

ALDOT-350-87
IN-PLACE BITUMINOUS PLANT MIX DENSITY MEASUREMENTS

1. Scope

- 1.1. This method of test provides a non-destructive measurement of in-place density of bituminous plant mix using a thin layer or dual-purpose nuclear density gauge for thin lift overlays.

Note: All operators must be certified as Roadway Technicians by the Bureau of Materials and Tests. Before becoming certified as a Roadway Technician, operators must pass the Radiological Safety Course. When these requirements are met, an operator will be issued a card by the Bureau of Materials and Tests certifying him/her as an operator.

2. Applicable Documents

- 2.1. M&T-33, Technical Specifications for Thin Layer Nuclear Density Gauges.
- 2.2. Nuclear Gauge Training Manual.
- 2.3. Radiological and Operational Manual on use of Nuclear Moisture and Density Gauges.
- 2.4. AASHTO T-166, Bulk Specific Gravity of Compacted Bituminous Mixture Using Saturated Surface-Dry Specimens.
- 2.5. ALDOT-210, Selecting Samples Using Random Numbers.
- 2.6. ALDOT-341, Standard Procedures for Comparing Independent Assurance Samples and Tests (IAS&T) and Acceptance Test Results.

3. Nuclear Gauging Device

- 3.1. This device must meet Technical Specifications M&T-33, available at the Bureau of Materials and Tests.

4. Gauge Application Thicknesses

- 4.1. Troxler Electronic Labs Model 4640-B – 1 in. (25 mm) to 4 in. (100 mm)
Troxler Electronic Labs Model 3430, 3440, & 3450 – 1 in. (25 mm) to 4 in (100 mm)
Campbell Pacific Nuclear Corp. Model MC-3 - 1 in. (25 mm) to 4 in. (100 mm)

5. Gauge Operation

- 5.1. Operation of the gauge shall be in accordance with the manufacturer's instruction manual and Alabama Department of Transportation Nuclear Gauge Training Manual, available from the Bureau of Materials and Tests.

- 5.2. When operating nuclear gauges, standard counts must be taken on a daily basis in order to maintain gauge accuracy while testing. The gauges and standard frequency are as follows:

Gauge Type/Model	Standard Information
Troxler 4640- B	Daily / Default time
Troxler 3430, 3440 & 3450	Daily / Default time
Campbell-Pacific MC-3	Daily / Default time

6. Calibration

- 6.1. Calibration of gauges will be under the direction of personnel from the Bureau of Materials and Tests.
- 6.2. All gauges will be calibrated to densities of cores taken from the material being tested, as determined by AASHTO T-166.
- 6.3. Calibration of the thin layer or dual-purpose gauges shall be in accordance with Alabama Department of Transportation Nuclear Gauge Training Manual available from the Bureau of Materials and Tests.
- 6.4. The certified technicians will select an area within the first 500 T. (500 t) test section that is free of segregation and between the wheel paths. A minimum of four (4) cores will be taken and used to calibrate the thin-layer or dual-purpose gauges. These four cores will be used for determining the pay-factor of the tests strip. The gauge(s) to be calibrated will take four (4) one (1) minute counts around each of the four (4) cores, in accordance with article 7.3. The average density of these 16 counts is compared to the average density of the four (4) cores. This difference is the correction value for the layer being tested. The contractor has the option of taking more cores as needed for greater precision of the gage calibration(s).
- 6.5. Once the correction value has been applied, the technician will retake the same four (4) one (1) minute counts around each of the four (4) cores. The average density derived by the gauge, at each core location, must be within $\pm 1.5\%$ of the actual core density. This must be performed for each of the four (4) cores. If the gauge reads within $\pm 1.5\%$ of each calibration core, no recalibration will be necessary.
- 6.6. If recalibration is necessary, the cores previously taken, as outlined in article 6.4 should be used and the calibration process repeated.

7. In-Place Density Test

- 7.1. Determine the stations and locations for the In-Place Density Test in accordance with ALDOT-210. (Select samples by the random numbers method.) Use an engineering tape or other suitable measuring device to precisely locate the test location. Pacing is not permissible. Record/document, and maintain all random number test locations.
- 7.2. Place the gauge on the surface of the asphalt pavement as determined above. Check for uniform seating by placing hands on opposite corners of the gauge. If the gauge cannot be

- properly seated, cores shall be taken at the exact random number location to determine the density.
- 7.3. Take four one-minute counts rotating the gauge 90° over the same centerpoint after each count. Record these readings and average for the in-place density.
 - 7.4. When operating nuclear gauge within 24 in, (600 mm) of the edge of the asphalt mat, use the following procedure. For initial reading, place gauge parallel to the edge of the layer being tested. Then, rotate gauge at 60° intervals (over same centerpoint) to obtain the next three (3) readings. The last reading should be taken opposite the first reading, leaving the gauge parallel to the edge of the layer being tested.

8. Comparing IAS&T Samples and Tests and Acceptance Test Results

- 8.1. Frequency of (IAS&T) Tests shall be in accordance with the IAS&T schedule section of the testing manual. IAS&T tests shall be taken at the same location as the acceptance test taken by field or contractor personnel. IAS&T tests shall follow the guidelines set forth in ALDOT-341 with comparison tolerances outlined in Table 1.