

STATE

OF

TENNESSEE

(Rev. 5-15-17)

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January 1, 2021

SPECIAL PROVISION

REGARDING

BITUMINOUS PLANT MIX PAVEMENTS (HOT MIX)

ROADWAY DENSITY

Description

This work consists of the requirements for acceptance of asphalt roadway density by use of core samples, and for testing and acceptance of asphalt longitudinal joint density.

Meet all requirements of **407** of the Standard Specifications except as modified.

407.03.D.2.h - Contractor Quality Control System. Add the following between the second and third paragraphs:

Conduct quality control testing of surface and binder mixes for roadway density throughout placement to verify that the mixture being placed meets specified density requirements. A Quality Control Plan (QCP) for this density testing is required. Acceptable methods of quality control testing include coring, nuclear gauge testing, and non-nuclear gauge testing. Document all tests and records from the control strip (if any). Make quality control records available upon request to the Department.

407.07 - Rollers. Replace the entire subsection with the following:

Provide a sufficient number and type of self-propelled rollers to achieve proper compaction and obtain the specified densities.

407.15 - Compaction. Replace the entire subsection with the following:

A. General

After the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly compacted. Use a method that shall be capable of compacting the mixture to the specified density while it is in a workable condition. Rollers shall not park or be refueled on the bituminous pavements.

B. Density Requirements

Meet the applicable density requirements for travel lanes and joints as specified in Table 407DEN-1 and Table 407DEN-2.

1. Mix Types: All Travel Lanes for A, B, BM, BM-2, C, CW, D, E
2. All levels of ADT
3. %Gmm values specified are for lot averages.

Table 407DEN-1

Travel Lane Density		
% Gmm		% Pay
Min	Max	
99.0	100	90
98.0	<99	94
97.0	<98	98
96.0	<97	100
95.0	<96	101
94.0	<95	102
93.0	<94	101
92.0	<93	100
91.0	<92	98
90.0	<91	94
89.0	<90	90
88.0	<89	86
	<88	*

Table 407DEN-2

Joint Density Incentive/Disincentive		
% Gmm		\$/L.F./Lot
Min	Max	
98.0	100	*
97.0	<98	-0.70
96.0	<97	-0.42
95.0	<96	0.00
94.0	<95	0.00
93.0	<94	0.07
92.0	<93	0.14
91.0	<92	0.07
90.0	<91	0.00
89.0	<90	-0.14
88.0	<89	-0.42
87.0	<88	-0.70
86.0	<87	-0.98
	<86	*

*Shall be removed and replaced at no cost to the Department or as directed by the engineer.

% Pay for travel lanes shall be applied to the theoretical quantity of the mix on the travel lanes only, even when the shoulder and travel lane are placed concurrently. No incentive shall be paid for the second travel lane unless the joint for that lot is a minimum of 90.0%.

Any lot of joint density tests averaging below 87% shall be sealed at no cost to the Department. Approved sealers are listed on the Department’s Qualified Products List (QPL), Listing #40 for Pavement Sealers. Sealing of deficient longitudinal joint lots will only be required for surface mixes. No incentive/disincentive shall be applied to a longitudinal joint between a travel lane and a shoulder.

Meet the applicable density requirements for shoulders as specified in Table 407DEN-3.

1. Mix Types: All shoulder mixes
2. All levels of ADT
3. %Gmm values specified are for lot averages.

Table 407DEN-3

Shoulder Density		
% Gmm		% Pay
Min	Max	
98.0	100	*
97.0	<98	96
96.0	<97	98
95.0	<96	100
94.0	<95	100
93.0	<94	100
92.0	<93	100
91.0	<92	100
90.0	<91	100
89.0	<90	100
88.0	<89	100
87.0	<88	98
86.0	<87	94
85.0	<86	90
	<85	*

* Shall be removed and replaced at no cost to the Department or as directed by the engineer.

% Pay for shoulders shall be applied to the theoretical quantity of mix on the shoulder even when the travel lane and shoulder are placed concurrently.

407.20.B.5 - Acceptance of the Mixture. Replace the entire subsection with the following:

5. Acceptance for Mix Density on the Roadway

- a. **General.** The Department will apply a deduction in payment, not as a penalty but as liquidated damages, for failure to meet the density requirements as specified in **407.15.B**. As soon as practical after the final rolling is completed on each lot, 5 density tests (1 per subplot) shall be performed by the Department at random locations determined by the Engineer, and an average of all such tests shall be computed. Any deduction for failure to meet density requirements or incentive for exceeding density requirements shall be

computed to the nearest 0.1% as a percentage of the total payment otherwise due for each lot.

Consecutive lots with density deductions is cause to stop production as directed by the Engineer. Adjust the rolling operation and Quality Control Plan to achieve the required density. Construct a test strip of not more than 250 tons to demonstrate to the Engineer that the changes made produce densities meeting the requirement without deductions. Only resume full production after the Engineer has accepted the test strip.

- b. Travel Lane, Turning Lane, Ramp or Shoulder Density.** For density acceptance purposes, the pavement shall be divided into lots of 1,000 tons for surface mixes (D, E, C, and CW), 2,000 tons for intermediate mixes (B, BM, and BM2), and 3,000 tons for base mixes (A). Lots shall be divided into 5 even sublots. One core will be tested in each subplot and the average for the entire lot shall be compared with the requirements in Table 407DEN-1 for travel lanes or Table 407DEN-3 for shoulders. When possible, attention should be provided to avoid cutting cores in areas where signal/loop wire may be affected. If test location selections indicate testing locations in these areas, a new random number should be selected. At the beginning of a project or at any time advisable, the Department may consider smaller lots to evaluate compaction methods or for other reasons as approved or directed by the Engineer.
- c. Joint Density.** For density acceptance purposes, joints shall use the same length lot and longitudinal coring location as the last adjoining lane to be paved. The average of the 5 cores for the entire lot shall be compared with the requirements in Table 407DEN-2. At the beginning of a project or at any time advisable, the Department may consider smaller lots to evaluate compaction methods or for other reasons as approved or directed by the Engineer.
- d. Test Method.** Five randomly selected cores (4" min./ 6" max. diameter), from each lot, will be tested to determine density compliance and acceptance. The density (bulk specific gravity) determination for a compacted asphalt mixture shall be performed in accordance with AASHTO T-166, Method A only.

All core samples shall be COMPLETELY DRY before testing. Air drying is permitted provided core samples are weighed at 2-hour intervals until dry in accordance with AASHTO T166, Section 6.1. Cores may also be dried in accordance with ASTM D 7227.

The Bulk Specific Gravity (G_{mb}) of the cores shall be averaged for each lot.

For **lanes and shoulders** the maximum theoretical gravity (G_{mm}) from acceptance testing for that shift's production will be averaged and the percent density will be determined for compliance by dividing the G_{mb} average for each lot by the G_{mm} daily average.

For **joints** the maximum theoretical gravity (G_{mm}) from acceptance testing for both adjoining lanes shall be averaged, and the percent density will be determined for compliance by dividing the G_{mb} average for each lot by the G_{mm} daily average.

Obtain the cores at the locations randomly selected by the Engineer. The Department will test the cores by a certified plant technician.

If a lot is split between two days, determine the percent density of each individual core using the daily G_{mm} average from the day the subplot (represented by the core being tested) was paved.

After obtaining the cores, all core holes shall be properly filled and compacted in kind with hot mix asphalt at no additional cost to the Department.

Cores shall be clearly labeled in a discrete, sequential manner (i.e. – M1, M2, ..., M30; J1, J2, ..., J15) throughout the course of the project. After testing, cores shall be retained along with copies of test results and will be periodically obtained by regional materials and tests for spot-check verification testing. The cores may be discarded, if regional materials and tests determines that they are no longer needed for payment or dispute resolution.

- e. **Incentive/Disincentive Payment.** The Department shall apply the incentive disincentive payment in accordance with the tables in **407.15.B**.

Any deduction in monies due the Contractor for failure to meet the density requirements shall be made under the item for Density Deduction.

Any incentive payment due the Contractor shall be under the item for Density Incentive.