

## VOID REDUCING ASPHALT MEMBRANE GUIDELINE

### Description.

This specification covers the requirements and practices for applying a void reducing asphalt membrane (VRAM) underneath the longitudinal construction joint of a course of a hot-mix asphalt (HMA) pavement. The VRAM shall be applied beneath the intended area of the HMA pavement longitudinal construction joint prior to the installation of the HMA course. This work shall be done according to the Standard Specifications except as modified herein.

### Materials.

The bituminous material used for the VRAM shall meet the requirements of the following table. Elastomers shall be added to a base asphalt and shall be either a styrene-butadiene diblock or triblock copolymer. In addition to the following table, the VRAM shall be suitable for construction traffic to drive on within 30 minutes of placement without pickup or tracking.

TEST	TEST REQUIREMENT	TEST METHOD
Dynamic shear @ 88°C (unaged), $G^*/\sin \delta$ , kPa	1.00 min.	AASHTO T 315
Creep stiffness @ -18°C (unaged) Stiffness (S), MPa m-value	300 max. 0.300 min.	AASHTO T 313
Ash, %	1.0 - 4.0	AASHTO T 111
Elastic Recovery, 100 mm elongation, cut immed., 25°C, %	70 min.	ASTM D6084 method A
Separation of Polymer, difference in ring and ball, °C	3 max.	ASTM D7173

### Equipment.

A pressure distributor shall be provided that is capable of applying the VRAM at the desired application rate. The distributor shall be equipped with a heating and recirculating system along with a functioning auger agitating system or vertical shaft mixer in the hauling tank to prevent localized overheating.

The contractor may use a melter kettle for transporting and/or application of the material that is capable of applying the VRAM at the desired application rate. The melter kettle shall be of an oil jacketed double-boiler type with agitating and recirculating systems. Material from the kettle may be dispensed through a pressure feed wand with an applicator shoe or spray bar.

## Construction.

Prior to the application of the VRAM, ensure the area of the intended longitudinal asphalt pavement joint is thoroughly cleaned and free of debris. The area may be cleaned by sweeper/vacuum truck, power broom, air compressor or hand to the satisfaction of the Engineer. Ensure the existing surface is dry and free of moisture.

Milled surfaces may require the use of compressed air to remove dust and fine materials from the area where VRAM will be applied. Low speed roadways, less than 45 miles/hour, shall require the use of compressed air to clean the surface where the VRAM will be placed. Final cleaning will be within 24 hours of the placement of VRAM and performed to the Engineer's approval.

The center of the VRAM application width shall be within 2" of the project established centerline or established lane edge. A stringline or paint mark shall be used as a guide for application in order to maintain a uniform edge alignment; if any other method is proposed; it shall meet the approval of the Engineer before being used. When only one-half of the joint is exposed, such as a mill and inlay project, the application shall be applied at one-half the prescribed width and rate and shall be adjacent to the center of the joint, and the vertical face of the cold joint left in place shall also be coated.

The VRAM shall be applied to the existing surface prior to or following any or all tack coat applications. Tack coat may be placed over the VRAM at the Engineer's discretion. Should the tack coat application supersede placement of the VRAM, the tack coat shall be fully cured.

The application rate of VRAM shall be determined from the Job Mix Formula (JMF) for the paving project. From the JMF, determine the Nominal Maximum Aggregate Size (NMAS) for the mixture. NMAS is defined as one sieve size larger than the first sieve to retain more than 10%. From the following table, determine if the mixture is defined as fine-graded or coarse-graded. After determining the mixture type, the application rate table may be referenced.

### Definition of Fine and Coarse-Graded Mixtures\*

Mixture NMAS	Coarse-Graded	Fine-Graded
19mm (3/4")	< 35% Passing 2.36mm (#8)	≥ 35% Passing 2.36mm (#8)
12.5mm (1/2")	< 40% Passing 2.36mm (#8)	≥ 40% Passing 2.36mm (#8)
9.5mm (3/8")	< 45% Passing 2.36mm (#8)	≥ 45% Passing 2.36mm (#8)

\* HMA Pavement Mix Type Selection Guide

The VRAM, meeting the requirements specified herein, shall be applied to the existing surface at the width and target application rate as specified in the following table:

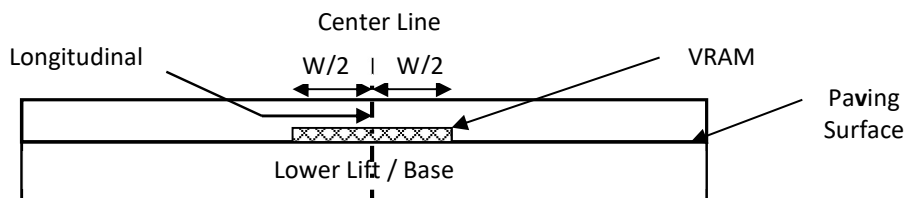
VRAM Application Table <sup>1/</sup>		
Coarse-Graded HMA Mixtures <sup>2/</sup>		
Overlay Thickness, in	VRAM Width, in.	Application Rate, lb/ft
1	18	1.15
1 ¼	18	1.31
1 ½	18	1.47
1 ¾	18	1.63
≥ 2	18	1.80
Fine-Graded HMA Mixtures <sup>2</sup>		
Overlay Thickness, in	VRAM Width, in.	Application Rate, lb/ft
1	18	0.80
1 ¼	18	0.88
≥ 1 ½	18	0.95
SMA Mixtures/SuperPave 5 Mixtures		
Overlay Thickness, in	VRAM Width, in.	Application Rate, lb/ft
1 ½	18	1.26
1 ¾	18	1.38
≥ 2	18	1.51

**Notes.**

1/ Each application rate has a surface demand for liquid included in it. Therefore, taking a given rate and trying to factor it up to a different thickness will over predict the required amount of VRAM.

2/ In the event of a joint between an SMA and an HMA mixture, the SMA application rate will be used.

The VRAM application rate may be adjusted in the field at the discretion of the Engineer based on observations and performance.



The VRAM shall be applied in a single pass placed by any application method listed in the Equipment section. VRAM application temperature shall not exceed 330°F.

The VRAM shall be applied at a width of not less or greater than 1.5” of the width specified in the plans. If the VRAM is outside of that tolerance, stop and remedial action shall be taken subject to the Engineer’s approval.

The VRAM shall be suitable for construction traffic to drive on without pick up or tracking of the VRAM within 30 minutes of placement. If pick up or tracking occurs; placement of the VRAM will stop and remedial action shall be taken subject to the Engineer's approval.

If conditions warrant, or at the agency's direction, an application of natural or crushed sand or lime may be applied at a rate of 1 +/- 1/2 lbs./SY with a push drop spreader.

Prior to the start of paving of a pavement course, ensure the paver end plate and grade control device is adequately raised above the finished height of the VRAM.

The area 1.0 ft on either side of the longitudinal joint will be excluded from density measurement and pay adjustment.

The Agency will require a random sample of VRAM. One sample set consisting of two (2) one quart metal containers will be taken from a random haul tanker, distributor or melting kettle for every 25,000 gallons of material used on the project. Samples will be forwarded to the Agency for testing.

Samples should be taken from the Sample valve. Do not obtain the samples from the spray bar to prevent contamination. It is suggested that sampling be done after the first required field rate check. It is recommended that the applicator retain a sister sample of the material at the same time and agency sample is provided.

For projects requiring less than 25,000 gallon of VRAM, one sample set consisting of two (2) one quart metal containers shall be taken by random sampling and forwarded to the Agency.

### **Acceptance.**

Provide a Bill of Lading to the Engineer for every tanker supplying material to the project.

The application rate of VRAM will be checked within the first 1,000 linear feet of the day's application length and every 12,000 linear feet the remainder of the day. For projects less than 12,000 feet, the rate will be checked twice. The rate will be checked by weight per foot. A suitable paper or pan shall be placed at a random location in the path of the placement for the VRAM. After application of the VRAM, the paper or pan shall be picked up and weighed. The weight per foot will be calculated. The tolerance for the Plan target weight per foot from the VRAM Application Rate Table shall be ± 10%. The contractor shall be responsible for replacing the VRAM in the area where the application rate was checked.

### **Measurement.**

The Agency will measure the quantity of VRAM in linear feet.

### **Basis of Payment.**

Void Reducing Asphalt Membrane will be paid for at the contract unit price per linear foot for full width applications as VRAM.

Void Reducing Asphalt Membrane placed half width will be paid for at the contract unit price per linear foot for half width applications as VRAM HALF WIDTH.

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