Tennessee Department of Transportation
Division of Materials and Tests

Asphalt Pavement Test Strips
(SOP 3-5)

Purpose- The purpose of this document is to establish the practice of constructing test strips for asphalt pavements

Background- Test strip construction is a vital part of the construction of a quality asphalt pavement. During the test strip: the roller pattern for achieving the greatest density of the mix, the application rate of tack coat to achieve complete coverage, validation of the mix at the plant, and correction factors for the nuclear gauges used in QA and QC are all determined.

Policy- Per TDOT Specifications test strips are required: to determine the tack coat application rate before paving each new layer of asphalt (403.05.B); to produce enough mix to perform start up quality control and verification (407.03.D.2.h); and to set a roller pattern and determine a nuclear gauge correction factor (407.15.C).

Construct a test strip at the beginning of work on the pavement course. A test strip is required for each mix A new test strip will be required in the following instances:

- There is a change in job mix formula,
- A change in the source of materials occurs,
- A change in the material from the same source is observed,
- There is reason to believe that the test strip density is not representative of the mixture being placed. For example, test results are consistently above 100% density or test results have been consistent for a steady number of days and had suddenly changed significantly,
- A change in paving or compaction equipment occurs,
- A change in lift thickness, and
- A visual change in subsurface structure or subgrade condition.

Procedure- A. Tack Coat Test Strip

1. On each project and immediately prior to placing a new layer of asphalt, require the contractor to create a Tack Coat Test Strip by spraying a minimum of 100 feet of the roadway to be paved over with tack. Apply tack at a rate within the rate given for the surface condition listed in 403.05.
    a. Note the reading in gallons of the tank prior to and after application of the emulsion the Tack Coat Test Strip.
    b. To ensure enough residual asphalt is left on the surface, calculate the application rate (Gal/SY) of the Tack Coat by:

$$Tack\ Application\ Rate = \frac{(Starting\ Gallons - End\ Gallons) \times 9}{Length(ft) \times Width\ (ft)}$$

Where Length and Width are measurements of the Tack Coat Test Strip

    c. If the application rate is outside the specified limits require an adjustment to fall within the range.

2. Visually inspect the Tack Coat Test Strip. The full width should be coated evenly and completely with tack coat.
    a. If the Tack Coat Test Strip is not evenly coated with tack or excess tack is running off the site, require adjustments to be made to the application rate, size or cleanliness of the spray nozzles, height of the spray bar. The goal is to achieve a minimum double overlap of tack spray.
    b. Require the contractor to create a new 100' long Tack Coat Test Strip to evaluate changes. Repeat as necessary until full coverage is achieved.
    c. Unacceptable Tack Coat Test Strips are to be corrected prior to being covered with the next layer.
3. If emulsion is being used for Tack Coat, observe the time required for the emulsion to break, (i.e. for the water to fully evaporate as evidenced by a color change from brown to black). Require the contractor to apply tack in advance of his paving operation to at a minimum distance to achieve this breaking time for the remainder of the layer. If atmospheric conditions significantly change, the breaking time may be adjusted at the Engineer's judgment.
    a. Note: in no cases should unbroken tack be paved over.

Improper Tack Coat, Zebra Strip/Corn Rows. Unacceptable.

Good Uniform Coverage, Acceptable.

B. Establish Roller Pattern

The role of the TDOT inspector in determining the roller pattern is as an observer. The contractor is ultimately responsible for constructing an asphalt pavement to the specified density. Determining the roller pattern to achieve this density is the contractor's role.

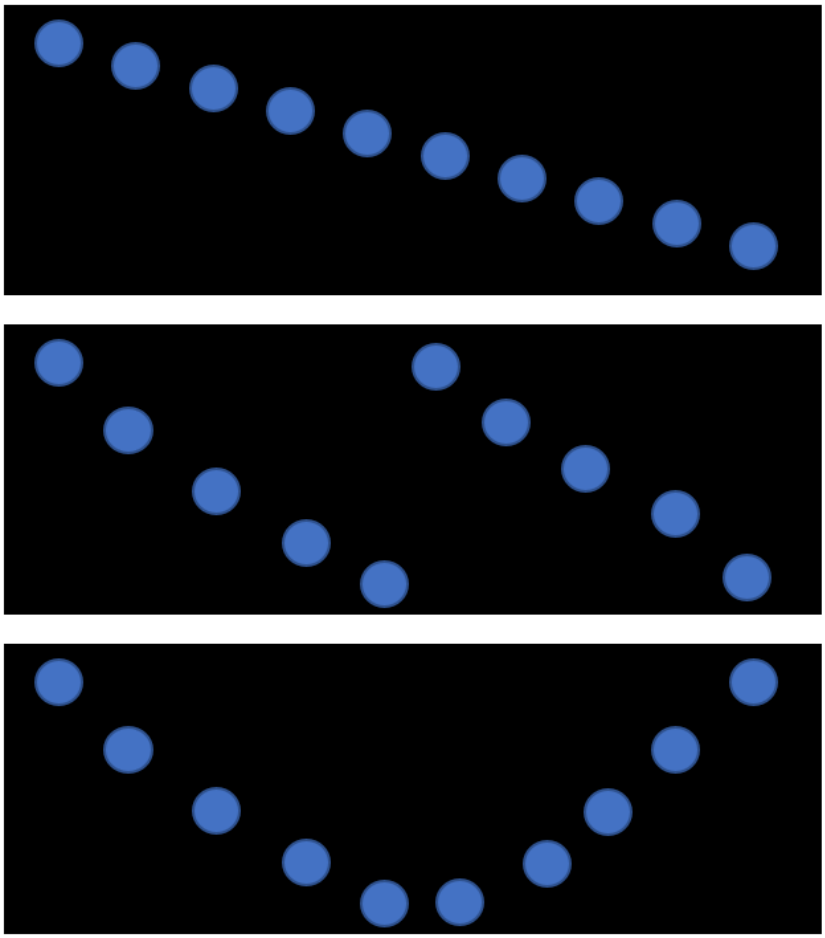
The TDOT inspector and nuclear gauge operator shall:

1. Document the equipment, number of passes, vibratory, frequency and amplitude information of each pass on DT0316.
2. Determine density for each pass and record it on DT0316. Make this information available to the contractor upon request. However, do not dictate the roller pattern to the contractor.

A suggested roller pattern establishment procedure is provided in the appendix for the contractor.

C. Calibrate Nuclear Gauge

1. Select at least ten locations on the test strip to run a nuclear gauge test and cut cores. The locations shall be chosen such that they represent locations along the full width and length of the project. Examples of potential patterns:



Note: some districts prefer to cut 12 cores. This is allowable. However, the low and high cores by density shall be discarded prior to step 6.

2. Conduct and record (at least) ten sets of uncorrected density (four 90 degrees test method, see SOP 7-1) tests on the compacted test strip area and record test information.
3. After running each test. Mark the location and test number on pavement with spray paint. DO NOT SPRAY PAINT THE LOCATION PRIOR TO THE NUCLEAR GAUGE TEST. This will get paint on the gauge that will need to be cleaned off.
4. Contact the contractor to cut cores and deliver them to the asphalt lab.
5. The TDOT Plant Technician shall test the cores for laboratory density in accordance with AASHTO T166.
    a. Note the contractor's technician shall not conduct this testing.
6. The nuclear gauge correction factor shall be the difference between the average of ten nuclear gauge readings and the average of ten core density values.
    a. Note this correction factor only applies to the project and the mix design.

APPENDIX

A Suggested Procedure for Establishing the Roller Pattern

This procedure is meant as a guide to the contractor as a method for establishing a roller pattern to achieve maximum density. It is not the TDOT inspector's role or duty to determine the roller pattern. The responsibility for achieving the required density rests with the contractor.

1. Establishing roller pattern and nuclear gauge calibration is required for A, BM, BM2, C, CW, D and E mixtures. Each test strip section shall be one paver width (or lane width) and a minimum of 400 square yard.

2. Compact the test strip using equipment as specified in 407.07 and 407.15. Immediately after placing the bituminous mixture, begin compacting the test strip. Perform compaction in a continuous and uniform manner over the entire test strip.

3. Nuclear readings for the Roller Pattern should be taken using the 15-second test, using the Backscatter Method after each pass at the same location.

4. Continue rolling until the apparent maximum density for the asphalt mixture is obtained. To achieve the apparent maximum density, the mat shall be rolled until the density reading decreases or flattens to no appreciable change, (i.e., less than 1 lb/ft^3). Once the density appears to decrease or flatten, make an additional pass.
    a. If the density decreases or flattens on this pass, then the maximum density will be the density achieved one roller pass before the second decrease.
    b. If the density increases, repeat these steps until maximum density has been achieved.
5. Repeat steps 1-4 with the intermediate roller to establish its roller pattern. If the mat has cooled, move forward on the project and roll the new section with the break down roller to the pattern established in steps 1-4 prior to establishing the roller pattern for the intermediate roller.

6. A roller pattern for density can be established for the final roller, if needed, following steps 1-5 above.