Recommended Performance Guideline For Polymer-Modified Emulsified Asphalt Slurry Seal

A115

NOTICE

It is not intended or recommended that this guideline be used as a verbatim specification. It should be used as an outline, helping user agencies establish their particular project specification. Users should understand that almost all geographical areas vary as to the availability of materials. An effort should be made to determine what materials are reasonably available, keeping in mind system compatibility and specific job requirements. Contact ISSA for answers to questions and for a list of ISSA member contractors and companies.

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RECOMMENDED PERFORMANCE GUIDELINE FOR POLYMER-MODIFIED EMULSIFIED ASPHALT SLURRY SEAL

1. SCOPE

The intent of this guideline is to aid in the design, testing, quality control, measurement and payment procedures for the application of polymer-modified emulsified asphalt slurry seal.

2. DESCRIPTION

Polymer-modified emulsified asphalt slurry seal shall consist of a mixture of a polymer-modified emulsified asphalt, mineral aggregate, water, and additives, proportioned, mixed and uniformly spread over a properly prepared surface as directed by the Buyer's Authorized Representative (B.A.R.). The polymer-modified emulsified asphalt slurry seal shall be applied in a single layer as a homogeneous mat, adhere firmly to the prepared surface, and have a skid-resistant texture throughout its service life. This is not a product to be utilized for reprofiling, leveling, or rut filling applications.

3. SPECIFICATIONS

It is not normally required to run all tests on every project. A compilation of results from the listed tests should be indicative of system performance. Failure to meet specification for an individual test does not necessarily disqualify the system. If, for example, the system to be used on the project has a record of good performance, individual requirements for testing may be waived. Test methods are listed in Appendix A and form an integral part of this Guideline.

4. MATERIALS

4.1 POLYMER-MODIFIED EMULSIFIED ASPHALT

4.1.1 GENERAL

The emulsified asphalt shall be polymer modified. The polymer material shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process. While a three percent (3%) polymer solids, based on asphalt weight, is considered typical, other options may be considered depending on project performance expectations.

4.1.2 QUALITY TESTS

The polymer-modified emulsified asphalt, and polymer-modified emulsified asphalt residue, shall meet the requirements of AASHTO M 316, AASHTO M 208 or ASTM D 2397 for CQS-1h, CQS-1hp, or CQS-1P, with the following exceptions:

TEST		TEST METHOD		SPECIFICATION	
		AASHTO	ASTM		
Settlement and Storage Stability of Polymer-Modified Emulsified Asphalt, 24-Hour		T 59	D 6930	1% Maximum	
Residual Asphalt Recovery Options[1]	OPTION No. 1: Distillation of Polymer-Modified Emulsified Asphalt	T 59	D 6997	62% Minimum	
	OPTION No. 2: Residue by Evaporation of Polymer-Modified Emulsified Asphalt	T 59	D 6934		
Tests on Polymer-Modified Emulsified Asphalt Residue					
				CQS-1hp	CQS-1P
Softening Point of Bitumen (Ring-and-Ball Apparatus)		T 53	D 36	135°F (57°C) Minimum	128°F (53°C) Minimum
Penetration of Bituminous Materials at 77°F (25°C)		T 49	D 5	40-90	90-200

[1]To prevent degradation of the polymer in polymer-modified emulsions, there are two options to consider. Option No. 1 is to recover the residual asphalt by distillation at 350°F (177°C), maintaining that temperature for 20 minutes. Option No. 2 is to recover the residual asphalt by oven evaporation according to ASTM D6934 or AASHTO T 59.

NOTE: When results from the oven evaporation method fail to meet the specification requirements, rerun the tests using residual asphalt obtained from 350°F distillation method.

Each load of emulsified asphalt shall be accompanied with a Certificate of Compliance/Conformance or other documentation as defined in the Supplier Quality Acceptance Plan to indicate that the emulsion meets the specifications.

4.2 AGGREGATE

4.2.1 GENERAL

The mineral aggregate used shall be the type specified for the particular application requirements of the slurry seal. The aggregate shall be crushed stone such as granite, slag, limestone, chat, or other high-quality aggregate, or combination thereof. To assure the material is 100 percent crushed, the parent aggregate will be larger than the largest stone in the gradation to be used.

4.2.2 QUALITY TESTS

The aggregate should meet agency specified polishing values and these minimum requirements:

TEST	TEST METHOD		SPECIFICATION
	AASHTO	ASTM	
Sand Equivalent Value of Soils and Fine Aggregate	T 176	D 2419	60 Minimum
Soundness of Aggregates by Use of Sodium Sulfate of Magnesium Sulfate	T 104	C 88	15% Maximum w/NA_2SO_4 25% Maximum w/$MgSO_4$
Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine[1]	T 96	C 131	30% Maximum

[1]The abrasion test is run on the parent aggregate.

4.2.3 GRADATION

When tested in accordance with AASHTO T 27 (ASTM C 136) and AASHTO T 11 (ASTM C 117), the mix design aggregate gradation shall be within one of the following bands (or one recognized by the local paving authority):

SIEVE SIZE		TYPE I PERCENT PASSING	TYPE II PERCENT PASSING	TYPE III PERCENT PASSING	STOCKPILE TOLERANCE FROM THE MIX DESIGN GRADATION
3/8	**(9.5 mm)**	100	100	100	
# 4	**(4.75 mm)**	100	90 - 100	70 - 90	± 5%
# 8	**(2.36 mm)**	90 - 100	65 - 90	45 - 70	± 5%
# 16	**(1.18 mm)**	65 - 90	45 - 70	28 - 50	± 5%
# 30	**(600 um)**	40 - 65	30 - 50	19 - 34	± 5%
# 50	**(300 um)**	25 - 42	18 - 30	12 - 25	± 4%
#100	**(150 um)**	15 - 30	10 - 21	7 - 18	± 3%
#200	**(75 um)**	10 - 20	5-15	5-15	± 2%

The gradation of the aggregate stockpile shall not vary by more than the stockpile tolerance from the mix design gradation (indicated in the table above) while also remaining within the specification gradation band. The percentage of aggregate passing any two successive sieves shall not change from one end of the specified range to the other end.

The aggregate will be accepted at the job location or stockpile based on five gradation tests sampled according to AASHTO T 2 (ASTM D 75). If the average of the five tests is within the stockpile tolerance from the mix design gradation, the material will be accepted. If the average of those test results is out of specification or tolerance, the contractor will be given the choice to either remove the material or blend additional aggregate with the stockpile material to bring it into compliance. Materials used in blending must meet the required aggregate quality test specifications in Section 4.2.2 before blending and must be blended in a manner to produce a consistent gradation. Aggregate blending may require a new mix design.

Screening shall be required at the stockpile if there are any problems created by oversized materials in the mix.

Type I. This aggregate gradation is used to fill surface voids, address moderate surface distresses, and provide protection from the elements. The fineness of this mixture provides the ability for some crack penetration.

Type II. This aggregate gradation is used to fill surface voids, address more severe surface distresses, seal, and provide a durable wearing surface.

Type III. This aggregate gradation provides maximum skid resistance and an improved wearing surface.

4.3 MINERAL FILLER

Mineral filler may be used to improve mixture consistency and to adjust mixture breaking and curing properties. Portland cement, hydrated lime, limestone dust, fly ash, or other approved filler meeting the requirements of ASTM D 242 shall be used if required by the mix design. Typical use levels are normally 0.0 - 3.0 percent and may be considered part of the aggregate gradation.

4.4 WATER

The water shall be free of harmful salts and contaminants. If the quality of the water is in question, it should be submitted to the laboratory with the other raw materials for the mix design.

4.5 ADDITIVES

Additives may be used to accelerate or retard the break/set of the slurry seal. Appropriate additives, and their applicable use range, should be approved by the laboratory as part of the mix design.

5. LABORATORY EVALUATION

5.1 GENERAL

Before work begins, the contractor shall submit a signed mix design covering the specific materials to be used on the project. This design will be performed by a laboratory which has experience in designing Polymer-Modified Emulsified Asphalt Slurry Seal. After the mix design has been approved, no material substitution will be permitted unless approved by the B.A.R.

ISSA can provide a list of laboratories experienced in slurry seal design.

5.2 MIX DESIGN

Compatibility of the aggregate, emulsified asphalt, water, mineral filler and other additives shall be evaluated in the mix design. The mix design shall be completed using materials consistent with those supplied by the contractor for the project. Recommended tests and values are as follows:

TEST	ISSA TB NO.	SPECIFICATION
Mix Time @ 77˚F (25˚C)	TB 113	Controllable to 150 Seconds Minimum
Wet Cohesion @ 30 Minutes Minimum (Set) @ 60 Minutes Minimum (Traffic)	TB 139 (For quick-traffic systems)	 12 kg-cm Minimum 20 kg-cm or Near Spin Minimum
Wet Stripping	TB 114	Pass (90% Minimum)
Wet-Track Abrasion Loss One-hour Soak	TB 100	60 g/ft^2 (647 g/m^2) Maximum
Excess Asphalt by LWT Sand Adhesion	TB 109 (Critical in heavy-traffic areas)	50 g/ft^2 (538 g/m^2) Maximum

The Wet Track Abrasion Test is performed under laboratory conditions as a component of the mix design process. The purpose of this test is to determine the minimum asphalt content required in a slurry seal system. The Wet Track Abrasion Test is not recommended as a field quality control or acceptance test. ISSA TB 136 describes potential causes for inconsistent results of the Wet Track Abrasion Test.

The mixing test is used to predict the time the material can be mixed before it begins to break. It can be a good reference check to verify consistent sources of material. The laboratory should verify that mix and set times are appropriate for the climatic conditions expected during the project.

The laboratory shall also report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect) according to AASHTO T19 (ASTM C29). The report must clearly show the proportions of aggregate, mineral filler (if used) and polymer-modified emulsified asphalt, based on the dry weight of the aggregate.

The percentages of each individual material required shall be shown in the laboratory report. Based on field conditions, adjustments within the specific ranges of the mix design may be

required.

The component materials shall be designed within the following limits:

COMPONENT MATERIALS	SUGGESTED LIMITS
Polymer-Modified Residual Asphalt	Type I: 10 - 16% Type II: 7.5 - 13.5% Type III: 6.5 - 12% (Based on dry weight of aggregate)
Mineral Filler	0.0 - 3.0% (Based on dry weight of aggregate)
Additives	As needed
Water	As required to produce proper mix consistency

5.3 MIX TOLERANCES

Tolerances for the slurry seal mixture are as follows:

a. After the polymer-modified residual asphalt content is determined, any variations (based on percent of weight of dry aggregate) that will be permitted must be defined in the mix design for the project.
b. The rate of application shall not vary more than ± 2 lb/yd^2 (± 1.1 kg/m^2) when the surface texture does not vary significantly.

6. EQUIPMENT

6.1 GENERAL

All equipment, tools, and machines used in the application of slurry seal shall be maintained in satisfactory working condition at all times.

6.2 MIXING EQUIPMENT

The machine shall be specifically designed and manufactured to apply polymer-modified slurry seal. The material shall be mixed by an automatic-sequenced, self-propelled, slurry seal mixing machine of either truck-mounted or continuous-run design. Continuous-run machines are those that are equipped to self-load materials while continuing to apply slurry seal. Either type machine shall be able to accurately deliver and proportion the mix components through a mixer and to discharge the mixed product on a continuous-flow basis. Sufficient storage capacity for all mix components is required to maintain an adequate supply

to the proportioning controls.

The B.A.R. should decide which type of equipment best suits the specific project. In some cases, truck-mounted machines may be more suited, i.e. cul-de-sacs, small narrow roadways, parking lots, etc. On some projects, continuous-run equipment may be chosen due to the continuity of mix and the reduction of start-up joints. Generally, truck-mounted machines or continuous-run machines may be used on similar projects.

If continuous-run equipment is used, the machine shall provide the operator with full control of the forward and reverse speeds during application of the slurry seal. It shall be equipped with a self-loading device and opposite-side driver stations. The self-loading device, opposite-side driver stations, and forward and reverse speed controls shall be of original-equipment-manufacturer design.

6.3 PROPORTIONING DEVICES

Individual volume or weight controls for proportioning mix components shall be provided and properly labeled. These proportioning devices are used in material calibration to determine the material output at any time.

6.4 SPREADING EQUIPMENT

The mixture shall be continuously agitated and distributed uniformly throughout the spreader box by means of spiral augers fixed in the box. With polymer-modified, quick-set systems, mechanical agitation may extend mix time. The slurry seal mixture shall have the proper consistency as it enters the spreader box. Spraying of additional water into the spreader box will not be permitted.

A front seal shall be utilized to ensure no loss of the mixture at the road contact point. The rear seal shall act as final strike-off and shall be adjustable. The spreader box and rear seal shall be designed and operated to provide uniform mix consistency behind the box. The spreader box shall have suitable means to side shift to compensate for variations in the pavement geometry. A burlap drag or other approved screed may be attached to the rear of the spreader box to provide a highly textured uniform surface. A drag stiffened by hardened slurry is ineffective and should be replaced immediately.

6.5 AUXILIARY EQUIPMENT

Suitable surface preparation equipment, traffic control equipment, hand tools, and other support and safety equipment necessary to perform the work shall be provided by the contractor.

7. CALIBRATION

Each mixing unit to be used in performance of the work shall be calibrated in the presence of the B.A.R. prior to the start of the project. Previous calibration documentation covering the exact materials to be used may be acceptable, provided the calibration was performed during the previous 60 days. The documentation shall include an individual calibration of each material at various settings, which can be related to the machine's metering devices. Any equipment replacement affecting material proportioning requires that the machine be recalibrated. No machine will be

allowed to work on the project until the calibration has been accepted. The ISSA Inspector's Manual describes a method of machine calibration. ISSA contractors and/or machine manufacturers may also provide methods of machine calibration.

8. WEATHER LIMITATIONS

The slurry seal shall not be applied if either the pavement or air temperature is below 50°F (10°C) and falling, but may be applied when both pavement and air temperatures are above 45°F (7°C) and rising. No slurry seal shall be applied when there is the possibility of freezing temperatures at the project location within 24 hours after application. The mixture shall not be applied when weather conditions prolong opening to traffic beyond a reasonable time.

9. NOTIFICATION AND TRAFFIC CONTROL

9.1 NOTIFICATION

Homeowners and businesses affected by the paving shall be notified at least one day in advance of the surfacing. Should work not occur on the specified day, a new notification will be distributed. The notification shall be posted in written form, stating the time and date that the surfacing will take place. If necessary, signage alerting traffic to the intended project should be posted.

9.2 TRAFFIC CONTROL

Traffic control devices shall be in accordance with agency requirements and, if necessary, conform to the requirements of the Manual on Uniform Traffic Control Devices. Opening to traffic does not constitute acceptance of the work.

In areas that are subject to an increased rate of sharp-turning vehicles, additional time may be required for a more complete cure of the slurry seal mat to prevent damage. Tire marks may be evident in these areas after opening but typically diminish over time with rolling traffic.

10. SURFACE PREPARATION

10.1 GENERAL

Prior to applying the slurry seal, loose material, oil spots, vegetation, and other objectionable material shall be removed. Any standard cleaning method will be acceptable. If water is used, cracks shall be allowed to dry thoroughly before slurry surfacing. Manholes, valve boxes, drop inlets and other service entrances shall be protected from the slurry seal by a suitable method. The B.A.R. shall approve the surface preparation prior to surfacing.

10.2 TACK COAT

Normally, tack coat is not required unless the surface to be covered is extremely dry and raveled or is concrete or brick. If required, the emulsified asphalt should be SS, CSS, or the slurry seal emulsion. Consult with the slurry seal emulsion supplier to determine dilution stability. The tack coat may consist of one part emulsified asphalt/three parts water and should be applied with a standard distributor. The distributor shall be capable of applying the dilution evenly at a rate of 0.05-0.15 gal/yd^2 (0.23-0.68 l/m^2). The tack coat shall be allowed to cure sufficiently before the application of slurry seal. If a tack coat is to be required, it must

be noted in the project plans.

10.3 CRACKS

It is recommended to treat cracks wider than 0.25" (0.64cm) in the pavement surface with an approved crack sealer prior to application of the slurry seal.

11. APPLICATION

11.1 GENERAL

If required, it is recommended that a test strip be placed in conditions similar to those expected to be encountered during the project.

The surface may be wetted with water ahead of the spreader box. The rate of application of the water spray shall be adjusted during the day to suit temperature, surface texture, humidity, and dryness of the pavement. Pooling or standing water shall be avoided.

The slurry seal shall be of the desired consistency upon exiting the mixer. A sufficient amount of material shall be carried in all parts of the spreader box at all times so that complete coverage is achieved. Overloading of the spreader shall be avoided.

No lumping, balling, or unmixed aggregate shall be permitted.

Significant streaks, such as those caused by oversized aggregate or broken mix, shall not be left in the finished surface. If excessive streaking occurs, the job will be stopped until the cause of the problem has been corrected. Some situations may require screening the aggregate prior to loading it into the units going from the stockpile area to the jobsite.

11.2 RATE OF APPLICATION

The slurry seal mixture shall be of the proper consistency at all times so as to provide the application rate required by the surface condition. The average application rate shall be in accordance with the following table:

AGGREGATE TYPE	LOCATION	SUGGESTED APPLICATION RATE
Type I	Parking Areas Urban and Residential Streets Airport Runways	8 - 12 lb/yd^2 (4.3 - 6.5 kg/m^2)
Type II	Urban and Residential Streets Airport Runways	14 - 18 lb/yd^2 (7.6 - 9.8 kg/m^2)
Type III	Primary and Interstate Routes	18 - 24 lb/yd^2 (9.8 - 13.0 kg/m^2)

Suggested application rates are based upon the weight of dry aggregate in the mixture. Application rates are affected by the unit weight and gradation of the aggregate and the demand of the surface to which the slurry seal is being applied.

11.3 JOINTS

No excess buildup, uncovered areas, or unsightly appearance shall be permitted on longitudinal or transverse joints. The contractor shall provide suitable equipment to produce a minimum number of longitudinal joints throughout the project. When possible, a longitudinal joint shall not be placed in a wheel path. Less than full box width passes will be used only as required. If less than full box width passes are used, they shall not be the last pass of any paved area. A maximum of 6" (15.2 cm) shall be allowed for overlap of longitudinal joints.

11.4 MIXTURE

The slurry seal shall possess sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. It shall be free of excess liquids which create segregation of the aggregate. Spraying of additional water into the spreader box will not be permitted.

11.5 HANDWORK

Areas which cannot be accessed by the mixing machine shall be surfaced using hand squeegees to provide complete and uniform coverage. If necessary, the area to be handworked shall be lightly dampened prior to mix placement. Handwork shall exhibit the same finish as that applied by the spreader box and shall be completed prior to final surfacing.

11.6 LINES

Care shall be taken to apply straight lines along curbs, shoulders, and intersections. No run-off on these areas will be permitted. Roofing felt or heavy plastic may be used to begin or end a pull cleanly. This also provides for easy removal of excess slurry.

11.7 ROLLING

Rolling is usually not necessary for slurry seal on roadways. Airports and parking areas should be rolled by a self-propelled, 10-ton (maximum) pneumatic tire roller equipped with a water spray system. All tires should be inflated per manufacturer's specifications. Rolling shall not start until the slurry has cured sufficiently to avoid damage by the roller. Areas which require rolling shall receive a minimum of two (2) full coverage passes.

11.8 CLEAN UP

All utility access areas, gutters and intersections, shall have the slurry seal removed as specified by the B.A.R. The contractor shall remove any debris associated with the performance of the work on a daily basis.

12. QUALITY CONTROL

12.1 INSPECTION

Inspectors assigned to projects must be familiar with the materials, equipment and application of slurry seal. Local conditions and specific project requirements should be considered when determining the parameters of field inspection.

Proper mix consistency should be one of the major areas of inspector concern. If mixes are too dry, streaking, lumping and roughness will be present in the mat surface. Mixes applied too wet will flow excessively and not hold straight lane lines. Excessive liquids may also cause an asphalt-rich surface with segregation.

12.2 MATERIALS

To account for aggregate bulking, it is the responsibility of the contractor to check stockpile moisture content and to set the machine accordingly. At the B.A.R.'s discretion, material tests may be run on representative samples of the aggregate and emulsion. Tests will be run at the expense of the buyer. The buyer must notify the contractor immediately if any test fails to meet the specifications.

12.3 SLURRY SEAL

If required, representative samples of the slurry seal may be taken directly from the slurry unit(s). Consistency (ISSA TB No. 106) and residual asphalt content (ASTM D2172) tests may be run on the samples. Please note that the consistency test may not be applicable to certain Quick-Set and Quick-Traffic systems because of erratic results due to setting characteristics. If this test is run, it must be performed immediately after the sample is taken. Tests will be run at the expense of the buyer. The buyer must notify the contractor immediately if any test fails to meet specifications.

Data obtained from the proportioning devices on the slurry seal unit may be used to determine individual material quantities and application rate.

12.4 NON-COMPLIANCE

If any two successive tests fail on the stockpile aggregate, the job shall be stopped. If any two successive tests on the mix from the same machine fail, the use of the machine shall be suspended. It will be the responsibility of the contractor, at his expense, to prove to the B.A.R. that the problems have been corrected.

13. PAYMENT

The slurry seal shall be measured and paid for by the unit area or weight of aggregate and the weight of emulsion used on the work completed and accepted by the buyer. If paid by the weight of the aggregate and emulsified asphalt, the contractor shall submit to the B.A.R. certified delivery tickets which show quantities of each material delivered to the job site and used on the project. Payment shall be full compensation for all preparation, mixing and application of materials, and for all labor, equipment, tools, testing, cleaning, and incidentals necessary to complete the job as specified herein.

APPENDIX A

AGENCIES

AASHTO: **American Association of State Highway and Transportation Officials**
ASTM: **American Society for Testing and Materials**
ISSA: **International Slurry Surfacing Association**

TEST METHODS

EMULSIFIED ASPHALT

AASHTO TEST NO.	ASTM TEST NO.	TEST
M 140	D 977	Standard Specification for Emulsified Asphalt
M 208	D 2397	Specification for Cationic Emulsified Asphalt
M 316		Standard Specification for Polymer-Modified Emulsified Asphalt
T 301	D 6084	Elastic Recovery of Asphalt/Bituminous Materials by Ductilometer
T 53	D 36	Softening Point of Bitumen (Ring-and-Ball Apparatus)
T 49	D 5	Penetration of Bituminous Materials at 77°F (25°C)
T 59	D 6930	Settlement and Storage Stability of Emulsified Asphalt, 24-Hour
T 40	D 140	Sampling Bituminous Materials
T 59	D 244	Test Methods and Practices for Emulsified Asphalts
T 59	D 6997	Distillation of Emulsified Asphalt
T 59	D 6934	Residue by Evaporation of Emulsified Asphalt

AGGREGATE AND MINERAL FILLER

AASHTO TEST NO.	ASTM TEST NO.	TEST
T 176	D 2419	Sand Equivalent Value of Soils and Fine Aggregate
T 104	C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
96	C 131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (This test should be performed on the parent rock that is used for crushing the finer gradation Micro Surfacing material.)
T 27	C 136	Sieve Analysis of Fine and Coarse Aggregates
T 11	C 117	Test Method for Materials Finer than 75µm (No. 200) Sieve in Mineral Aggregates by Washing
T 2	D 75	Sampling Aggregates
M 17	D 242	Mineral Filler for Bituminous Paving Mixtures
T 19	C 29	Bulk Density (“Unit Weight”) and Voids in Aggregate

SLURRY SEAL SYSTEM

ISSA TEST NO.	Test
TB 100	Test Method for Wet Track Abrasion of Slurry Surfaces
TB 101	Guide for Sampling Slurry Mix for Extraction Test
TB 109	Test Method for Measurement of Excess Asphalt in Bituminous Mixtures by Use of a Loaded-Wheel Tester
TB 111	Outline Guide Design Procedure for Slurry Seal
TB 112	Method of Estimate Slurry Seal Spread Rates and To Measure Pavement Macrotexture
TB 113	Trial Mix Procedure for Slurry Seal Design
TB 114	Wet Stripping Test for Cured Slurry Seal Mixes
TB 115	Determination of Slurry Seal Compatibility
TB 139	Method of Classified Emulsified Asphalt, Aggregate Mixtures by Modified Cohesion Test Measurement of Set and Cure Characteristics
A105	Design, Testing, and Construction of Slurry Seal

NOTES:
ASTM D 3910, Standard Practice for Design, Testing, and Construction of Slurry Seal, is a combined reference of the ISSA Test Bulletins listed above.

ASTM D 2172, Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures, is referenced in Section 12.3.

Notes:

Notes:

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