

ALDOT-354--87
ASPHALT CONTENT OF HOT-MIX ASPHALT BY THE NUCLEAR METHOD

1. Scope

- 1.1. This test method covers the quantitative determination of the asphalt content of hot-mix asphalt (HMA) by examining a sample with a device that utilizes neutron thermalization techniques.
- 1.2. Operators must have a current operator's card issued by the Bureau of Materials and Tests and wear a neutron film badge.

2. Applicable Documents

- 2.1. ASTM D-4125, Asphalt Content of Bituminous Mixtures by the Nuclear Method.
- 2.2. ASTM D -7013, Standard Guide for Nuclear Surface Moisture and Density Gauge Calibration Facility Setup.
- 2.3. M&T-30, Technical Specifications for Nuclear Asphalt Content Gauge.
- 2.4. Radiological Safety Manual for the use of Nuclear Moisture Density and Asphalt Content gauges.
- 2.5. Alabama Department of Transportation Nuclear Gauge Training Manual.
- 2.6. Gauge Instruction Manual.
- 2.7. AASHTO T-168, Sampling Hot-Mix Asphalt Paving Mixtures.
- 2.8. ALDOT-130, Moisture Content of Hot-Mix Asphalt by Drying.
- 2.9. ALDOT-378, Accepting New Nuclear Moisture/Density and Thin Layer Gauges, and Recalibrating/Quality Checking Used Gauges.
- 2.10. BMT-65, Asphalt Content Gauge Worksheet.
- 2.11. BMT-66, Asphalt Content Gauge Calibration Worksheet.

3. Apparatus

- 3.1. Nuclear asphalt content (AC) gauge meeting Technical Specification M&T-30.
- 3.2. Metal sample pans, supplied with the nuclear AC gauge.

- 3.3. Balance, capable of weighing to 11 kg, readable to 0.1 g.
- 3.4. Straightedge, steel, approximately 18 in (450 mm) in length.
- 3.5. Plywood, $\frac{3}{4}$ in (20 mm) or thicker, or a 0.4 in (10 mm) or thicker metal plate having an area slightly larger than the sample pans.
- 3.6. Assorted spoons, mixing bowls, spatula, scoop, putty knife, and heat resistant gloves.
- 3.7. Microwave oven with variable power control and approximately 1 ft³ (0.03 m³) minimum capacity.
- 3.8. Laboratory oven and thermostatically controlled hot plate.
- 3.9. Thermometer capable of measuring to 350°F (177°C).
- 3.10. Two large metal mixing bowls.
- 3.11. Pyrex container capable of holding 500 g minimum of the sample.

4. Preparation of Calibration Specimens

- 4.1. Prepare three calibration specimens in accordance with Alabama Department of Transportation Nuclear Gauge Training Manual instructions. The specimens must be prepared at the same weight within ± 10 g. The aggregate blend and asphalt cement to be used in the mix must be used to prepare the calibration specimens. Prepare one specimen at the design asphalt content. Prepare another specimen at 1% higher than the design asphalt content and one specimen at 1% lower than the design asphalt content.
- 4.2. The calibration specimens shall be kept in moisture-proof containers until the calibration is accomplished or placed in an oven at low temperature to prevent moisture accumulation.
- 4.3. The calibration temperature of calibration materials should be between 300°F and 320°F (150°C and 160°C) at the start of calibration.

5. Calibration of the Nuclear AC Gauge

- 5.1. Use the calibration specimens prepared in Section 4 and calibrate the gauge in accordance with Alabama Department of Transportation Nuclear Gauge Training Manual instructions, ALDOT-378 and BMT-66.
- 5.2. The gauge is sensitive to its surroundings. Before calibrating, be sure that it is located in a place in the laboratory where it will not need to be moved and where it will be no closer than 33 feet or as far as possible from water storage tanks, other asphalt material, and other nuclear testing devices.
- 5.3. To check calibration of the gauge, take the specimen at the design asphalt content and run a four-minute test count to check the gauge calibration. The gauge accuracy must be within ± 0.25 percent.
- 5.4. Any change in the aggregate source and/or the liquid asphalt grade will require a new calibration.
- 5.5. The calibration specimen at the design asphalt content shall be retained after gauge calibration to be used as a check sample for gauge accuracy. The specimen shall be sealed in a plastic bag to prevent the specimen from accumulating moisture.

Preparation of Test Specimen

- 6.1. Obtain a representative sample of the mix from the hauling vehicle as per AASHTO T-168. Split the sample for asphalt content and moisture content testing.
- 6.2. For asphalt content testing, place the mix in test pan in three equal layers.
- 6.3. The tared weight of the test specimen should be within ± 10 g of the initial calibration pan weight.
- 6.4. Prepare a second specimen of 1200g for a moisture test according to ALDOT-130.

7. Procedure

- 7.1. Place test specimen in the nuclear AC gauge and take two, four-minute counts, rotating the specimen 180° after the first count. Average the two counts to obtain the percent (%) asphalt content (AC).
- 7.2. Determine moisture content of the hot-mix asphalt as per ALDOT-130. The moisture sample used to correct the % AC.

- 7.3. Correct the % AC for moisture by subtracting the percent moisture obtained in paragraph 7.2 from the percent asphalt obtained in paragraph 7.1 and record as the corrected percent asphalt.
- 7.4. Remove specimen from the gauge. Empty and clean the specimen pan.

8. Reporting

- 8.1. Report the asphalt content to the nearest 0.01 percent on BMT-65.