

**STATE**

**OF**

**TENNESSEE**

(Rev. 5-18-15)  
(Rev. 7-13-15)  
(Rev.11-16-15)  
(Rev. 6-27-16)  
(Rev. 12-2-16)  
(Rev. 1-6-17)

January 1, 2015

**Supplemental Specifications - Section 400**

**of the**

**Standard Specifications for Road and Bridge Construction**

**January 1, 2015**

**Subsection 402.03** (pg. 282) 5-27-16; revise the following in the 2<sup>nd</sup> paragraph: “The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable surface widths at readily determined and controlled rates from 0.05 to 0.5 gallons per square yard, with uniform pressure, and with an allowable variation from any specified rate of plus or minus 0.02 gallons per square yard.”

**Subsection 403.02** (pg. 285-286) 12-2-16; Bituminous Materials, revise as follows:  
“Emulsified Asphalt, SS-1, SS-1h, CSS-1, CSS-1h, TST-1P, CQS-1h, CQS-1hp.....904.03 or Approved Emulsified Trackless Tack from the QPL.

**Table 403.02-1: Tack Coat Application Temperatures**

<b>Material</b>	<b>Temperature Range</b>
SS-1, SS-1h, CSS-1, TST-1P, CQS-1h, CQS-1hp and CSS-1h	60 to 140 °F

**Subsection 403.02** (pg. 285-286) 11-16-15; Bituminous Materials, add the following:  
“Emulsified Asphalt, SS-1, SS-1h, CSS-1, CSS-1h, TST-1P, CQS-1h, CQS-1hp, TTT-1, TTT-2, TTT-3 .....904.03”

**Table 403.02-1: Tack Coat Application Temperatures**

<b>Material</b>	<b>Temperature Range</b>
SS-1, SS-1h, CSS-1, TST-1P, CQS-1h, CQS-1hp and CSS-1h	60 to 140 °F
TTT-1	160 to 180 °F
TTT-2	120 to 160 °F
TTT-3	100 to 180 °F

**Subsection 403.05** (pg. 286) 11-16-15; A. Emulsified Asphalt, Add the following paragraph at the end of the subsection:

“Take a minimum of 3 cores throughout the length of the project for informational tack coat shear testing. Include the underlying layer. Not required for mats less than one inch thick.”

**Subsection 403.05** (pg. 287) 11-16-15; ) B. Test Strip, modify the following:

“If placing the bituminous material upon a milled surface, apply the tack material at a rate of between 0.08 and 0.12 gallons of applied emulsion per square yard.”

**Subsection 403.05** (pg. 287) 6-27-16; revise the following in the last sentence of the 2<sup>nd</sup> paragraph: “If placing the bituminous material upon a milled surface, apply the tack material at a rate of between 0.08 and 0.12 gallons applied emulsion per square yard.”

**Subsection 404** (pg. 289-293) 1-6-17; Remove the entire subsection. All specifications regarding Double Bituminous Surface Treatment has been incorporated into subsection 405. All references shall be updated to subsection 405.

**Subsection 405** (pg. 294-298) 1-6-17; revise the following:

“405.01 Description

This work consists of constructing a bituminous seal coat consisting of one or more applications each of bituminous material and cover aggregate.

*MATERIALS*

405.02 Materials

Provide materials as specified in:

- Mineral Aggregate, Size Nos. 7, 8, 78, 89 ..... 903.13
- Mineral Aggregate..... 903.14
- Emulsified Asphalt, CRS-2p ..... 904.03

Apply seal coat at a temperature range of 60 to 140 °F.

*EQUIPMENT*

## 405.03 Equipment

Provide a power broom or other mechanical sweeping equipment, equipment for heating bituminous material, a pressure distributor meeting the requirements of 402.03, pneumatic-tire and steel-wheel rollers, self-propelled mechanical aggregate spreading equipment that can be adjusted so as to spread accurately at the specified rate, and such other equipment and small tools as may be required to perform the work in a satisfactory manner. Provide equipment as specified in 404.03.

*CONSTRUCTION REQUIREMENTS*

## 405.04 Limitations

~~Adhere to the limitations specified in 404.04.~~

Only apply bituminous material:

1. When the designated surface is dry, firm, and properly cured;
2. Between April 15 and October 1; and, unless otherwise directed,
3. When the ambient temperature in the shade and away from artificial heat is 70°F or more.

~~If approved by the Engineer, the limitations for construction to be covered by a succeeding stage of pavement after October 1 and prior to April 15 shall be as follows:~~

~~Adhere to the seasonal limitations specified in 407.09.~~

## 405.05 Preparing the Designated Surface

~~Prepare the surface to be sealed as specified in 404.05. Before placing seal coat, clean all surfaces to be sealed by sweeping with a motorized broom to remove any loose material. Clean depressions and cracks not reached by the power broom using hand brooms or pressurized air.~~

Cover any utility installations to prevent adherence of the bituminous mixture. Suitable covering includes plywood disks, sand, craft paper, roofing felt or other approved methods. Remove the protective coverings before opening the road to traffic. The cost for these adjustments shall be included in the bid price for other items.

The Plans will indicate whether the surface is to be constructed on a treated or untreated subbase, a granular base, an asphalt base, or on an existing surface. The surface of the base or sub-base upon which the construction is to be placed shall meet the requirements of the applicable Section of Part 3, Bases and Subgrade Treatments, of these Specifications.

Condition existing surface, if called for on the Plans, as specified in 407.10. Condition existing mineral aggregate base as specified in 310.

Construct and maintain Prime Coat or Tack Coat, if shown on the Plans, as specified in 402 or 403, respectively.

405.06 Applying ApplicationA. Applying Bituminous Material:

Have all equipment calibrated prior to starting work. The TDOT inspector shall be present during calibration to determine aggregate spread rate and distributor rates. Distributor trucks shall have proper calibration of spray equipment. Spray nozzles should be clean, properly angled, and appropriately sized for the desired application rate. Stop work if the distributor is not applying material properly, such as gaps in application or streaking.

Place a 500 ft. test strip for the bituminous seal coat at the beginning of the project to assure proper coverage and proper equipment calibration. The test section is to verify break time of emulsion and chip retention. The test strip shall be able to carry normal traffic within 3 hours. If normal traffic cannot be carried, the emulsion shall be adjusted and another test strip is required.

At least 14 working days before the scheduled start of construction of any bituminous seal coat, submit a sample of aggregate intended for use for the determination of the appropriate application rates of bituminous material and aggregate. Apply emulsified asphalt by pressure distributor at a uniform rate in accordance with Table 405.06-1 below. The exact rate will be established by the Engineer.

Table 405.06-1: Application Rates for Bituminous Material

Aggregate Size (per 903.22)	Aggregate Spread Rate (lb/yd <sup>2</sup> )	Emulsion Shot Rate (gal/yd <sup>2</sup> )
7	25 – 30	0.30 – 0.45
78	22 – 28	0.28 – 0.38
8	20 – 25	0.20 – 0.35
89	17 – 23	0.17 – 0.28

Before beginning each spread, place building paper across the roadway surface with the forward edge exactly coinciding with the end of the preceding covered spread. Start distributors on the paper, the width of which shall allow the full force of all nozzles to be in effect before the forward edge of the paper is reached. If required by the Engineer, also stop the spread on building paper. Remove the paper immediately after its use, and dispose of properly. Immediately correct all defects in application.

The length of spread of bituminous material shall not exceed that which trucks loaded with cover material can immediately cover.

The spread of bituminous material shall not extend more than 6 inches wider than the width covered by the cover material. Do not allow the bituminous material to chill or otherwise impair retention of the cover material.

Do not allow traffic on the bituminous material until it has been covered with mineral aggregate.

Treat areas that are inaccessible to the distributor with either hand sprays or pouring pots as directed by the Engineer.

B. Application of Double Bituminous Surface Treatment:

**First Application**

Apply the first application of emulsified asphalt using pressure distributors at a uniform rate established by the Engineer within the range of 0.30 to 0.38 gallons per square yard. Apply each spread of bituminous material so as not to be more than 6 inches wider than the width covered by the immediate spread of cover aggregate. Each width of spread shall not be less than half the surface to be treated.

Before beginning each spread, place building paper across the roadway surface with the forward edge exactly coinciding with the end of the preceding covered spread. Start distributors on the paper, the width of which shall allow the full force of all nozzles to be in effect before the forward edge of the paper is reached. If required by the Engineer, also stop the spread on building paper. Remove the paper immediately after its use, and dispose of properly. Immediately correct all defects in application.

Treat areas that are inaccessible to the distributor with hand sprays or pouring pots as directed by the Engineer.

If treating less than the full width of the roadway, do not spread the aggregate on the inside 6 inches of either the first or second application until the adjacent lane has been treated. Immediately following each application, uniformly cover the applied bituminous material with Size No. 7 mineral aggregate that is reasonably free of surface moisture.

Spread the aggregate at a rate between 24 and 30 pounds per square yard, as established by the Engineer, using a self-propelled mechanical spreader; except on short projects of 1/2 mile in length or less, self-propelled mechanical spreading equipment will not be required. Back the truck on the aggregate being spread, without driving on or over uncovered bituminous material.

The length of bituminous material spread shall not exceed that which trucks loaded with cover material can immediately cover.

**Second Application**

Apply the second application of emulsified asphalt in the same manner as the first application, at a uniform rate established by the Engineer within the range of 0.20 and 0.35 gallons per square yard.

Spread mineral aggregate, Size No. 8, in the same manner as the first spread at a rate established by the Engineer within the range of 16 to 28 pounds per square yard.

Immediately after each spread of cover aggregate, broom to achieve uniform coverage. Use a power source, which is independent of the drive train that propels the equipment, to power the revolving brooms of mechanical sweeping equipment. Place additional aggregate by hand on thin or bare areas.

**405.07 Spreading and Rolling Aggregate****A. Spreading**

Immediately after bituminous material has been applied, no more than two minutes, spread and embed the mineral aggregate cover in the bituminous material. Spread the aggregate as close to the

application of bituminous material as is practicable, and cover each distributor load applied immediately. ~~Ensure that the mineral aggregate cover is reasonably free of surface moisture. Aggregates shall be moistened and visually damp at the time of placement.~~

Spread the aggregate in accordance with the rates specified in Table 405.06-1. The exact rate will be established by the Engineer. Back the truck on the aggregate being spread, without driving on or over uncovered bituminous material. If treating less than the full width of roadway, do not spread the aggregate on the inside 6 inches of the bituminous spread until the adjacent lane is treated. Immediately after spreading the aggregate, perform hand-brooming to achieve uniform coverage. Place additional aggregate by hand on thin or bare areas.

The speed of the spreader shall be such that the aggregates are not rolling over, and starting and stopping of the spreader is minimized. Use of previously used (swept) aggregates is not permitted.

**B. Rolling – Bituminous Seal Coat**

Immediately after distributing the aggregate, roll the entire surface by moving in a longitudinal direction, beginning at the outer edges and progressing toward the center of the roadway, with each trip of the roller overlapping the previous trip by half the width of the rear wheel. Perform initial rolling with a self-propelled pneumatic tire roller, and follow with steel-wheel rolling. The amount and sequence of rolling shall be as directed by the Engineer. Complete the initial rolling of the aggregate within 1 hour after applying the bituminous material.

Use ~~hand power~~ brooms to correct irregularities by sweeping the aggregates from areas of thick or heavy distribution to areas of thin or light distribution. Then continue rolling using both steel-wheel and pneumatic rollers until the aggregate is thoroughly embedded in the bituminous material. The Engineer may require additional rolling at a later date. Redistribute excess or loose aggregate that was thrown out of place.

Slow moving traffic may use the section or roadway upon which the aggregate has been spread.

**Rolling and Curing – Double Bituminous Seal Coat**

Immediately after spreading and brooming the cover aggregate, roll the entire surface, beginning at the edges and progressing to the center. Begin rolling within 30 minutes after spreading the aggregate. Perform initial rolling with a self-propelled pneumatic tire roller, and follow with steel-wheel rolling. The amount and sequence of rolling shall be as directed by the Engineer.

Allow the first application of bituminous material and aggregate to cure for as long as deemed necessary by the Engineer before beginning the second application. Immediately before the second application of bituminous material, roll the surface with a steel-wheel roller.

For the second application of bituminous material and cover aggregate, repeat the same rolling and curing procedures as required for the first application.

The Contractor may allow slow-moving traffic to use sections of the roadway where the bituminous material has been covered with mineral aggregate.

**405.08 Shoulders**

Restore shoulders that have been disturbed by the Contractor’s construction operations at no cost to the Department. Remove all objectionable material placed on the shoulders by the Contractor as directed by the Engineer.

Construct shoulders, when specified, as provided for under **208**.

**405.09 Maintenance and Protection**

Maintain in a satisfactory condition each completed section of seal coat until the entire Project is complete. Maintenance shall include making repairs where failures occur, and maintaining the seal coat in a smooth uniform condition; and brooming, dragging, and rolling when required.-

After the final application, maintain the work in a satisfactory condition for at least 10 calendar days. If all other requirements of the Contract have been fulfilled, the Department will not charge working time during the 10-day maintenance period against the Contract time.

For final cleanup, sweep up all excessive quantities of loose, dislodged cover aggregate that may have collected along the edge of the completed seal coat, and dispose of this material as directed by the Engineer.

**405.10 Method of Measurement**

The Department will measure Mineral Aggregate and Bituminous Material by the ton in accordance with **109**. The Department may use net certified weights as a basis of measurement for mineral aggregate, subject to correction for aggregate that is lost, wasted, or otherwise not incorporated into the Work.

**405.11 Basis of Payment**

The Department will pay for accepted quantities of Bituminous Seal Coat, complete in place, at the contract prices as follows:

<i>Item</i>	<i>Pay Unit</i>
Bituminous Material	Ton
Mineral Aggregate	Ton

The Department will measure and pay for the work required to prepare the designated surface, as provided for under **405.05**, in accordance with the applicable Section or Subsection under which the work is performed.”

**Subsection 407.02** (pg. 300-301) 12-2-16; Revise the 4<sup>th</sup> paragraph as follows: ““If anti-stripping additive, other than hydrated lime, meeting 921.06.B.1 is required, use approved in-line blending equipment, as specified in 407.04.A.6, to add it at the mixing plant or inject it at the asphalt terminal. Manufacture’s documentation that asphalt binders will continue to meet requirements listed in subsection **904** after the anti-stripping additive is added shall be provided by the contractor with the mix design submittal. For mix designs submitted more than six months in advance, the documentation shall be resubmitted prior to use of the mix design with updated test results.”

**Subsection 407.02** (pg. 300) 11-16-15; Materials, add the following at the end of the fourth paragraph:

“If anti-stripping additive, other than hydrated lime, meeting **921.06.B.1** is required, use approved in-line blending equipment, as specified in **407.04.A.6**, to add it at the mixing plant or inject it at the asphalt terminal. Provide manufacture’s documentation ensuring asphalt binders will continue to meet requirements listed in Subsection **904** after anti-stripping additives are added.”

**Subsection 407.06** (pg. 327), 5-18-15; - A. Pavers. Replace the entire first paragraph with the following:

“Bituminous pavers shall be self-contained, power-propelled units provided with an activated screed, equipped to be heated, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the Plans. All screed extensions shall be full assembly extensions, including activated and heated screeds. Pavers shall include throw-back blades, reverse augers, or equivalent to place mix beneath the auger gearbox. Auger extensions shall be incorporated in a manner such that the maximum distance from the augers to the end plate shall be 18 inches. Screed extensions may extend beyond the 18-inch maximum from auger extensions only when extending for short-term temporary deviations in pavement width such as driveways. Do not use strike-off boxes, with the exception of sections with continuously varying width.”

**Subsection 407.11** (pg. 332) 12-2-16; Add the following to the paragraph below Table 407.11-1: “Minimum temperature for OGFC mixes shall be 280°.”

**Subsection 407.15, C. Test Strips.** (pg. 340-341) 11-16-15; Add the following paragraph after the 7<sup>th</sup> paragraph of the subsection:

“Take an additional 3 cores after placement of the surface layer on the tack coat test strip described in subsection **403.05.B**. Include the underlying pavement layer for shear testing. These cores will be for informational testing only. Not required for mats less than one inch thick”

**Subsection 407.15** (pg. 341) 6-27-16; remove the 2<sup>nd</sup> sentence of the paragraph as follows: “Take cores on the test strip at ten randomly selected locations as designated by the Engineer. ”

**Subsection 407.15** (pg. 341) 12-2-16; revise the last paragraph as follows: “Take cores on the test strip at ten locations as designated by the Engineer.”

**Subsection 407.20** (pg. 346) 5-18-15; Basis of Payment; B. Acceptance of Mixture; Modify the last paragraph as follows:

“When the total plan quantity of any mix is less than 1000 tons, the Department will accept the mix on the basis of visual inspection and Contractor Quality Control certification. The Department may run extraction, gradation analysis, or other tests deemed necessary for acceptance purposes.”

**Subsection 407.20** (pg. 348) 11-16-15; Table 407.20 – 2, make the following change:

**Table 407.20-2: Acceptance Schedule of Payment  
(Asphalt Plant Mix Characteristics)**

Characteristics	Pay Factor	Average Arithmetic Deviation of the Lot Acceptance Test from the JMF	
		1 Test	2 Tests or more
Asphalt Cement Content <sup>(1)</sup>	1.00	0.00-0.30	0.00-0.25
(Extraction or ignition oven)	0.95	0.31-0.35	0.26-0.30
	0.90	0.36-0.40	0.31-0.35
	0.80 <sup>(2)</sup>	over 0.40	over 0.35
Gradation	1.00	0.00-6.50	0.00-5.70
3/8 inch sieve and larger	0.95	6.51-7.08	5.71-6.20
	0.90	7.09-7.66	6.21-6.69
	0.80 <sup>(2)</sup>	over 7.66	over 6.69
Gradation	1.00	0.00-4.62	0.00-4.00
No. 4 sieve <sup>(3)</sup>	0.95	4.63-5.20	4.01-4.50
	0.90	5.21-5.77	4.51-5.00
	0.80 <sup>(2)</sup>	over 5.77	over 5.00

**Subsection 407.20** (pg. 350) 11-16-15; B. 5. Acceptance for Mix Density on the Roadway, Replace the entire 2<sup>nd</sup> paragraph with the following:

“For density testing purposes, the Department will divide the pavement into lots of 1,000 tons. Five density tests will be performed in each lot and the average results compared with the requirements specified in Tables 407.15-1 to 407.15-4. At the beginning of a project or at any time it is deemed advisable, the Department may consider smaller lots to evaluate compaction methods or for other reasons as approved or directed by the Engineer.”

**Subsection 411.03** (pg. 363) 11-16-15; 2. Recycled Asphalt Shingles (RAS), change the following: “Recycled Asphalt Shingles (RAS) may be included to a maximum of 3% of the total weight of mixture.”

**Subsection 411.03** (pg. 365) 6-27-16; revise the following: “Mix an approved anti-strip agent with the asphalt cement at the dosage as specified in **921.06.B.**”

**Subsection 414.02** (pg. 369) 11-16-15; Materials, add the following paragraph:

“Ensure that no deleterious material is introduced into aggregate stockpiled at project site.” -