Standard Practice for

Sand Seal Design

AASHTO Designation: PP xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

Standard Practice for

Sand Seal Design

AASHTO Designation: PP xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April)

1. SCOPE

1.1. This standard determines application quantities for applied graded cover aggregate and emulsified asphalt for sand seals on properly prepared bituminous streets. A sand seal is the application of emulsified asphalt following immediately by an application of a single layer of fine graded cover aggregate. The seal may be applied in multiple lifts depending on traffic demands and existing road surface conditions.

2. REFERENCED STANDARDS

2.1. *AASHTO Standards*:

- MP 27, Materials for Emulsified Asphalt Chip Seals
- T 19M/T 19, Bulk Density ("Unit Weight") and Voids in Aggregate
- T 84, Specific Gravity and Absorption of Fine Aggregate
- T 85, Specific Gravity and Absorption of Coarse Aggregate
- T 304, Fine Aggregate Angularity

3. TERMINOLOGY

3.1. *Definitions*:

3.1.1. *badly pocked, porous, oxidized*—severe raveling of surface with much texture.

3.1.2. *flushed-bleeding*—free asphalt on the pavement surface with little or no texture.

3.1.3. *slightly pocked, porous, oxidized*—raveling beginning to show with moderate texture.

3.1.4. *slightly porous, slightly oxidized*—little or no free asphalt on the surface with noticeable but low texture.

3.1.5. *smooth, non-porous*—some free asphalt on the pavement surface, but with some texture.

4. SIGNIFICANCE AND USE

4.1. This standard practice may be used to determine the quantities of materials required for the construction of emulsified asphalt sand seals.

4.2. Sand seal is recommended for low volume roads of less than 750 ADT. For use on compacted bases, a prime coat should be applied to the base prior to application of the sand seal. As an initial seal on a road base, more than one sand seal application may be necessary to obtain the expected seal lifespan.

4.3. For multi-layer application of sand seals, the road should remain open to traffic for 4 to 8 weeks between successive applications.

5. EMULSIFIED ASPHALT SAND SEAL DESIGN REQUIREMENTS

5.1. *Method*—Sand seal is intended to be an economical and simple preservation alternative for low volume roads where high quality materials may not be available. As such, the design method is semi-empirical. Several factors will influence the selection of emulsified asphalt spray rates and cover aggregate application rates.

5.2. *Material Quantities:*

5.2.1. Emulsified asphalt application rate shall be in the range of 0.20 to 0.30 gal/yd^2. Cover aggregate shall be spread in the range of 12 to 25 lb/yd^2. The Contractor shall use lab tests to design specific material quantities to meet existing field conditions. Variation in material quantities shall be made without adjustment to contract unit price.

5.2.2. Emulsified asphalt and aggregate used in the design shall meet MP 27 unless otherwise specified by the owner agency. The following material and jobsite conditions shall be considered in determination of variances from the center of the suggested emulsified asphalt and cover aggregate application rates.

5.2.3. *Traffic*—Sand seals are intended for low speed, low volume roads, generally less than 750 ADT. Higher traffic counts will require use of coarser aggregate gradations in conjunction with a decrease in emulsified asphalt application rate. Depending on anticipate traffic types and speeds, use of angular high friction aggregate may be required.

5.2.4. *Substrate Surface Condition*—The application rate of emulsified asphalt is impacted by the condition of the surface onto which the sand seal is applied. The existing surface should be swept clean prior to application of sand seal. A porous surface will require a higher rate, and a smooth surface will require a lower rate. Table 1 indicates adjustments to emulsified asphalt application rates that can be made to the general emulsified asphalt application rate recommendations in Sections 5.3.1 and 5.3.2 based on the observed condition of the substrate.

Table 1— Emulsified Asphalt Application Rate Adjustment for Substrate Surface Condition

Existing Surface Condition	Correction Factor, l/m^2 (gal/yd^2)
Flushed-bleeding	–0.19 (0.06)
Smooth, non-porous	–0.09 (0.03)
Slightly porous, slightly oxidized	0.00
Slightly pocked, porous, oxidized	+0.09 (0.03)
Badly pocked, porous, oxidized	+0.19 (0.06)

5.2.5. *Aggregate Characteristics*—Aggregate gradation will impact binder demand. Fine gradations require higher emulsified asphalt application rates. If the aggregate contains significant quantities of flattened or elongated particles, the emulsified asphalt application rate should be adjusted downward. Aggregates with a high percentage passing #200 sieve or with low sand equivalent values will require increased emulsified asphalt application rates.

5.2.6. *Adhesion of Binder Residue to Aggregate*—The specified emulsion class must be compatible with the project aggregate source. An aggregate from a predominantly calcareous mineral source such as limestone or dolomite will require an anionic type emulsified asphalt. A predominantly siliceous sourced aggregate will require a cationic type emulsified asphalt. If the aggregate mineralogy and emulsifier asphalt class are not matched as indicated, an adhesion additive should be incorporated into the emulsified asphalt formulation to compensate. The compatibility of the emulsified asphalt with the project aggregate should be verified by a stripping test.

5.3. *Selection of Emulsified Asphalt and Cover Aggregate Application Rates*—Based on the chosen aggregate gradation, use the center point values in Sections 5.3.1 and 5.3.2 to determine starting values. Adjust the values as recommended in Sections 5.2.1 through 5.2.4.

5.3.1. *Smaller Gradations (Type I and II)*—0.40 to 0.60 L/m^2 (0.13 to 0.19 gal/yd^2) emulsified asphalt application rate and 6.0 to 9.0 kg/m^2 (11.1 to 16.6 lb/yd^2) cover aggregate application rate.

5.3.2. *Larger Gradations (Type II and III)*—0.60 to 0.80 L/m^2 (0.19 to 0.25 gal/yd^2) emulsified asphalt application rate and 9.0 to 12.0 kg/m^2 (16.6 to 22.1 lb/yd^2) cover aggregate application rate.

6. REPORT

6.1. *Report the following*:

6.1.1. Aggregate spread rate in kilograms per square meter (pounds per square yard) to the nearest 0.1 kg/m^2 (lb/yd^2).

6.1.2. Emulsified asphalt spray rate in liters per square meter (gallons per square yard) to the nearest 0.01 l/m^2 (gal/yd^2).

7. KEYWORDS

7.1. Aggregate; emulsified asphalt; sand seal.

[1] This provisional standard was first published in 20yy.