

## SECTION 02966

# RECYCLED SURFACE

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Materials and procedures for recycling the existing surface by heating, scarifying, screeding, and compacting the existing surface.

#### 1.2 RELATED SECTIONS

- A. Section 02741: Hot Mix Asphalt.
- B. Section 02745: Asphalt Material.

#### 1.3 REFERENCES

- A. AASHTO T 48: Flash and Fire Points by Cleveland Open Cup.
- B. AASHTO T 59: Testing Emulsified Asphalt.
- C. AASHTO T 201: Kinematic Viscosity of Asphalts.
- D. AASHTO T 240: Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test).
- E. ASTM D 244: Emulsified Asphalts.
- F. ASTM D 2006-71: Rostler Test Method.
- G. ASTM D 2007: Characteristics Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method.

## **PART 2 PRODUCTS**

### **2.1 HEATER/SCARIFYING EQUIPMENT**

- A. Heating unit
  - 1. Enclosed combustion area.
  - 2. No open flame to come in direct contact with asphalt surface.
  - 3. Burn only clean burning fuels (propane, butane, etc.).
  - 4. The Utah State Fire Marshal inspects and approves units which use liquified natural gas at least annually.
  - 5. Use equipment meeting the requirements of the Utah State Liquified Petroleum Gas Board.
  
- B. Safety Shut-off Switch for the Heat Exchanger
  - 1. Clearly marked and easily operated.
  - 2. Controlled from both the ground and the operator's station.
  - 3. Instantaneously turn off the heat exchanger and the fuel supply.
  
- C. Scarifier Unit
  - 1. Have at least two rows of spring equalized scarifier rakes (hydraulic or pneumatic leveling).
  - 2. Removable teeth in the rakes.
  - 3. Spring release for manhole and valve protection.
  
- D. Screed
  - 1. Heated to maintain specified surface temperature.
  - 2. Have reversible augers to move material left or right.
  - 3. Vibratory or oscillating screed.

### **2.2 ASPHALT REJUVENATING AGENT**

- A. Petroleum resin oil base emulsified with water and conforming to the requirements in Table 1.
  
- B. Asphalt Materials: Refer to Section 02745.

**Table 1**

<b>Asphalt Rejuvenating Agent</b>				
<b>Test on Emulsion</b>	<b>ASTM</b>	<b>AASHTO</b>	<b>Min.</b>	<b>Max.</b>
Viscosity at 77 degrees F, SFS		T 59	15	85
Residue, percent		T 59	60	
Cement Mixing Test, percent		T 59		2.0
Sieve Test, percent		T 59 <sub>2</sub>		0.1
Particle Charge Test		T 59	Pos.	Pos.
<b>Test on Residue Oil</b>				
Original				
Viscosity at 140 degrees F, cst		T 201	80	500
Flash point, COC, degrees F		T 48	752	
Saturates, percent	D 2007			3.0
Asphaltenes, percent	D 2007			1.0
PC/S Ratio <sub>4</sub>	D 2007			1.5
Maltenes Distribution <sub>4</sub>	D 2006-71		0.5	
Ratio <sub>4</sub>	D 2006-71		0.2	1.0
(PC + A <sub>1</sub> )(A + A <sub>2</sub> )				
<b>Test on Residue From RTFO</b>				
Oven Test at 325 degrees F		T 240		
Viscosity Ratio <sub>5</sub>		T 201		3.0
RTFO Oven Weight Change		T 240		6.5

<sup>1</sup>ASTM D 244 Modified Evaporation Test of percent residue is made by heating a 50 g sample to 284 degrees F until foaming ceases, then cool immediately and calculate results.

<sup>2</sup>Test procedures identical with ASTM D 244 except that distilled water will be used in place of two percent sodium oleate solution.

<sup>3</sup>ASTM D 2006-71 can be used for the determination of saturates.

<sup>4</sup>In the Maltenes Distribution Ratio Test by ASTM Method D 2006-71.

PC = Polar Compounds    A<sub>1</sub> = First Acidaffins

A<sub>2</sub> = Second Acidaffins    S<sub>1</sub> = Saturates

<sup>5</sup>Viscosity Ratio =  $\frac{\text{RTF O Viscosity of Residue at 140 degree F, Cst}}{\text{Original Viscosity at 140 degrees F, Cst}}$

## **PART 3 EXECUTION**

### **3.1 REPARATION**

- A. Broom all loose material off the pavement surface before starting heater/scarifying operations.

### **3.2 HEATER/SCARIFYING OPERATIONS**

- A. Temperature Control
  - 1. Regulate burners to produce the required scarification without charring the asphalt surface or breaking aggregate particles.
  - 2. Keep the temperature of the scarified material behind the screed between 230 degrees F and 315 degrees F.
- B. Width and Depth
  - 1. Heat the surface to be recycled 6 inches to 12 inches wider than the width to be processed.
  - 2. Scarify to a sufficient depth to yield at least 84 lb/yd<sup>2</sup>.
  - 3. When a subsequent pass is made adjacent to a previously recycled surface, extend the longitudinal joint at least 2 inches into the previously recycled surface.

### **3.3 DISTRIBUTION OF MATERIAL**

- A. Uniformly distribute materials across the width being processed.
- B. Level to produce a smooth surface and uniform cross section.

### **3.4 COMPACTION**

- A. Use at least two rollers.
  - 1. One double drum steel vibratory for breakdown rolling.
  - 2. One pneumatic (13 Ton or more) for finishing rolling.
- B. Complete rolling before temperature of material drops below 185 degrees F.
- C. Conform to Section 02741, Part 1, article, "Acceptance for Density," and Section 02741 in Methods of Measurement and Basis of Payment in the Supplementary Specifications (Bid Book), except that it will be based on the Marshall Method.

### **3.5 APPLYING REJUVENATING AGENT**

- A. During scarifying:
  - 1. Mount applicator on the scarifier.
  - 2. Synchronize with the scarifier's forward speed so that the application rate is within  $\pm 5$  percent of the rate specified.
  
- B. After rolling:
  - 1. Apply before the surface temperature drops below 150 degrees F.
  - 2. Apply with a distributor truck equipped with a metering device.
  - 3. Maintain application rate  $\pm 5$  percent of that specified.

### **3.6 FIELD QUALITY CONTROL**

- A. Sampling and testing: Engineer makes at least one weight and one temperature determination randomly within each 20-minute interval during scarifying operations.
  
- B. Corrective action:
  - 1. Reprocess the surface from the last acceptable test, when a test yields less than 84 lbs/yd<sup>2</sup>.
  - 2. A failing test will be cause for suspension of work.
  - 3. Corrective action includes one or more of the following:
    - a. Increase the number of heater/scarifiers.
    - b. Reduce the speed of travel.
    - c. Adjust the burner(s).

END OF SECTION