PRESERVATIVE SEAL FOR ASPHALT CONCRETE Case #18-02 3/22/18

718.1 PRESERVATIVE SEAL

Asphalt Concrete preservative seal shall be one of the following types or equal, with typical application rates.

TYPE 1 - Asphalt rejuvenating agent shall be an emulsion composed of a petroleum resin oil base uniformly emulsified with water. Each supplier must submit a certified statement from the asphalt rejuvenator manufacturer showing that the asphalt rejuvenating emulsion conforms to the required physical and chemical requirements. They also must provide documentation of tests that determine the acceptable range of application of the product. Typical application rates are 0.07 to 0.18 gallons per square yard.

TYPE 2 - Petroleum Hydrocarbon emulsion. Applied at 0.05 to 0.20 gallons per square yard, diluted.

TYPE 3 - Acrylic polymer modified emulsion Diluted to the manufacture's recommendation and applied at a rate of 0.08 to 0.20 gallons per square yard.

TYPE 4 - Polymer modified rejuvenating emulsion. (PMRE) Diluted to the manufacture's recommendation and applied at a rate of 0.08 to 0.20 gallons per square yard.

718.2 TEST METHODS AND REQUIREMENTS PRESERVATIVE SEAL

Preservative seal for asphalt concrete material, shall meet type 1, 2, 3 or 4 on Table 718-1 by certification from the manufacturer.

Tests shall be performed by AMRL accredited laboratory, accredited in the specified test being performed.

Properties	Method	Type-1	Type-2	Type-3	Type-4
Saybolt Viscosity @77°F (sfs)	ASTM D244	15-40	25-150	15-40	50-150
Sieve test %	ASTM D244	0.1 max	0.1 max	0.1 max	0.1 max
Storage Stability, 24 hours, %	ASTM D244				1.0 max
Settlement test, 5 days, %	ASTM D244		2.0 max	5.0 max	
Test on residue by:		**ASTM D244 Evaporation To 138°C**	**ASTM D244 Evaporation To 138°C**	**ASTM D244 Evaporation To 138°C**	**ASTM D244 Distillation To 177°C**
Residue Content, %	ASTM D244	60 min	62 min	53 min	65 min
Oil Distillate, % by volume	ASTM D244				0.5 max
Flash point (Note 2) °F	ASTM D92	400°F	450°F	450°F	
Softening point, °F	ASTM D36			130 min	
Viscosity (Note 3), 60C, Poise	ASTM D2171				5000 max
Elastic Recovery (Note 4), 10C, %	AASHTO T301				50 min
Test on residue by:		**ASTM D244 Evaporation To 138°C**	**ASTM D244 Evaporation To 138°C**	**ASTM D244 Evaporation To 138°C**	**ASTM D244 Distillation To 177°C**
Ductility, 25C, 5 cm/min, cm	ASTM D113			20 min	
Penetration, 25C, 100g/5 sec, dmm	ASTM D5			20-80	

Properties	Method	Type-1	Type-2	Type-3	Type-4
Penetration, 4C, 200g/60 sec, dmm	ASTM D5				20-70
Kinematic Viscosity, 140°F, cSt	ASTM D2170	100-200	1,000-9,500		
Accelerated Weathering test (Note 5)	ASTM D4799			Plant certification within 12 months	
Test on		**Evaporative Residue**	**Evaporative Residue**		**Rejuvenating Agent Base**
Asphaltenes, % w	ASTM D2006	1.0 max	10.0 Max.		1.0 max
Maltene Dist. Ratio $(PC+A_1)/(A_2+S)$	ASTM D2006	0.3-0.6	0.2-1.4		
PC/S Ratio	ASTM D2006	0.5 min	0.5 min.		
Saturated Hydrocarbons, S	ASTM D2006	28 max	28 max.		30 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170				50-175
Flash point °F	ASTM D92				375 min
Test on residue from RTFO:	**ASTM D2872**				**Rejuvenating Agent Base**
Mass Change, %,	ASTM D2872				6.5 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170				Report
Kinematic Viscosity, Ratio (Note 6)					3.0 max

Notes:

1. Brookfield viscosity using spindle #27 (ASTM D4402) test temperature at 140°F temperature equilibrate the sample for a minimum of 20 minutes. Sample test time is at 5 minutes inside the Brookfield viscosity tube.
2. Flash point on residue may be waived by the engineer during production sampling and testing provided manufacturer submits results performed in the previous 12 months in compliance.
3. Viscosity in poise may be determined using AASHTO T315 by converting the Complex Dynamic Shear Viscosity to Viscosity in poise.
4. Elastic Recovery molds shall have straight sides as shown in Fig. 1 of AASHTO T301.
5. Other Accelerated Weathering test procedures may be presented for acceptance by the engineer prior to project start. These results shall be provided at no additional cost to the agency.
6. Kinematic Viscosity Ratio will be determined by dividing the viscosity of the material after RTFO aging by the original viscosity.

718.3 ASPHALT SURFACE SEALER

Asphalt Surface Sealer - Asphalt Surface Sealer not diluted, and applied as per the manufacturer's specifications, shall conform to ASTM D8099 noted in Table 718-2 and two additional requirements on the base asphalt used in preservative seal for flash and softening points.

TABLE 718-2		
ASPHALT SURFACE SEALER		
Properties	**Method**	**Asphalt Surface Sealer**
Uniformity	ASTM D2939	No separation, coagulation, or settlement that cannot be overcome by moderate stirring
Wet Film Continuity	ASTM D2939	Uniform homogenous consistency
Density @ 25C (77F) [lbs/gal]	ASTM D2939	Min 1.0 [9] Max 1.5 [12]
Water Content, %	ASTM D95	70% max
Ash content of residue, %	ASTMD2939	10% min 70% max
Drying time, firm set, hours	ASTM D2939	8 hours max
Resistance to heat	ASTM D2939	No blistering, sagging, or slipping
Resistance to water	ASTM D2939	No loss of adhesion and no blistering or tendency to re-emulsify
Flexibility	ASTM D2939	No flaking, cracking, or loss of adhesion to the substrate
Residue by Evaporation	ASTM D2939	30% min
Tests on Base Asphalt Used in Preservative Seal Prior to Emulsification	**Method**	**Asphalt Surface Sealer**
Flash Point (degrees F)	ASTM D92	450° F
Softening Point (degrees F)	ASTM D36	140° F min

- End of Section -

PRESERVATIVE SEAL FOR ASPHALT CONCRETE – As part of case 18-02 3/22/18

334.1 DESCRIPTION:

The asphalt concrete preservative seal shall be composed of an emulsified asphalt or asphalt rejuvenate, or an asphalt sealant to preserve the asphalt concrete pavement.

Preservative seals are applicable for asphalt pavements as directed on the plans, special provisions, or the Engineer.

334.2 MATERIALS:

The preservative seal shall be one of the following materials as specified by the Engineer:

Type	Description	Material Conformance
1	Rejuvenating emulsion	Section 718.1
2	Petroleum hydrocarbon emulsion	Section 718.1
3	Acrylic polymer emulsion	Section 718.1
4	Polymer modified rejuvenating emulsion (PMRE)	Section 718.1
Other	Diluted asphalt emulsion, CSS-1 or SS-1h	Section 713
Asphalt Surface Sealer	"Filled" asphalt surface sealer	Section 718.3

334.3 CONSTRUCTION METHOD:

The material shall be approved by the Engineer in accordance to this specification. The application rates, dilution and curing shall be directed by the Engineer in accordance with this specification.

The contractor shall be responsible to clean the pavement to be treated free of trash, debris, earth or other deleterious substances present in sufficient quality to not interfere with the work to be performed.

The application rate will be based upon a typical surface condition test site with application rate trials to determine the needed rate. All application rates specified in Section 718 shall be a diluted 50-50 emulsified asphalt and water, except as recommended by the manufacturer for Type 2 and Asphalt Surface Sealer. Any over applied seal will be sanded as directed by the Engineer. Application equipment shall be in accordance with Section 330.

Before opening a treated area to traffic, the surface shall be checked for slipperiness and/or tackiness. If the treated portion of the roadway must be opened to traffic prior to the disappearance of slipperiness and/or tackiness, the surface shall be sanded with a minimum of 1 ½ pounds per square yard or as directed by the Engineer. Sand Blotter shall comply with Section 333.

334.4 MEASUREMENT:

Preservative seal for asphalt concrete will be measured by the gallon or ton applied.

334.5 PAYMENT:

Payment will be made on the basis of the unit price bid in the proposal. Payment shall be full compensation for preservative seal complete and in place.

- End of Section -

PRESERVATIVE SEAL FOR ASPHALT CONCRETE Case #18-02 3/22/18

718.1 ~~GENERAL~~PRESERVATIVE SEAL

Asphalt Concrete preservative seal shall be one of the following types or equal, with typical application rates.

TYPE 1~~A~~ - Asphalt rejuvenating agent shall be an emulsion composed of a petroleum resin oil base uniformly emulsified with water. Each supplier must submit a certified statement from the asphalt rejuvenator manufacturer showing that the asphalt rejuvenating emulsion conforms to the required physical and chemical requirements. They also must provide documentation of tests that determine the acceptable range of application of the product. Typical application rates are 0.07 to 0.18 gallons per square yard.

TYPE 2~~B~~ - Petroleum Hydrocarbon emulsion. Applied at 0.05 to 0.20 gallons per square yard, diluted.

TYPE 3~~D~~ - Acrylic polymer modified emulsion Diluted to the manufacture's recommendation and applied at a rate of 0.08 to 0.20 gallons per square yard.

TYPE 4~~E~~ - Polymer modified rejuvenating emulsion. (PMRE) Diluted to the manufacture's recommendation and applied at a rate of 0.08 to 0.20 gallons per square yard.

718.2 TEST METHODS AND REQUIREMENTS PRESERVATIVE SEAL

Preservative seal for asphalt concrete material, shall meet type 1~~A~~, 2~~B~~,~~ C,~~ 3~~D~~ or 4~~E~~ on Table 718-1 by certification from the manufacturer.

Tests shall be performed by AMRL accredited laboratory, accredited in the specified test being performed.

TABLE 718-1

PRESERVATIVE SEAL SPECIFICATIONS

Properties	**Method**	**Type-1~~A~~**	**Type-2~~B~~**	**~~Type-C-~~**	**Type-3~~D~~**	**Type-4~~E~~**
Saybolt Viscosity @77°F (sfs)	ASTM D244	15-40	25-150	~~200-2000 Cp (Note 1)~~	15-40	50-150
Sieve test %	ASTM D244	0.1 max	0.1 max	~~0.1 max~~	0.1 max	0.1 max
Storage Stability, 24 hours, %	ASTM D244					1.0 max
Settlement test, 5 days, %	ASTM D244		2.0 max		5.0 max	
Test on residue by:		**ASTM D244 Evaporation To 138°C**	**ASTM D244 Evaporation To 138°C**	**~~ASTM D244 Evaporation To 138°C~~**	**ASTM D244 Evaporation To 138°C**	**ASTM D244 Distillation To 177°C**
Residue Content, %	ASTM D244	60 min	62 min	~~30 min~~	53 min	65 min
Oil Distillate, % by volume	ASTM D244					0.5 max
Flash point (Note 2) °F	ASTM D92	400°F	450°F	~~450°F~~	450°F	
Softening point, °F	ASTM D36~~5~~			~~140 min.~~	130 min	
Viscosity (Note 3), 60C, Poise	ASTM D2171					5000 max
Elastic Recovery (Note 4), 10C, %	AASHTO T301					50 min

TABLE 718-1						
PRESERVATIVE SEAL SPECIFICATIONS						
Properties	**Method**	**Type-1A**	**Type-2B**	**~~Type-C~~**	**Type-3D**	**Type-4E**
Test on residue by:		**ASTM D244 Evaporation To 138°C**	**ASTM D244 Evaporation To 138°C**	**~~ASTM D244 Evaporation To 138°C~~**	**ASTM D244 Evaporation To 138°C**	**ASTM D244 Distillation To 177°C**
Ductility, 25C, 5 cm/min, cm	ASTM D113			-	20 min	
Penetration, 25C, 100g/5 sec, dmm	ASTM D5			-	20-80	
Penetration, 4C, 200g/60 sec, dmm	ASTM D5			-		20-70
Kinematic Viscosity, 140°F, cSt	ASTM D2170	100-200	1,000-9,500	-		
Accelerated Weathering test (Note 5)	ASTM D4799			-	Plant certification within 12 months	
Test on		**Evaporative Residue**	**Evaporative Residue**	-		**Rejuvenating Agent Base**
Asphaltenes, % w	ASTM D2006	1.0 max	10.0 Max.	-		1.0 max
Maltene Dist. Ratio $(PC+A_1)/(A_2+S)$	ASTM D2006	0.3-0.6	0.2-1.4	-		
PC/S Ratio	ASTM D2006	0.5 min	0.5 min.	-		
Saturated Hydrocarbons, S	ASTM D2006	28 max	28 max.	-		30 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170			-		50-175
Flash point °F	ASTM D92			-		375 min
Test on residue from RTFO:	**ASTM D2872**			-		**Rejuvenating Agent Base**
Mass Change, %,	ASTM D2872			-		6.5 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170			-		Report
Kinematic Viscosity, Ratio (Note 6)				-		3.0 max

Revised 2016

Notes:

1. Brookfield viscosity using spindle #27 (ASTM D4402) test temperature at 140°F temperature equilibrate the sample for a minimum of 20 minutes. Sample test time is at 5 minutes inside the Brookfield viscosity tube.
2. Flash point on residue may be waived by the engineer during production sampling and testing provided manufacturer submits results performed in the previous 12 months in compliance.
3. Viscosity in poise may be determined using AASHTO T315 by converting the Complex Dynamic Shear Viscosity to Viscosity in poise.
4. Elastic Recovery molds shall have straight sides as shown in Fig. 1 of AASHTO T301.
5. Other Accelerated Weathering test procedures may be presented for acceptance by the engineer prior to project start. These results shall be provided at no additional cost to the agency.
6. Kinematic Viscosity Ratio will be determined by dividing the viscosity of the material after RTFO aging by the original viscosity.

718.3 ASPHALT SURFACE SEALER

~~**TYPE C**~~**Asphalt Surface Sealer** - ~~Tire modified surface sealer (TRMSS) or equal~~ Asphalt Surface Sealer not diluted, and applied as per the manufacturer's specifications, shall conform to ASTM D8099 noted in Table 718-2 and two additional requirements on the base asphalt used in preservative seal~~residue~~ for flash and softening points. (Note: Type C on Table 718-1 has been eliminated altogether)~~at a rate of 0.10 to 0.20 gallons per square yard~~.

TABLE 718-2

ASPHALT SURFACE SEALER

Properties	**Method**	**Asphalt Surface Sealer**
Uniformity	ASTM D2939	No separation, coagulation, or settlement that cannot be overcome by moderate stirring
Wet Film Continuity	ASTM D2939	Uniform homogenous consistency
Density @ 25C (77F) [lbs/gal]	ASTM D2939	Min 1.0 [9] Max 1.5 [12]
Water Content, %	ASTM D95	70% max
Ash content of residue, %	ASTMD2939	10% min 70% max
Drying time, firm set, hours	ASTM D2939	8 hours max
Resistance to heat	ASTM D2939	No blistering, sagging, or slipping
Resistance to water	ASTM D2939	No loss of adhesion and no blistering or tendency to re-emulsify
Flexibility	ASTM D2939	No flaking, cracking, or loss of adhesion to the substrate
Residue by Evaporation	ASTM D2939	30% min
Tests on ~~Residue~~Base Asphalt Used in Preservative Seal Prior to Emulsification	**Method**	**Asphalt Surface Sealer**
Flash Point (degrees F)	ASTM D92~~44~~	450° F
Softening Point (degrees F)	ASTM D36~~244~~	140° F min

- End of Section -

PRESERVATIVE SEAL FOR ASPHALT CONCRETE – As part of case 18-02 3/22/18

334.1 DESCRIPTION:

The asphalt concrete preservative seal shall be composed of an emulsified asphalt or asphalt rejuvenate, or an asphalt sealant to preserve the asphalt concrete pavement.

Preservative seals are applicable for asphalt pavements as directed on the plans, special provisions, or the Engineer.

334.2 MATERIALS:

The preservative seal shall be one of the following materials as specified by the Engineer:

Type	Description	Material Conformance
1~~A~~	Rejuvenating emulsion	Section 718.1
2~~B~~	Petroleum hydrocarbon emulsion	Section 718.1
3~~D~~	Acrylic polymer emulsion	Section 718.1
4~~E~~	Polymer modified rejuvenating emulsion (PMRE)	Section 718.1
Other	Diluted asphalt emulsion, CSS-1 or SS-1h	Section 713
Asphalt Surface Sealer	"Filled" asphalt surface sealer ~~such as TRMSS or equal~~	Section 718.3

334.3 CONSTRUCTION METHOD:

The material shall be approved by the Engineer in accordance to this specification. The application rates, dilution and curing shall be directed by the Engineer in accordance with this specification.

The contractor shall be responsible to clean the pavement to be treated free of trash, debris, earth or other deleterious substances present in sufficient quality to not interfere with the work to be performed.

The application rate will be based upon a typical surface condition test site with application rate trials to determine the needed rate. All application rates specified in Section 718 shall be a diluted 50-50 emulsified asphalt and water, except as recommended by the manufacturer for Type 2~~B~~ and ~~-~~Asphalt Surface Sealer~~C~~. Any over applied seal will be sanded as directed by the Engineer. Application equipment shall be in accordance with Section 330.

Before opening a treated area to traffic, the surface shall be checked for slipperiness and/or tackiness. If the treated portion of the roadway must be opened to traffic prior to the disappearance of slipperiness and/or tackiness, the surface shall be sanded with a minimum of 1 ½ pounds per square yard or as directed by the Engineer. Sand Blotter shall comply with Section 333.

334.4 MEASUREMENT:

Preservative seal for asphalt concrete will be measured by the gallon or ton applied.

334.5 PAYMENT:

Payment will be made on the basis of the unit price bid in the proposal. Payment shall be full compensation for preservative seal complete and in place.

- End of Section -