

**KANSAS DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISION TO THE  
STANDARD SPECIFICATIONS, EDITION 2015**

**HMA BOND STRENGTH**

**Page 600-2, subsection 602.1. Add the following bid item:**

**BID ITEMS**

Emulsified Asphalt  
Bond Core (Set Price)

**UNITS**

Square Yard  
Each

**Page 600-31, delete subsection 602.11c. and replace with the following:**

**c. Emulsified Asphalt.** The Engineer will measure emulsified asphalt used for tack to the unit of measure specified in the Contract Documents. Payment for "Emulsified Asphalt" at the contract unit price is full compensation for the specified work.

The minimum asphalt residue required is 0.03 gallons/square yard.

**Page 600-31, delete subsection 602.11d. and replace with the following:**

**d. Asphalt Core (Set Price).**

(1) Nuclear Density Gauge Calibration. The Engineer will measure each asphalt core required by the Engineer to calibrate the nuclear density gauges. No payment will be made for cores deemed unsuitable for calibrating the nuclear density gauges. No payment will be made for cores taken at the Contractor's option to determine density.

(2) Nuclear Density Dispute Resolution. If during nuclear density dispute resolution, the Contractor's test results are used for payment, the Engineer will measure each core taken for payment at the Asphalt Core (Set Price). If KDOT's test results are used for payment, then no payment for cores will be made for nuclear density dispute resolution.

(3) Payment for "Asphalt Core (Set Price)" at the contract set unit price is full compensation for the specified work.

**Page 600-32, add subsection 602.11g.**

**g. Bond Core (Set Price).** For Bond Strength Testing, the Engineer will measure each 6-inch diameter core required by the Engineer to determine the bond strength of the HMA tack coat. No payment will be made for cores deemed unsuitable for bond strength testing.

Payment for Bond Core (Set Price) at the contract set unit price is full compensation for the specified work.

**Page 600-32, add the following new subsection:**

**602.12 BOND STRENGTH OF HOT MIX ASPHALT TACK COAT**

**a. General.** Establish a tack coat procedure within the first two days of production. The Engineer will determine the bond strength of the HMA tack coat according to KT-78 Method for Determining the Tensile Adhesive Strength of Asphalt Pavement Tack Coat. Take random samples from each lift placed, at a frequency determined by the Engineer and at locations selected by the Engineer. The recommended testing frequency for conclusive test results is shown in **TABLE 602-19**. If results are consistently inconclusive, the Engineer may determine that bond testing is not warranted.

| <b>TABLE 602-19: RECOMMENDED BOND TEST FREQUENCY</b> |                       |   |
|--|-----------------------|---|
| <b>Tensile Stress<br/>(psi)</b>                      | <b>Bond Condition</b> | <b>Recommended Test Frequency</b>                       |
| ≥ 70   | good                  | 1 test every 2 weeks or when the tack procedure changes |
| 35 - 69  | fair                  | 1 test per week or when the tack procedure changes      |
| < 35   | poor                  | test each day   |

For each test the Engineer will generate one random longitudinal location to obtain the bond strength samples. At the longitudinal test location, obtain two samples according to KT-78. At the random longitudinal location, the Engineer will generate two random transverse locations for each half of the paved lane. The outside lane sample will be obtained at a random location between 6 to 11 feet from the centerline of the roadway. The inside lane sample will be obtained at a random location between 1 to 6 feet from the centerline of the roadway. With the Engineer present, obtain the samples within 24 hours of the material being placed. Present the cores to the Engineer who will immediately transport the cores to the KDOT Field lab.

Dry the core holes, tack the sides and bottom, fill them with a HMA mixture (approved for the project) and properly compact it by the end of the next working day.

The Engineer will evaluate the samples using KT-78, within  $48 \pm 2$  hour after the HMA was placed. The tensile stress for the test will be determined by using the lowest tensile stress of the two samples. When the evaluation of the test falls on a non-working day, then the test will be performed on the next working day. The Engineer will provide a copy of the results to the Contractor by the end of the working day on which the test is performed.

The target tensile stress for all specimens is 70 psi or greater. If the tensile stress of a test is less than 35 psi, suspend plant production and paving. Follow the Best Management Processes in Appendix A to verify proper placement of tack material, and establish a new tack coat procedure if necessary.

07-13-18 C&M (BTH)  
 Aug-18 Letting

## APPENDIX A

### *Kansas Department of Transportation* **Best Management Practices: Checklist for Tack**

#### *PREPARATION:*

- Consult with the emulsion supplier with respect to a particular asphalt-aggregate combination as there are few absolute rules that will work the same under all circumstances.
- Understand condition (previous use) of delivery tankers and steps taken to minimize risk of contamination to the asphalt emulsion.
- Remove accumulated dust and dirt by mechanical brooming or by flushing with air and/or water.

#### *STORAGE/HANDLING:*

- Prevent contamination by water, oils or other liquids.
- Prevent contamination by other incompatible emulsions.
- Protect from freezing and boiling temperatures that break the emulsion and cause separation into asphalt and water.
- If water is added by contractor, then water is to be clean, potable water, free from detectable solids or incompatible soluble salts. Test for dilution incompatibility, whenever in doubt, by diluting the emulsion in the severest conditions anticipated (e.g., high dilution, cold water, hard water, high shear pumps). No instability or coagulation should appear.
- Protect from local overheating caused by high temperature heating coils and surface heating pads. Use of hot water is recommended for heating emulsion. Where steam, hot oil or direct fire must be used, controls must keep coil surfaces below 85° C (185° F).
- Use bottom loading wherever possible or employ full-length drop hose to eliminate foaming. Foaming may cause a volume gauge error.
- Allow surface crust that may form on emulsion in storage to float without disturbance. Vertical tanks can help maintain constant and minimal surface area. Return lines into tanks should have outlets near the tank bottom and circulation should not free-fall or disturb surface crust.
- Reduce high shear that can break emulsions by enlarging clearances on new gear pumps by milling if necessary.
- Prevent unnecessary circulation that can cause drop in emulsion viscosity and emulsion instability.
- Do not agitate emulsion with forced air as it may cause the emulsion to break.

#### *DISTRIBUTOR:*

- Review appropriate maintenance practices of distributor with driver.
- Apply tack by a pressure distributor.
- All nozzles on the distributor are open and functioning.
- Nozzles are turned at the same angle to the spray bar; approximately 30°, depending on the manufacturer of the distributor.
- Proper height above the pavement surface provides a double or triple lap of the liquid asphalt material.
- Distributor heats the asphalt emulsion to the proper temperature so that it is fluid enough to be sprayed from the nozzles; not coming out in strings.

#### *APPLICATION:*

- Proper asphalt emulsion is used; material adheres to the existing surface.
- Correct amount of tack coat is sprayed on the surface, so some of the existing surface will still be visible through the tack coat—not all of the existing pavement surface will be covered with the tack coat. Use of a diluted asphalt emulsion tack coat (slow-setting asphalt emulsion diluted 1:1 with water) will result in complete coverage of an extremely thin residual asphalt film.
- The proper tack coat application will leave **residual asphalt cement content** of approximately 0.03 to 0.06 gal/yd<sup>2</sup> on the roadway.

- An open-textured surface requires more tack coat than a surface that is tight or one that is “fat” or flushed.
- More tack coat material may be needed on a milled surface because of the increased surface area. In this case, the application rate could be as great as 0.08 gal/yd<sup>2</sup> of residual asphalt cement.
- The emulsion must break (change color from brown to black) and the water must evaporate from the emulsion before the new mix can be placed over the tack coat material.
- If the overlay is to be constructed under traffic, the tack coat is normally placed only a short distance in front of the paver; within the lane closure and far enough ahead for the tack to cure properly before the mix is laid on top of it.

*SPECIAL CONSIDERATIONS:*

- Do not dilute rapid setting (RS) emulsions with water. RS emulsions require dilution with specific chemical emulsifier solutions to produce stable dilutions.

*ASPHALT EMULSION SUPPLIER:*

Variables that may be causing issues are, but not limited to, the following:

- Ionic charge on the asphalt emulsion
- Type and concentration of the emulsifying agent
- Addition of chemical modifiers
- Asphalt particle size in the emulsion
- Hardness and quantity of the base asphalt cement
- Chemical properties of the base asphalt cement
- Manufacturing variables

NOTE: Most of the list is derived from the Hot-mix Asphalt Paving Handbook (AASHTO/FAA/FHWA/NAPA/US Corp), A Basic Emulsion Manual (Asphalt Institute) and Performance Guidelines, Section 11(AEMA)