METHODS OF SAMPLING AND TESTING
MT 325-14
DETERMINING MOISTURE CONTENT OF BITUMINOUS MIXTURES OR AGGREGATE USING MICROWAVE OVENS

1 Scope

1.1 This test method provides a procedure for determining the amount of moisture in either bituminous mixtures or graded aggregates used in bituminous mixtures. Its primary purpose is to provide a rapid field test to permit quality assurance of bituminous mixtures and its use is strictly limited to moisture content determination.

2 Referenced Documents

AASHTO:
M 231 Weighing Devices Used in the Testing of Materials

MT Materials Manual
MT 201 Sampling Roadway Materials
MT 202 Sieve Analysis of Fine and Coarse Aggregates
MT 303 Sampling Bituminous Paving Mixtures
MT 309 Splitting Samples of Plant Mix Surfacing to Testing Size
MT 607 Reducing Field Samples of Aggregate to Testing Size

3 Terminology

3.1 *Constant Mass for Bituminous Mixtures* – the state at which a mass does not change more than 0.05 percent. Do not exceed the mix design mixing temperature. Use equation 7.1. If the % change is greater than 0.05 continue drying.

3.2 *Constant Mass for Aggregate* – the state at which a mass does not change more than 0.1 percent. Do not exceed the mix design mixing temperature. Use equation 7.2. If the % change is greater than 0.1 continue drying.

4 Apparatus

Ensure equipment used meets the following requirements:

4.1 *Microwave* - oven capable of holding 4000 g sample.

4.2 *Sample containers* - capable of holding 600 g (must be Pyrex, glass, porcelain, ceramic or paper plates).

4.3 *Balance* - with a 16,000 g capacity and sensitive to 0.1 g, conforming to requirements of AASHTO M 231.

4.4 *Miscellaneous Equipment* – Spatula, Gloves

4.5 *Airtight container* - capable of holding 2500 to 3000 g sample.

4.6 *Flat pan* - approximately 25 x 20 x 3 inches.

5 Sample Preparation

5.1 Obtain 2500 to 3000 g of bituminous mix (according to MT 303) or aggregate (according to MT 201).

5.2 Quarter the aggregate into two (2) 500 ± 50 gram samples. Reduce aggregate samples in size, if necessary, according to MT 607.

5.3 Reduce bituminous mixtures in size, as necessary, according to MT 309, to obtain two (2) 500 ± 50 g samples.

6 Procedure

6.1 Place sample in tared container, and weigh to the nearest 0.1 g.

6.2 Record sample temperature.

6.3 Put sample in microwave oven and turn oven on.

6.4 After two (2) minutes, turn the oven off, remove the container and sample, weigh the sample and container to the nearest 0.1 g, and record the weight and temperature.

6.5 Place sample and container back in the oven. Turn oven on and dry sample for two (2) additional minutes.

6.6 Remove sample and container from oven, weigh to the nearest 0.1 g, and record weight and temperature.

6.7 Repeat steps 6.3 through 6.6 until a constant mass is obtained.

6.8 Ensure the final sample temperature, when weighed, is within ±15°F of section 6.2.

Note 1 – Do not exceed mix design mixing temperature.

7 Calculations

7.1 After a constant weight has been obtained, calculate the moisture content for bituminous mixtures as follows:

$$Moisture\ Content\ of\ Bituminous\ Mixtures, \% = \left(\frac{M_i - M_f}{M_i}\right) \times 100$$

where:
Mi = mass of the initial, moist test sample
Mf = mass of the final, dry test sample

Record the moisture content of bituminous mixtures as the average of the two samples to the nearest 0.01%.

7.2 After a constant weight has been obtained, calculate the moisture content aggregate as follows:

$$Moisture\ Content, \% = \left(\frac{M_i - M_f}{M_f}\right) \times 100$$

where:
Mi = mass of the initial, moist test sample
Mf = mass of the final, dry test sample

Record the moisture content of aggregate as the average of the two (2) samples to the nearest 0.1%.

7.3 If the moisture contents of the two (2) samples differ by more than 0.2%, the test is invalid. In this case new samples must be prepared and the test re-run.

8 Precautions

8.1 Use gloves for handling hot mixtures during quartering and when placing in or removing from oven.

8.2 Do not use metal containers in oven at any time. Damage to the oven will occur.

8.3 Do not delay getting sample into oven after sampling. (If a delay of 15 minutes or more is anticipated, samples must be placed into and kept in sealed containers. For reliable results, all samples should be tested within 1 hour of sampling).

8.4 **DO NOT USE** the moisture content sample for additional testing.