Section 4ZZ

Proposed Construction Guide Specification for Tack Coats for Pavement Preservation Treatments

These proposed guide specifications (proposed practice) are the recommendations of the NCHRP Project 14-44 staff at the University of Arkansas. These specifications (practices) have not been approved by NCHRP or any AASHTO committee nor formally accepted for the AASHTO specifications.

4ZZ.1 DESCRIPTION

A tack coat is the application of either an emulsified asphalt or hot applied asphalt binder and may be specifically formulated to reduced tracking. Tack coats are intended to assist with the bonding of a pavement preservation treatment to the existing roadway surface.

This guide specification provides guidance for the construction of tack coats for preservation treatments. Both English and SI units are included in this guide.

Commentary

Commentaries are included in this guide specification to 1) emphasize and further explain the section, 2) present options to be considered by the user, or 3) provide sources of additional information.

Potential pavement preservation treatments that could leverage a tack coat include slurry seals, micro surfacing, ultra-thin lift overlays, and thin-lift overlays. The tack coat is integrated into ultra-thin bonded wearing courses (UTBWC). Tack coats ensure a proper bond between the existing pavement surface and the pavement preservation treatment placed on top of the existing pavement.

4ZZ.2 REFERENCED DOCUMENTS

4ZZ.2.1 *AASHTO Standards*

- M 140, Emulsified Asphalt
- M 208, Cationic Emulsified Asphalt
- M 316, Polymer-Modified Cationic Emulsified Asphalt
- M 320, Performance-Graded Asphalt Binder
- T 27, Sieve Analysis of Fine and Coarse Aggregate
- T 304, Uncompacted Void Content of Fine Aggregate
- AASHTO Guide Specifications for Highway Construction, 10th Edition, 2020

4ZZ.2.2 *Other Documents*

- Martin, R. S., Jr., "Chip Seal Practice", Proceedings of the 26th Paving and Transportation Conference, Department of Civil Engineering, University of New Mexico, Albuquerque, New Mexico, January 1989.
- Decker, D. Best Practices for Emulsion Tack Coats, National Asphalt Pavement Association, NAPA Quality Improvement Series (QIS) 128, 2013.
- FHWA. Tack Coat Best Practices, TechBrief, US Department of Transportation, Federal Highway Administration, FHWA-HIF-16-017, April 2016.
- Gierhart, D., Johnson, D. Tack Coat Specifications, Materials, and Construction Practices, National Cooperative Highway Research Program, NCHRP Synthesis 516, National Academies of Sciences, Engineering, and Medicine, Washington, DC, 2018.
- Manual on Uniform Traffic Control Devices for Streets and Highways, (MUTCD), 2009 Edition, US Department of Transportation, Federal Highway Administration, Washington, DC 20590.
- Musselman, J., Moraes, R., Walbeck, T., West, R. Agency Guidelines for Addressing Tack Tracking, National Asphalt Pavement Association, NAPA PS-36, 2020.
- NCHRP report Guide Specifications for Slurry Seals, Scrub Seals, and Tack Coats, NCHRP project 14-44, 2022.

4ZZ.3 TERMINOLOGY

4ZZ.3.1 *Emulsified Asphalt* – asphalt binder suspended in water with the help of emulsifiers that is applied at temperatures ranging from ambient to 185ºF (85ºC) to ensure a consistent and homogeneous flow from the distributor.

Commentary

There are dozens of different asphalt emulsion grades used by states, including RS-1, RS-2, MS-1, MS-2, QS-1, QS-1h, HFMS-1, HFMS-2, HFMS-2h, HFRS-2, SS-1, SS-1h, CRS-1, CRS-1h, CRS-2, CQS-1, CQS-1h, CSS-1, CSS-1h, CRS-2P, CRS-2L, and CQS-1hP.

Polymer modified asphalt emulsions, as indicted by a capital "P", tend to be more durable and provide a higher quality membrane between the existing pavement and the pavement preservation treatment.

4ZZ.3.2 *Hot Applied Asphalt Binder* – a paving grade asphalt binder that that is typically applied at temperatures between 275F and 375F to ensure a consistent and homogeneous flow from the distributor.

4ZZ.3.3 *Reduced Tracking Tack* – a proprietary tack coat material that is designed to adhere to the existing pavement surface but not to tires of traffic. Both emulsified asphalt and hot applied asphalt binder can be reduced tracking tack technology.

Commentary

In addition to the emulsified asphalt and asphalt binder grades shown above, there are several definitions that should also be used to ensure that there is no confusion regarding the use of emulsified asphalt (Gierhart and Johnson, 2018):

- *Original emulsion: an undiluted emulsion which consists of a paving grade binder, water, and an emulsifying agent*
- *Diluted emulsion: an emulsion that has been diluted with additional water (1:1 typical, original emulsion: added water) (note: if water is added to an emulsion, the emulsion supplier should add the additional water)*

- *Residual asphalt: the remaining asphalt after an emulsion has set, typically 57-70%*
- *Tack coat break: the moment when water separates enough from the asphalt showing a color change from brown to black*
- *Tack coat set: when all the water has evaporated, leaving only the residual asphalt. AKA "completely broke"*

4ZZ.3.4 *Tack Coat Material* – in this document, this term is used to represent emulsified asphalt, hot applied asphalt binder, and reduced tracking tack. Otherwise, one of the three specific terms will be utilized if necessary.

4ZZ.4 MATERIALS

4ZZ.4.1 *Emulsified Asphalt*—Emulsified asphalt for tack coats shall meet the requirements of M 140, M 208, or M 316. The emulsified asphalt shall be kept at 70-180°F, depending on the grade, until application.

Commentary

Emulsified asphalts diluted with water can be less stable than the emulsified asphalt concentrate that was diluted. Maximum shelf life expectancy of the diluted emulsified asphalt is two days; unless otherwise noted by the manufacturer. Most manufacturers recommend you shoot what you dilute the same day.

4ZZ.4.2 *Asphalt Binder* – asphalt binder for tack coat shall meet the requirements of M 320. These asphalt binders are typical performance grade (PG) asphalt binders, and include: PG 46-28, PG 52-28, PG 58-22, PG 64-22, PG 67-22, and PG 76-22. Hot applied asphalt binder must be heated to greater than 300°F (149°C) in order to be sprayed evenly on the pavement surface

Commentary

In general, the lower PG grades are used in northern (cooler) climates whereas the higher PG grades are used in southern (warmer) climates. In addition, the lower PG grades are more often used in night paving. Hot applied asphalt binder is popular during nighttime paving projects as they do not require water to leave the binder system for proper performance (FHWA, 2016)

4ZZ.4.3 *Reduced Tracking Tack Coat* – can be either emulsified asphalt or hot applied asphalt binder. Emulsified asphalts or hot applied asphalt binder that are reduced tracking shall meet the requirements of state specifications as determined by the Engineer for reduced tracking tack coats.

4ZZ.4.4 *Blotter Aggregate* —When blotter aggregate is used, the aggregate size to be used will be as shown in the plans or the requirements shown in Table 1. Aggregate shall be crushed by mechanical means and shall have a minimum void content of 45 percent as determined by AASHTO T 304. The normal application rate for blotter aggregate may vary from 1.0-3.0 lbs. /yd² (0.5 – 1.6 kg/m^2).

Table 1. Blotter Aggregate

Sieve Size (T 27)	Passing, %
No. 8 (2.36 mm)	100
No. 16 (1.18 mm)	50-85
No. 30 (0.60 mm)	25-60
No. 50 (0.30 mm)	5-30
No. 200 (0.075mm)	0-10

4ZZ.5 CONSTRUCTION

4ZZ.5.1 *Weather Limitations: Emulsified Asphalt* —Construct emulsified asphalt tack coat per the following conditions:

- Ambient or pavement surface temperatures shall be 60°F (15.6°C) and rising;
- Application of the emulsified asphalt tack coat shall be only during daylight hours;
- The road surface shall be dry or moist, there shall be no standing water;
- Suspend emulsified asphalt tack coat operations when rain is imminent;
- Temperatures below 40°F (4.4°C) are not anticipated for at least 24 h after application;
- Sustained winds are less than or equal to 10 mph (16.1 kph); and
- Application shall be completed at least 2 h before sunset.

4ZZ.5.2 *Weather Limitations: Hot Applied Asphalt Binder* —Construct hot applied asphalt binder tack coat per the following conditions:

- Ambient or pavement surface temperatures shall be 60°F (15.6°C) and rising;
- The road surface shall be dry;
- Suspend hot applied asphalt binder tack coat operations when rain is imminent;
- Temperatures below 40°F (4.4°C) are not anticipated for at least 24 h after application; and
- Sustained winds are less than or equal to 10 mph (16.1 kph)

4ZZ.5.3 *Application Rate*

The application rate for the emulsified asphalt tack coat shall be between 0.02 gal/yd^2 (0.11 L/m^2) for new asphalt to 0.08 gal/yd^2 (0.43 L/m^2) of residual asphalt binder for a milled surface. Target rates are shown in Table 2 for four types of typical pavement surfaces. The actual rate used for a specific pavement shall be determined using a test strip.

Table 2. Initial Target Tack Coat Application Rate[a]

Surface Type	Residual Rate, gal/yd^2	Undiluted, gal/yd^2 [b]	Diluted 1:1, gal/yd^2
New asphalt	0.02 – 0.05	0.03 – 0.07	0.06 – 0.14
Existing/old asphalt	0.04 – 0.07	0.06 – 0.11	0.12 – 0.22
Milled surface	0.03 – 0.08	0.04 – 0.12	0.09 – 0.24
Portland Cement Concrete	0.03 – 0.06	0.05 – 0.09	0.10 – 0.18

[a] Multiple each value by 5.44 to obtain application rates in L/m^2

[b] This assumes an emulsified asphalt residual binder content of 60 percent and a water content of 40 percent.

Hot applied asphalt binder tack coat shall be placed at the residual rate levels shown in Table 2.

Commentary

All design work will be carried out using the tack coat material to be used on the job site or from equivalent material from the same source and having substantially the same material properties.

4ZZ.5.4 *Preconstruction Meeting*—Coordinate a preconstruction meeting prior to construction with the engineer to discuss the following topics:

- construction process
- quality control plan, required to be submitted
- tack coat design and application rates, required to be submitted
- materials control
- materials measurement
- equipment calibration, required to be submitted
- traffic control plan
- equipment/process overview
- inspection
- test strip
- unique project conditions
- project documentation
- expectations
- schedule

4ZZ.5.5 *Road Surface Preparations*

4ZZ.5.5.1 *Preparing Pavement*— All existing asphalt should be removed from joints/cracks greater than 1.5 in (38.1 mm) wide, all cracks greater than 0.5 in (12.7 mm) should be sealed. Allow crack sealant material to cure for a minimum of 30 days before application of the tack coat. Waive this requirement if a compatible crack sealant is used that does not require a cure time.

Commentary
In addition, ensure that all patches are flush with clean edges and the entire pavement section is structurally sound and no patch is less than 30 days old.

4ZZ.5.5.2 *Cleaning Pavement*—Clean the roadway surface by sweeping no more than 30 min prior to application of the tack coat. However, this 30 min window may be extended if authorized by the engineer in cases where extending the time does not jeopardize a clean surface prior to tack coat operations. Sweep the pavement with a motorized broom to remove loose material. Clean depressions not reached by the motorized broom with a hand broom or other approved method. Clean the outer edges of the pavement to be sealed including an adjacent paved shoulder.

4ZZ.5.5.3 *Protecting Accessories*—Cover utility castings (manholes, gate valve covers, catch basins, traffic sensors, etc.) to prevent coating with tack coat material. Remove the protective coverings after placing the preservation treatment before opening the road to traffic.

Commentary
Suitable coverings include plywood disks, Kraft paper, roofing felt, or other approved methods.

4ZZ.5.6 *Equipment*

All equipment used should be in good working order.

4ZZ.5.6.1 *Asphalt Distributor*—The asphalt distributor shall have a ground speed control device interconnected with the tack coat material pump such that the specified application rate will be supplied at any speed. The asphalt distributor shall be capable of maintaining the tack coat material at the specified temperature. The tolerance for application cannot vary more than ±0.02 gal/yd^2 (0.11 L/m^2).

Commentary

A skirt can be attached to the asphalt distributor in the case winds are above 10 mph to prevent the binder from blowing onto passing vehicles.

4ZZ.5.6.2 *Spray Paver* – a spray paver is used primarily for ultra-thin bonded wearing courses. It is a traditional asphalt paver with a spray bar installed just before the screed. The asphalt paver portion shall conform to the Hot Mix Asphalt Pavement (Guide Specifications for Highway Construction, Section 401, 2020) while the spray bar shall conform to the requirements outlined for the asphalt distributor in Section 4ZZ.5.6.1.

4ZZ.5.6.3 *Spray Wands* - spray wands shall be used in areas that are not accessible to the distributor spray bar for emulsified asphalt applications only. The application rate with spray wands will not be as uniform as with a distributor and is highly dependent on the wand operator (Decker, 2013). However, every attempt should be made to place the tack at the same application rate with the spray wand as was placed by the asphalt distributor.

4ZZ.5.6.4 *Brooms*—Motorized brooms with a positive means of controlling vertical pressure shall be used to clean the road surface prior to spraying tack coat material.

Commentary

Vacuum brooms are preferred in urban or residential areas, but push brooms are acceptable in rural areas where debris scattered off the roadway does not pose a hazard to pedestrians or vehicles.

4ZZ.5.6.5 *Blotter Aggregate Spreader*— If used, a self-propelled mechanical type aggregate spreader mounted on pneumatic-tired wheels with a computerized spread control, capable of distributing the aggregate uniformly to the required width and at the designed rate shall be used.

Commentary

Blotter aggregate is sometimes used to absorb any excess tack coat material that may occur on the pavement surface due to over application or because of pooling in low areas of the pavement. The normal application rate is 1.0 to 3.0 lbs/yd^2 (0.5 – 1.6 kg/m^2).

4ZZ.5.7 *Equipment Calibration*

The contractor shall provide proof of calibration of the asphalt distributor, the spray paver, and the blotter aggregate spreader if a blotter aggregate is applied to the tack coat. Calibration shall be conducted no earlier than five days prior to tack coat operations. The contractor shall submit the results of the calibration procedure and calibration results to the Engineer prior to beginning work.

Flow from each nozzle in the asphalt distributor and the spray paver must be within ±10 percent of the average flow of all nozzles as measured by the procedure described below.

Commentary

Calibration is very important to ensure the quantity of emulsified asphalt, hot applied asphalt binder applied, or the blotter aggregate to the pavement is correct. Although modern asphalt distributors are computer controlled, calibration is required to tell the computer how much tack coat material is being applied. This quantity must be checked prior to spraying emulsified asphalt, hot applied asphalt binder, or blotter aggregate and checked against the quantity the computer (if the distributor is so equipped) indicates is being applied.

4ZZ.5.7.1 *Asphalt Distributor and Spray Bar of Spray Paver*

All nozzles shall be the same size, provide the same flow rate, be oriented in the same direction, and be the same distance above the pavement. The spray bar nozzles shall produce a uniform double (triple coverage is more often an industry recognized practice) lap application fan spray, and the shutoff shall be instantaneous, with no dripping. All nozzles shall be oriented at the same angle between 15 and 30 degrees, or as recommended by the manufacturer using the wrench supplied by the distributor manufacturer and as described below in Section 4ZZ.5.7.1.1.

Commentary

The asphalt distributor or the spray bar of a spray paver applies tack coat material to the pavement surface. This application must be done uniform such that the applied tack coat is evenly distributed both transverse and longitudinal to the centerline of the pavement.

When lower application rates are determined necessary or shown in the plans, smaller nozzles shall be inserted in the spray bar where the tack coat material is reduced.

4ZZ.5.7.1.1 *Nozzle Angle*

Nozzles shall be positioned at an angle of 15 to 30 degrees from the horizontal of the spray bar in accordance with the manufacturer's recommendation. All nozzles shall spray a full fan except for the right and left edge nozzles. The right and left edge nozzle shall be adjusted to a half fan such that the spray stays to the inside of the spray bar.

Commentary

The next step in calibrating the distributor is adjustment of the spray bar nozzle angles. Each nozzle has a slot cut across the face of the nozzle. When the nozzle is threaded into the spray bar, the slot should all be positioned at an angle of 15 to 30 degrees to the direction of the spray bar as shown in Figure 1. This angle provides the best position for achieving uniformity in the spray and the triple overlap coverage. The angle should be adjusted using the wrench supplied with the distributor. This wrench is designed when used properly to set the correct angles for each nozzle. Any wrench that fits the hexagonal nozzle can adjust the nozzle angle, but correctness of the angle would have to be visually verified.

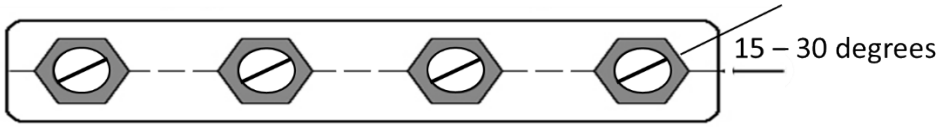

Figure 1. Spray Bar Nozzle Orientation in Spray Bar

Commentary

The angle at which the nozzles are positioned shall be adjusted using the wrench supplied with the distributor. However, in cases where this wrench is unavailable, a wrench that fits the hexagonal nozzle will suffice but the angle must be judged visually.

4ZZ.5.7.1.2 *Spray Bar Height*

The spray bar height must be adjusted so that the tack coat material provides exactly the number of chosen overlaps (typically two or three overlaps) across the entire spray width.

Commentary

Improper application of the tack coat material may occur if the spray bar is set too high or too low as shown in Figures 2 and 3.

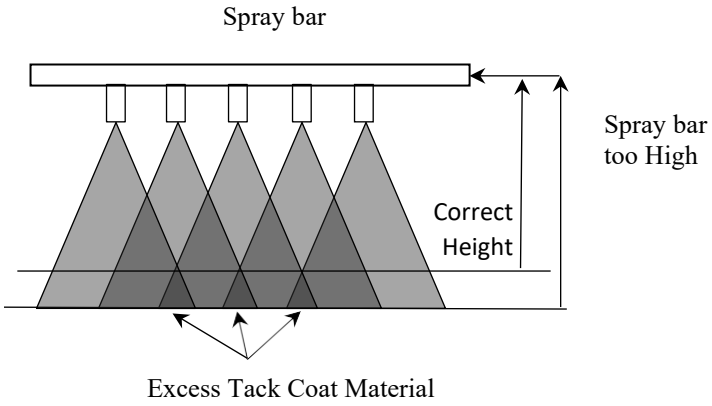

Figure 2. Streaks with Spray Bar Too High for Double Overlap

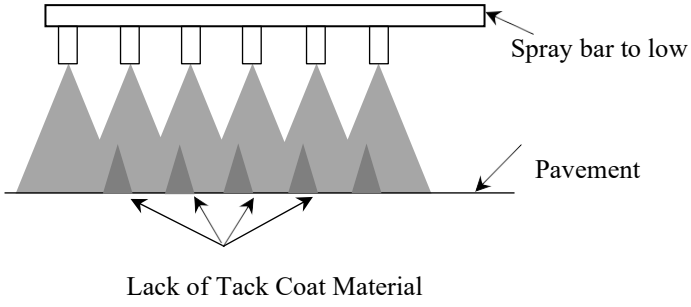

Figure 3. Streaks with Spray Bar Too Low for Double Overlap

Commentary

To avoid potential improper application, the bar must be adjusted to the correct height. This adjustment process is accomplished by shutting off nozzles to determine where the spray pattern contacts the pavement as shown in Figures 4 and 5.

4ZZ.5.7.1.2.1 *Bar Height Adjustment to Achieve Double Lap*

Every other nozzle shall be turned off when a double lap application is desired as shown in Figure 4. The distributor operator shall spray tack coat material onto the pavement surface for as short an interval as possible while an observer watches where the tack coat material hits the pavement from each open nozzle. If there is overlap of tack coat material from adjacent nozzles, the bar is too high. If there is a lack of tack coat material between adjacent nozzles, the bar is too low.

Once it is confirmed the bar height is correct, the nozzles that were turned off can be turned back on and a double application of tack coat material will result when spraying resumes.

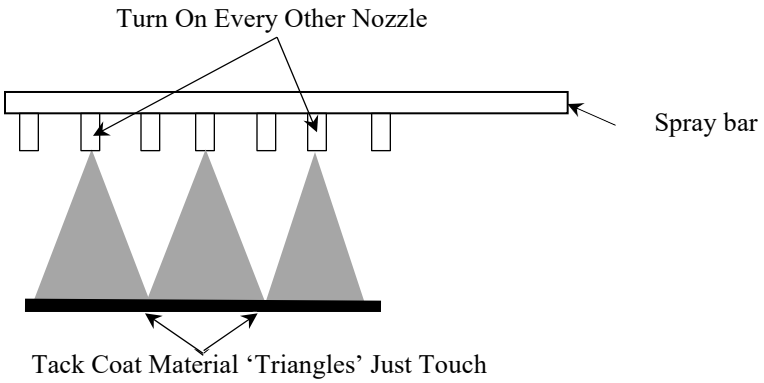

Figure 4. Adjustment of Spray Bar Height for Double Overlap

4ZZ.5.7.1.2.2 *Triple Lap Application Bar Height Adjustment*

Every third nozzle shall be turned off when a triple lap application is desired as shown in Figure 5. The distributor operator shall spray tack coat material onto the pavement surface for as short an interval as possible while an observer watches where it hits the pavement from each nozzle left open. If there is overlap of tack coat material from adjacent nozzles, the bar is too high. If there is a lack of tack coat material between adjacent nozzles, the bar is too low.

Once it is confirmed the bar height is correct, the nozzles that were turned off can be turned back on and a triple application of tack coat material will result when spraying resumes.

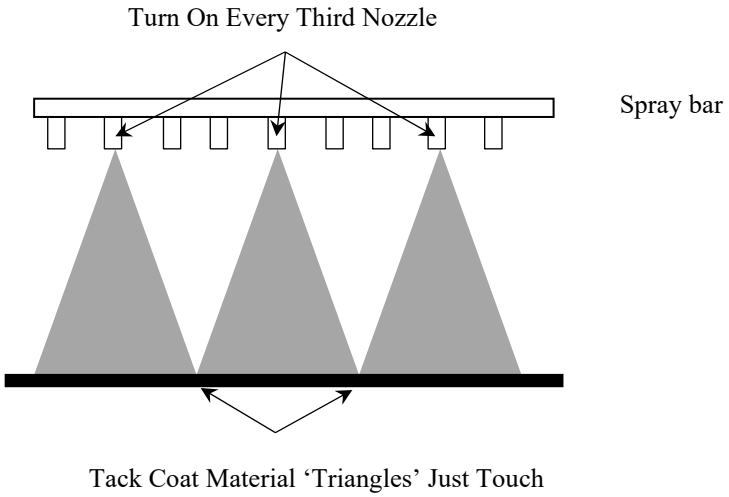

Figure 5—Adjustment of Spray Bar Height for Triple Overlap

Commentary

As the distributor empties during spraying, the bar height will rise. However, this is not usually enough to cause significant streaking worth adjustment of the spray bar.

4ZZ.5.7.1.3 *Transverse Flow Rate*—The flow rate across the spray bar shall be uniform with each nozzle spraying within ±10 percent of the average flow rate.

Commentary

This is done by measuring the width of the slot in the nozzle and by measuring the orifice diameter. Also, some nozzles are labeled by the manufacturer. Manufacturers supply a list of nozzles in the owner's document describing which nozzles shall be used for various application rates or on a placard mounted on the equipment.

However, nozzles of the same apparent size have been measured with different flow rates. Therefore, it is recommended that all nozzles be checked for flow rate before tack coat operations begin. This is easily accomplished by fabricating a flow apparatus (Martin, 1989). This apparatus consists of a pipe to which each nozzle can be fitted, in turn, on one end and a water source can be fitted to the other end. The flow of water through each nozzle shall be measured by filling a 1-gal container in a measured period. This shall be done for each nozzle to be used on the project. If the flow rate of any of the nozzles is greater than plus or minus 10 percent of the average of all the nozzles to be used, the noncompliant nozzles shall be discarded, or modified to flow within the 10 percent tolerance.

Determination of uniform lateral flow from the spray bar is determined by collecting a measured volume of emulsified asphalt in containers placed under each nozzle. This process is practical using standard 6-in. (15.2 cm) by 12-in. (30.4 cm) concrete cylinder molds lined with 1-gal (4.5 L) zip-lock freezer bags. The cylinder molds can be reused, and the zip-lock bags discarded appropriately with the contents.

4ZZ.5.7.1.4 *Longitudinal Flow Rate*

The longitudinal spray rate shall be accomplished by measuring the volume of tack coat material in the distributor before and after spraying enough tack coat material to reduce the volume of tack coat material in the distributor by 70 to 90 percent.

Commentary

The longitudinal flow rate must be measured with all nozzles inserted in the distributor bar. First, the quantity of tack coat material in the truck must be determined. Although there is a volume indicator on the rear of most modern distributors, these are not calibrated in small enough increments to be of use for longitudinal flow rate calibration and shall not be used for this purpose. Instead, the dipstick supplied with the distributor must be used. This dipstick is usually carried on the top of the tank near the inspection hatch. Prior to shooting tack coat material, take a volume reading with the dipstick. NOTE – carefully follow all safety protocol when taking a dipstick reading for tack coat material.

Pay attention to how the dipstick is used. Many dipsticks are not intended to be submerged in the tack coat material, but instead, are inserted into the top of the tank only until the tip of the dipstick touches the surface of the tack coat material. Then, the volume in the tank is read by indexing the top of the inspection cover to the reading on the dipstick.

- *Record this volume as "beginning volume."*
- *Set up the truck to shoot tack coat material and shoot a minimum of 3000 ft (914 m) by 12 ft (3.66 m) of tack coat material at the design rate using the gallon per minute pump flow volume and truck speed required by the manufacturer to attain this flow rate.*
- *Take a second dipstick reading.*
- *Record this reading as "ending volume."*
- *Subtract ending volume from beginning volume and record this as "volume used."*
- *Determine the area emulsified asphalt sprayed. Divide volume used by the area*

sprayed in square yards. This is the gallons per square yard applied to the pavement.

- *This value shall then be compared to the distributor computer, if equipped, to evaluate the accuracy of the computer.*
- *A correction factor may then be applied to the computer output, if needed, and used for the remainder of the day. This calibration shall be accomplished each day.*

An example of this calibration is presented below:

Given:

1800-gal capacity asphalt distributor 12-ft-wide spray width

Trial spray distance = 22500 ft

0.05-gal/yd^2 design spray rate

Dipstick reading beginning of shot = 1765 gal

Dipstick reading end of shot = 265 gal

NOTE: 1 gal = 4.55 L, 1 ft = 0.30 m, 1 gal/yd^2 = 5.44 L/m^2

Calculations:

1. *Check to see if enough volume shot. 1765 – 265 = 1500 gal*
2. *1500/1765 = 85 percent > 70 percent and < 90 percent. OK, enough applied to be valid*
3. *Calculate spray rate = 1500 gal/ (12 × 22500/9) = 0.05*

gal/yd^2 Therefore, distributor is set up correctly.

Note: This example uses US Customary units. For SI units, use 1 ft = 0.3048 m, 1 yd = 0.914 m, 1 lb = 0.454 kg, 1 lb/yd^2 = 0.54 kg/m^2, and 1 ton = 0.907 Mg.

4ZZ.5.7.2 *Blotter Aggregate Spreader*

4ZZ.5.7.2.1 *Transverse Spread Rate–* the blotter aggregate shall be uniform when placed on the tack coat to aid in preventing tracking of the tack coat material.

Commentary

A visual assessment of the distribution of the blotter aggregate is a good place to start the process, since non-uniform distribution can easily be seen. The veil of sand deposited on the pavement from the spreader box can be viewed from behind with the spreader moving away from the observer or from the front. Either position for the observer is adequate for viewing how uniform the veil of sand is falling out of the spreader box. However, viewing from either front quarter affords the observer a better view of the entire spreader width and is, of course, safer than directly in front of the spreader. Any variation in light passing through the veil of sand indicates variation in application rate. More light means a lack of sand. Variation in light means the machine shall be stopped, the gates on the spreader contributing to the non-uniformity adjusted and the trial rerun. This procedure provides adjustment to the transverse spread rate.

4ZZ.5.7.2.2 *Longitudinal Spread Rate* - the longitudinal spread rate shall be uniform and be within +/- 10 percent of the design spread rate of the blotter aggregate.

Commentary

Once the transverse spread rate is adjusted the longitudinal rate can be adjusted. This is also done visually, at first. For emulsified asphalt, this shall be done well before the emulsified asphalt begins to "break" or "set," but not immediately after spraying unless temperature, wind, or high demulsibility demand it. For hot applied asphalt binder, this shall be done as soon as possible.

The application rate of the blotter aggregate shall be similar to the design rate. This is a rate where immediately upon dropping the blotter aggregate the appearance of the surface has some tack coat material r showing between blotter aggregate. In fact, the quantity should seem somewhat inadequate. The spread rate should be high enough to prevent pickup problems on wheels. However, the rate should be such that a small decrease in rate would cause pickup. Tack coat material should be visible between the aggregate upon dropping and before traffic is released. It is the responsibility of the construction superintendent to achieve this application rate.

Evaluating the quantity of the blotter aggregate being placed is important after the rate is established. This provides a quantitative baseline for future work. The best method to accomplish this evaluation is by weighing the aggregate spreader before and after applying the aggregate and calculating the spread rate based on the area covered. This is often not practical. Therefore, a suitable alternative includes estimating the quantity of spread over a known area by knowing the weight of each transport truck supplying the spreader and dividing the estimated weight of spread by the area covered for that load.

An example follows:

Given:

Trucks loading the aggregate spreader are 12-ton capacity tandem dumps

12-ft wide pavement

2.8 lb/yd^2 design spread rate

Calculations:

1. Check Truck No. 1

a. Load = 2,380 lb

b. Spreader distance = 640 ft

c. Rate = 2,380/(640 × 12/9) = 2.79 lb/yd^2

2. Check Truck No. 2

a. Load = 2,392 lb

b. Spreader distance = 634 ft

c. Rate = 2,392/(634 × 12/9) = 2.83 lb/yd^2

3. Check Truck No. 3

a. Load = 2,385 lb

b. Spreader distance = 639 ft

c. Rate = 2,385/(639 × 12/9) = 2.80 lb/yd^2

4. Average Rate = (2.79 + 2.83 + 2.80) / 3 = 2.81 lb/yd^2

5. No adjustment needed since measured rate is within 1 percent of design.

Commentary

Compensation for moisture on aggregate must be considered when calibrating spreaders. The above example indicates no adjustment is needed since the measured spread rate is within 0.10 lbs/yd^2 (0.054 kg/m^2) of the design spread rate. However, if the aggregate above had contained as

much as 1.02 percent moisture that was unaccounted for, the application rate would have been too low.

This example uses US Customary units. For SI units, use 1 ton = 0.9 Mg, 1 ft = 0.30 m, 1 gal/yd^2 = 5.44 L/m^2, 1 lb = 0.45 kg, 1 lb/yd^2 = 0.54 kg/m^2.

4ZZ.5.8 *Test Strip*—Construct a 500-ft (152.4 m) test strip and adjust the application rate as needed to ensure a uniform application of the tack coat is applied with no streaking. Apply the tack coat to minimize the amount of overspray and do not allow traffic on the tack coat until it has cured.

Commentary

The application rate shall not result in an excess of tack coat material that could run off the pavement area to be tacked.

Special attention should be paid to the nozzles and spray bar as discussed in Section 4ZZ.5.7.1, the tack coat material temperature as discussed in Section 4ZZ.5.10.

4ZZ.5.9 *Traffic Control*— Traffic shall not be placed on a tack coat and construction traffic should be minimized. Barricades, signage, and traffic control shall follow the current Manual on Uniform Traffic Control Devices (MUTCD) standards.

4ZZ.5.10 *Application of Tack Coat*

Apply the tack coat at the rate determined by the test strip within ±5 percent.

Although the tack coat application rate is determined by the tests strip, roads can change over the length of a job. Therefore, there may be a need to slightly increase the application rate when traveling along older, more aged pavement than the test strip, or decrease the amount of tack coat when traveling along bleeding surfaces.

The temperature of the emulsified asphalt at the time of application shall be above 120°F (48.9°C) and the temperature of the hot applied asphalt binder shall be above 270°F (132.2°C).

The longitudinal construction joint for a tack coat must be approximately 2-in (50.8 mm) wider than the longitudinal construction joint for the pavement preservation treatment to be placed over the tack coat.

Commentary

These methods apply to all three methods of applying tack coat for preservation treatments found in Section 4ZZ.5.6: through an asphalt distributor, a spray paver, and a spray wand.

If the temperature of the emulsified asphalt is lower than 120°F (48.9°C), there is risk of less material being applied than desired due to high viscosity.

The potential for change of application rate emphasizes the need for examining any unique project conditions during the preconstruction meeting, to be aware of these sections before the start of work.

If tracking of the tack coat is a concern, include discussion of tracking in the preconstruction meeting leveraging the methods of addressing tracking at the project level (Musselman et al., 2020). Discussion could included concepts around equipment spacing, construction traffic movement, traffic control for motor vehicles, access points to the construction site, and other factors that may increase the chance of tracking.

4ZZ.5.11 *Transverse Paper Joints* – When beginning a new application of the tack coat transversely abutting the previously placed tack coat a transverse paper joint shall be used so excess tack

coat material r are not placed at the joint. The transverse paper joint shall be formed by placing 36-in. (91.4 cm) wide Kraft paper on top of the previously applied tack coat so the edge of the paper aligns with the joint that will be formed when the previously placed tack coat meets the newly applied tack coat. The asphalt distributor shall begin applying tack coat material by starting the application on top of the Kraft paper. After the distributor moves forward and over the joint, the paper shall be removed.

Commentary

Ideally, the paper should also be placed at the end of the distributor shot as well. This creates a clean, edge with the correct tack coat quantity at the joint. The placement of the paper is calculated based on the tack coat material shot rate and the quantity of tack coat material in the distributor. The distance the distributor travels before encountering the paper and turning off the bar should be approximately equivalent to 80 percent of the distributor tank volume. This ensures the distributor does not spray until empty which can result in less tack coat material r applied than desired at the end of the shot.

4ZZ.5.12 *Protection of Motor Vehicles*—The Contractor is responsible for claims of damage to vehicles until the tack coat has been covered by the preservation treatment.

4ZZ.5.13 *Sequence of Work*

Construct the tack coat so that it is covered by the preservation treatment while still adhesive.

4ZZ.5.14 *Quality Assurance*

Referred to COMP TS 5c. The “Tack Coat Quality Assurance Guide” is being developed as a standalone document.

4ZZ.6 MEASUREMENT

The Engineer will measure the acceptably completed tack coat as specified in the "AASHTO Guide Specifications for Highway Construction" Section 404 (2020) or as specified in Sections 4ZZ.6.1 and 4ZZ.6.2.

4ZZ.6.1 *Emulsified Asphalt (conventional and reduced tracking)* —Measure the undiluted emulsified asphalt by weight, at 60°F (15.6°C). At the completion of the job, measure the area of tack placed and accepted.

4ZZ.6.2 *Hot Applied Asphalt Binder (conventional and reduced tracking)* – Measure the asphalt binder by weight, at the application temperature. At the completion of the job, measure the area of tack placed and accepted.

4ZZ.7 PAYMENT

Payment for tack coats shall be made by either paying for the materials as unit costs, or for the completed tack coat l by area of pavement sealed as shown in the plans or contract documents.

4ZZ.7.1 *Payment by Unit Price*—The Agency will pay for accepted quantities at the contract price as follows:

1. Payment for the accepted quantity of tack coat material (including any required additives) at the contract bid price of measure is compensation in full for all costs of furnishing and

applying the material as specified.

2. Payment will be made in accordance with the schedule set forth below at the Contract bid price for the specified unit of measure.

Item No.	Item	Unit
State ##	Emulsified asphalt for tack coat	gal (L)
State ##	Diluted emulsified asphalt for tack coat, if used	gal (L)
State ##	Hot applied asphalt binder for tack coat	gal (L)

4ZZ.7.2 *Payment for Completed Tack Coat*

1. Payment for the accepted quantity of the tack coat at the Contract bid unit price of measure is compensation in full for all costs of furnishing and applying the material as specified, including all peripheral items of work as per the contract.
2. Payment will be made in accordance with the schedule set forth below at the Contract bid price for the specified unit of measure.

Item No.	Item	Unit
State ##	Tack coat	yd^2 (m^2)
State ##	Diluted emulsified asphalt for tack coat, if used	gal (L)

Such payment is full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified.

Commentary

The advantage of payment by the square yard for a completed tack coat is simplicity if the area is easily defined. The disadvantage is that an incentive is created to reduce material quantities.