAMPLE

- 5.1. A sample of HMA shall be obtained in accordance with T 168.
- 5.2. The sample shall be reduced in size in accordance with T 328. The size of the test sample shall be a minimum of 1000 g.

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## 6. PROCEDURE

- 6.1. Determine and record the mass of the sample container to the nearest 0.1 g.
- 6.2. Place the test sample in the sample container. Determine and record the temperature of the test sample. To facilitate drying, evenly distribute the test sample in the sample container.
- 6.3. Determine and record the total mass of the sample container and moist test sample to the nearest 0.1 g.
- 6.4. Calculate the mass of the initial, moist test sample by subtracting the mass of the sample container determined in Section 6.1 from the total mass of the sample container and moist test sample determined in Section 6.3.
- 6.5. Dry the test sample to a constant mass in the sample container. The sample shall initially be dried for 90 minutes and its mass determined, and then at 30 minute intervals until a constant mass is reached.

**Note 1**—Constant mass shall be defined as the mass at which further drying at a minimum of  $105^{\circ}\text{C}$  ( $221^{\circ}\text{F}$ ) does not alter the mass by more than 0.05 percent but in no case should the Job Mix Formula (JMF) mixing temperature be exceeded.

**Note 2**—The moisture content of test samples and the number of test samples in the oven will affect the rate of drying at any given time. Placing wet test samples in the oven with nearly dry test samples could affect the drying process.

- 6.6. Cool the sample container and test sample to approximately the same temperature as determined in Section 6.2.
- 6.7. Determine and record the total mass of the sample container and dry test sample to the nearest 0.1 g.

**Note 3**—Do not attempt to remove the test sample from the sample container for the purposes of determining the dry mass of the test sample.

- 6.8. Calculate the mass of the final, dry test sample by subtracting the mass of the sample container determined in Section 6.1 from the total mass of the sample container and dry test sample determined in Section 6.7.

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## 7. CALCULATIONS

- 7.1. Moisture content is determined as described in either Sections 7.1.1 or 7.1.2, depending upon agency standards:

- 7.1.1. When the asphalt binder content is reported as a percent of the HMA, the moisture content is determined and reported as a percent of the mass of the initial, moist test sample as follows.

$$\text{Moisture Content, \%} = \frac{M_i - M_f}{M_i} \times 100 \quad (1)$$

where:

$M_i$  = mass of the initial, moist test sample; and

$M_f$  = mass of the final, dry test sample.

Example:  $M_i = 1134.9 \text{ g}$

$M_f = 1127.3 \text{ g}$

$$\text{Moisture Content} = \frac{1134.9 \text{ g} - 1127.3 \text{ g}}{1134.9} \times 100 = 0.67\%$$

- 7.1.2. When the asphalt binder content is reported as a percent of the aggregate in the HMA, the moisture content is determined and reported as a percent of the mass of the final, dry test sample as follows.

$$\text{Moisture Content, \%} = \frac{M_i - M_f}{M_f} \times 100 \quad (2)$$

where:

$M_i$  = mass of the initial, moist test sample; and

$M_f$  = mass of the final, dry test sample.

Example:  $M_i = 1134.9 \text{ g}$

$M_f = 1127.3 \text{ g}$

$$\text{Moisture Content} = \frac{1134.9 \text{ g} - 1127.3 \text{ g}}{1127.3} \times 100 = 0.67\%$$

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## 8. REPORT

- 8.1. Report the moisture content to the nearest 0.01 percent.
- 8.2. Results shall be reported on standard forms approved for use by the agency.

