

# CHAPTER 9 PAVING MATH PROBLEMS

## Useful Formulas

To find length of spread  $L = \frac{9 \times T}{W \times R}$

To find length of spread per ton  $L = \frac{9 \times 2000}{W \times R}$

To find rate of application  
for asphalt or aggregate  $R = \frac{9 \times T}{W \times L}$

Definitions:

L = Length of spread in feet

R = Rate of application (asphalt in gallons per sq. yd. or aggregate in lb. per sq. yd.)

W = Width of roadway

T = Total gallons or pounds

## Determining Length of Spread

**Example:**

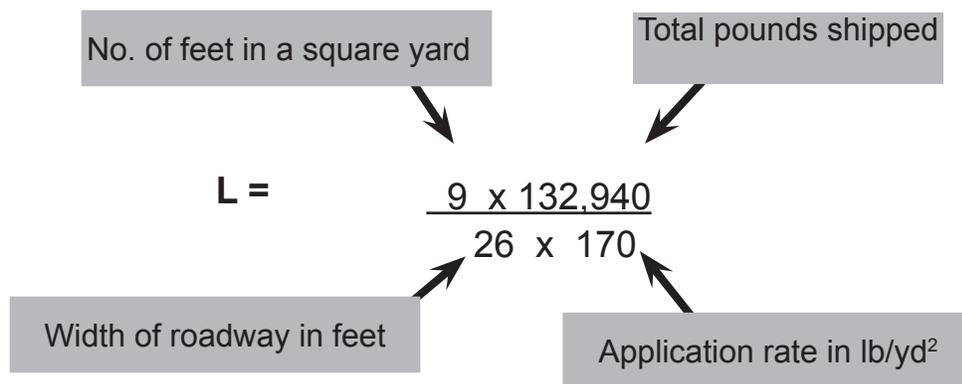
**Application rate = 170 lb/yd<sup>2</sup>**

**Total weight shipped = 132,940 lb**

**Pavement width = 26 feet**

Formula:

$$L = \frac{9 \times T}{W \times R}$$



$$L = \frac{1196460}{4420} = 270.69 \text{ or } 270.7 \text{ linear feet}$$

How many feet per ton will this material cover?

**Formula:**

$$L = \frac{9 \times 2000}{W \times R}$$

$$\frac{18000}{26 \times 170} = \frac{18000}{4420}$$

$$L = 4.07 \text{ or } 4.1 \text{ linear feet per ton}$$

## Hot Mix Paving Problems

1. Using the information below:
  - A) Calculate the linear feet this truckload of HMA should cover at the specified application rate.
  
  - B) How many linear feet will each ton of HMA pave?

Application Rate = **185** lb./yd<sup>2</sup>  
Total weight shipped = **33,135** lb.  
Pavement width = **11** feet

2. Using the information below:
  - A) Calculate the linear feet this truckload of HMA should cover at the specified application rate.
  
  - B) How many linear feet will each ton of HMA pave?

Application Rate = **165** lb./yd<sup>2</sup>  
Total weight shipped = **127,580** lb.  
Pavement width = **24** ft.

## Hot Mix Paving Problems

3. Using the information below:
- A) Calculate the linear feet this truckload of HMA should cover at the specified application rate.
  
  - B) How many linear feet will each ton of HMA pave?

Application Rate = **158 lb./yd<sup>2</sup>**  
Total weight shipped = **46,778 lb.**  
Pavement width = **12 ft.**

## Determining Application Rate

### Example

The contractor has uniformly applied 495 gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. It covers 5750 linear feet of roadway at a width of 13 feet.

What is the application rate of the tack coat?

Does it meet the specification requirement? See VDOT Road & Bridge Spec. 310.03

**Formula:**  $R = \frac{9 \times T}{W \times L}$

$R = \frac{9 \times 495}{13 \times 5750}$

$$R = \frac{4455}{74750} = 0.059 \text{ or } 0.06 \text{ gal/yd}^2$$

## HMA Paving Problems

4. The Contractor has uniformly applied **610** gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. The tack covers **5250** linear feet in length at a width of **11** feet.

What is the application rate of the tack coat? \_\_\_\_\_ gal/yd.<sup>2</sup>

Does this meet specification?

5. The Contractor has uniformly applied **2154** gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. The tack covers **38,016** linear feet in length at a width of **12** feet.

What is the application rate of the tack coat? \_\_\_\_\_ gal/yd.<sup>2</sup>

Does this meet specification?

- 6.. The Contractor has uniformly applied **3320** gallons of undiluted CRS-1 emulsion to a section of roadway for a tack coat. The tack covers **29,040** linear feet length at a width of **12** feet.

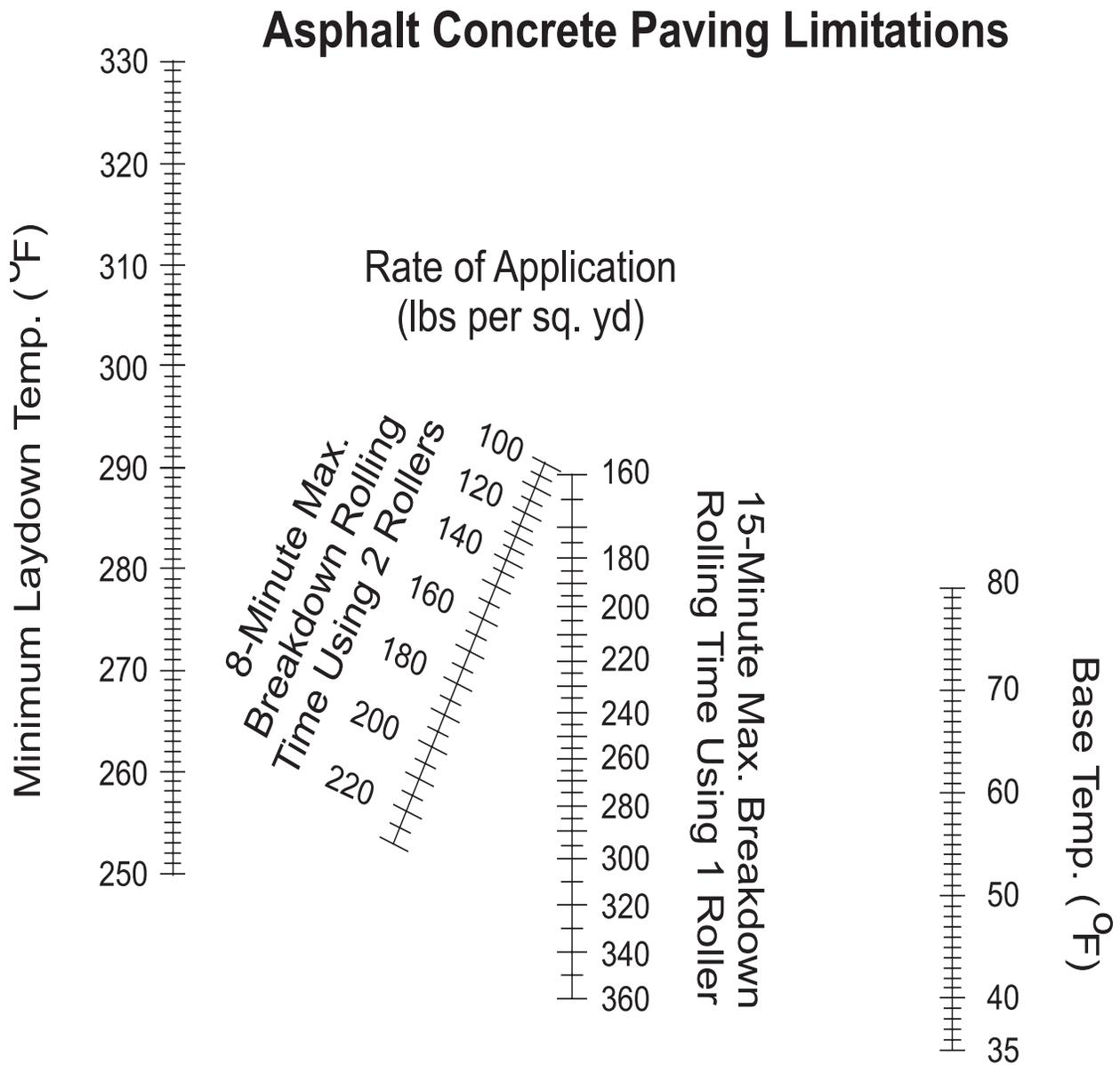
What is the application rate of the tack coat? \_\_\_\_\_ gal/yd.<sup>2</sup>

Does this meet specification?

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## Placement Limitations

Section 315.04 of the Road and Bridge Specifications provide for the placement limitations of hot mix asphalt. Table III-2, also called the nomograph, is used to determine the minimum laydown temperature for a mix at a specific **rate of application** using either the **8-minute maximum breakdown rolling time** (using two rollers) or the **15 minute maximum breakdown rolling time** (using 1 roller), at a specific **base temperature**.



7. A load of IM-19.0A arrived at the project to be placed at **220 lb./yd.<sup>2</sup>** with one breakdown roller on the job and a base temperature of **50°F**, what is the minimum laydown temperature?
- A. 250°F
  - B. 304°F
  - C. 295°F
  - D. 353°F
8. A load of SM-12.5A arrived at the project to be placed at **175 lb./yd.<sup>2</sup>** with two breakdown rollers on the job and a base temperature of **40°F**, what is the minimum laydown temperature?
- A. 330°F
  - B. 338°F
  - C. 250°F
  - D. 289°F
9. A load of SM-12.5A arrived at the project to be placed at **185 lb./yd.<sup>2</sup>** with one breakdown roller on the job and a base temperature of **45°F**, what is the minimum laydown temperature?
- A. 300°F
  - B. 318°F
  - C. 287°F
  - D. 307°F
10. A load of IM-19.0A arrived at the project to be placed at **190 lb./yd.<sup>2</sup>** with two breakdown rollers on the job and a base temperature of **52°F**, what is the minimum laydown temperature?
- A. 308°F
  - B. 338°F
  - C. 281°F
  - D. 274°F
11. The 8 minute maximum breakdown rolling time is specified when 2 or more rollers are used in breakdown rolling.
- A. True
  - B. False

