| TYPE | YEAR | PROJECT NO. | SHEET NO. |
|---|---|---|---|
| RESURF. | 2014 | HSIP-211(13) | 4C |

### F. SPREADING AND FINISHING

Unless otherwise specified or permitted, the process shall be limited to daylight hours. The mixture shall be spread and struck off to the established line, grade and elevation by means of approved asphalt paving machine(s). The Contractor shall be required to pave in the direction of traffic. The hot side of any constructed longitudinal joint shall overlap the previously paved lane 4 inches.

Unevenness of texture, segregation, tearing or shoving of the bituminous mixture that occurs during the paving operation, shall be reason to stop the paving until the condition is corrected. Unacceptable mix shall be immediately removed and replaced at the Contractor's expense. Automatic screed controls utilizing either the ski type grade reference system or a non-contact averaging system will be required on all work. Where the ski type system is used, the ski shall have the maximum practical length and in no case shall it be less than 40 ft. (12 m) in length.

### G. COMPACTION AND DENSITY REQUIREMENTS

Compaction, rollers, density requirements, and test strips shall comply with Standard Specification Subsection 407.15. A minimum of 3 rollers will be required. Density shall be measured with a calibrated nuclear gauge.

The Contractor shall obtain 4 inch diameter cores at locations determined by the Engineer to calibrate the nuclear gauge and determine if the density of the test strip is acceptable. TDOT shall take possession of the samples and deliver them to the Regional Laboratory for testing. Holes formed by extracting samples shall be filled with an approved material and properly compacted. Cutting samples and repairing sample holes shall be at the Contractor's expense.

### H. SURFACE REQUIREMENTS

The surface shall be tested with a 12 foot straightedge applied parallel to the centerline of the pavement. The deviation of the surface from the testing edge of the straightedge shall not exceed 1/4 inch. The crown in crowned pavements shall be tested with a string-line applied at right angles to the centerline of the pavement and the crown shall not deviate more than 1/2 in. (13 mm) from that specified on the Plans. Deviations greater than the specified tolerances shall be corrected by methods best suited for the purpose. Pavement that cannot be corrected to comply with the specified tolerances shall be removed and replaced at the Contractor's expense.

The plans will indicate if the surface of the recycled pavement is subject to a Smoothness Special Provision.

### I. SURFACE TREATMENTS

The rejuvenated pavement surface shall be maintained if and until the surface treatment shown in the Plans is completed. The recycled pavement shall be allowed to cure at least 1 week or until the moisture content of the pavement is less than 2.0% before applying the treatment unless otherwise directed by the Engineer. The surface treatment shall be applied within 21 days of completion of the Hot in Place Recycled Asphalt.

### METHOD OF MEASUREMENT:

Hot in Place Recycled Asphalt will be measured by the square yard complete in place. The length used in computing the area will be measured along the centerline of the work. The width will be that shown on the plans or as designated by the Engineer.

Asphalt Rejuvenating Agent will be measured by the gallon based on the amount of material applied.

### BASIS OF PAYMENT:

The accepted quantities of Asphalt Rejuvenating Agent complete and applied in place shall be paid for at the contract unit price per gallon for the rate and control specified. Following selection of a rejuvenator application rate by the department, the pay quantity for Asphalt Rejuvenating Agent shall be adjusted by the following:

PA = SY x ( APP – 0.15) x RBP

Where:
PA = Price Adjustment, $
SY = Square Yards of project or area to be adjusted
APP = Rejuvenating Agent Application Rate Selected by Department, Gal/yd$^2$
RBP = Bid Price for Rejuvenating Agent, $/Gal

The accepted quantities of Hot in Place Recycled Asphalt complete in place shall be paid for at the contract unit price per square yard for the depth specified. Such payment shall be full compensation for any additional materials, labor, equipment and incidentals necessary for the proper performance of the work and to meet the provisions of this specification.

A deduction in payment, not as a penalty but as liquidated damages, shall be made for failure to meet the density requirements. As soon as practical after the final rolling is completed on each lot, 5 density tests shall be performed by the Department at locations determined by the Engineer, and an average of all such tests shall be computed. Any deduction for failure to meet density requirements shall be computed to the nearest 0.1% as a percentage of the total payment otherwise due for each lot. The percent of total payment to be deducted shall be 5 times the percent the average in-place density for each lot that fails to meet the requirements of Standard Specification Subsection 407.15. Any deduction in monies due the Contractor for failure to meet the Density Requirements shall be made under the item for Density Deduction.

## Resistance of Emulsions to Shear Induced Degradation
## TM 101

**Scope:**

This test procedure measures the propensity for an asphalt emulsion to incur shear induced degradation as a result of being pumped or circulated by means of a positive displacement gear pump. A representative sample of emulsion, after being pre-sieved [#20 mesh, according to ASTM D-244] and conditioned to 60° C, is subjected to three pumping cycles. Afterward, the emulsion is tested according to ASTM D-244 for Sieve. Any emulsion which, after being subjected to the required number of pumping cycles, exhibits degradation in the form of sieve exceeding 0.050%, shall be considered suspect and will be rejected.

**Apparatus:**

Viking Model F-432 Gear Pump, driven at 500 +/- 10 rpm by Dayton 1/3 h.p. electric motor; metal inlet and outlet lines to and from the pump; numerous plastic containers [either 1/2 gal. or 1 gal.] for transfer/collection of material being pumped.

**Procedure:**

[1] Condition approximately 1500g of previously sieved [per ASTM D-244] asphalt emulsion to 60 ±1° C. in a sealed container inside a laboratory oven or water bath [held at less than 100° C].

[2] Flush the pump assembly with approximately 2 liters of heated [50-60° C] water or, preferably, compatible emulsifier solution.

[3] Place the inlet line of the pump assembly into the 60° C emulsion. The first 400 ml. [approximately] of material out of the outlet line of the pump shall be discarded [on the first cycle only], with the remaining emulsion caught in a clean plastic container. The container of pumped emulsion shall be immediately transferred to the pump inlet line and the procedure repeated using clean 'catch containers' until the requisite number of cycles has been completed.

[4] The emulsified asphalt sample shall then be tested for sieve in accordance with ASTM D-244. If conditions warrant, Saybolt Furol viscosity can also be evaluated before and after pumping.

**KTMR-20 CHEMICAL ANALYSIS OF ASPHALT REJUVENATING AGENTS (Kansas Central Lab Test KT-MR-20)**

**a. SCOPE**

This method is used to determine the composition of petroleum oils and asphalts in terms of: Asphaltenes Content, Polar Compounds Content, First Acidaffins Content, and Saturated Compounds Content. In addition, Second Acidaffins Content and the Maltene Ratio are calculated.

**b. DEFINITIONS**

**b.1.** Asphaltenes Content: That portion of the material not soluble in pentane.
**b.2.** Polar Compounds Content: That portion of the material soluble in pentane and that reacts with cold 85% (of concentrated) sulfuric acid.
**b.3.** First Acidiffins Content: That portion of the material that is soluble in pentane and that reacts with cold concentrated sulfuric acid.
**b.4.** Second Acidiffins Content: That portion of the material that is soluble in pentane and reacts with cold fuming sulfuric acid. (This is a calculated quantity)
**b.5.** Saturated Compounds Content: That portion of the material that is soluble in pentane and does not react with cold fuming sulfuric acid.
**b.6.** Maltene Ratio: Strictly a calculated quantity.

**c. REFERENCED DOCUMENTS**

**c.1.** AASHTO M 231: Weighing Devices Used in the Testing of Materials

### PROCEDURE 1: ASPHALTENE CONTENT

**a. APPARATUS**

**a.1.** (2) 125 Erlenmeyer flask with ground glass stopper fitting and stopper
**a.2.** Pentane, technical grade
**a.3.** Toluene, analytical reagent grade
**a.4.** 50 mL graduated cylinder
**a.5.** (2) 15 mL Gooch crucible with filter
**a.6.** (2) Walter crucible holder
**a.7.** (2) 250 mL side arm vacuum flask
**a.8.** Regulated vacuum source with gauge and hoses
**a.9.** (2) Wash bottles for solvents
**a.10.** (2) Crystallizing dish
**a.11.** 60 mL separatory funnel
**a.12.** Lab stand with ring
**a.13.** Hot plate with adjustable temperature control
**a.14.** Laboratory vent hood
**a.15.** Weighing device in accordance with AASHTO M 231 Class A
**a.16.** Oven capable of maintaining 221 +/- 9 ºF.

**b. SAMPLE PREPARATION**

**b.1.** This determination is made on as received material from the asphalt subsection, where the material is reduced.

**c. PROCEDURE**

**c.1.** Duplicate determinations of this procedure are required.
**c.2.** Place a clean and dry 125 mL Erlenmeyer flask with ground glass stopper fitting onto a tared analytical balance. Record the mass of the flask to the nearest 0.1 mg. Dispense into the flask 1.0 +/- 0.1 g of the as received ARA material. Record the mass of the flask plus sample to the nearest 0.1 mg.
**c.2.a.** Calculate the mass of the sample by subtracting the mass of the flask from the mass of the flask plus sample.
**c.3.** Using a 50 mL graduated cylinder add 50 +/- 5 mL of tech grade pentane. Stopper the flask and swirl until the sample appears to be completely dissolved.
**c.3.a.** Allow the flask to stand undisturbed for a minimum of 15 hours.
**c.4.** Place a 21 mm fiber glass filter into the bottom of a 15 mL Gooch crucible.
**c.4.a.** Take a 30 mm fiberglass filter and evenly tuck it into the same crucible to form a bowl shaped reservoir in the bottom of the crucible.
**c.4.b.** Place the crucible into a Walter crucible holder that is set into a 250 mL vacuum flask connected to a regulated vacuum source with a gauge. Turn the vacuum on, and run 20 +/- 5 mL of pentane through the crucible filter.
**c.4.c.** Turn off the vacuum and place crucible into a drying oven set at 105 +/- 5ºC for 30 +/- 5 minutes. Remove crucible from oven and allow to cool to room temperature in a dessicator. When cooled weigh and record the mass of the crucible to the nearest 0.1 mg.
**c.5** Transfer the contents of one of the flasks into a 60 mL separatory funnel. Rinse the sample flask into the funnel using pentane dispensed from a wash bottle.
**c.5.a.** Save the sample flask for use in step **c.12** of this procedure.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SPECIAL NOTES
FOR
RECYCLED ASPHALT