AASHTO
THE VOICE OF TRANSPORTATION
SUBCOMMITTEE ON MATERIALS

SUBCOMMITTEE ON MATERIALS

2017 Annual Meeting – Phoenix, AZ
Wednesday August 9, 2017
8:00 – 10:00 AM MST

TECHNICAL SECTION 5b
Bridge and Pavement Preservation

Derek Nener-Plante (ME) Chair, Mark Felag (ME) Vice Chair, and Morgan Kessler (FHWA) Secretary

AASHTO Support – Casey Soniera and John Malusky

I. Call to Order and Opening Remarks – (5 minutes)

A. Brief summary of activities *(to ensure all attendees up to speed)*

II. Roll Call (see page 3) – (5 minutes)

III. Approval of Technical Section Mid-Year Minutes (see pages 4-7) – (5 minutes)

IV. Old Business

A. SOM Ballot Items

B. TS Ballots (see pages 8-54) – (60 minutes, 5-10 minutes per standard)
1. Discussion Item: Combining materials specification and practice into one?
2. Discussion Item: Should Acceptance procedures and criteria be included in standards?
3. Technical Section Ballot 06/02/2017 Results (Comments attached in pages 55-68)

Ballot Item	Positives	Negatives	No Votes	Standard Pages	Comments Pages
Standard Specification for Diamond Grinding for Pavement Preservation	15	3	5	9-14	55-58
]Standard Specification for Materials for Emulsified Asphalt Sand Seals	16	2	5	15-17	58-59
Standard Specification for Materials for Emulsified Asphalt Scrub Seal	16	2	5	18-23	59-61
Standard Specification for Thin Overlay Treatments Using a Binder Resin System and Aggregate for Concrete Surfaces	15	3	5	24-33	61-63
Standard Practice for Application of Thin Overlay Treatments Using a Binder Resin System and Aggregates for Concrete Surfaces	16	2	5	34-42	63-65
Standard Specification for Emulsified Asphalt Sand Seal Design	17	1	5	43-46	65-67
Standard Practice for Emulsified Asphalt Scrub Chip Seal Design	17	1	5	47-54	67-68

C. Task Force Reports

V. New Business

A. Research Proposals

1. 20-7 RPS
2. Full NCHRP RPS

B. AASHTO Re:source/CCRL - Casey Soniera / John Malusky (AASHTO) – (5 minutes)

C. NCHRP Issues – Amir N. Hanna (NCHRP) – (5 minutes)

D. Correspondence, calls, meetings

E. Presentation by Industry/Academia
1. "Cold-In-Place Recycling" – Angela Pakes (Recycled Materials Resource Center) – (20 minutes)

F. Proposed New Standards

G. Proposed New Task Forces

H. Standards Requiring Reconfirmation – (5 minutes)
1. MP 27-16 – "Materials for Emulsified Asphalt Chip Seals" – *Adopt, revise, or extend 2 years*
2. MP 28-16 – "Materials for Micro Surfacing" – *Adopt, revise, or extend 2 years*
3. PP 82-16 – "Emulsified Asphalt Chip Seal Design" – *Adopt, revise, or extend 2 years*
4. PP 83-16 – "Micro Surfacing Design" – *Adopt, revise, or extend 2 years*
5. TP 96-13 – "Protective Sealers for Portland Cement Concrete" – *Adopt, revise, or extend 1 year*

I. Provisional Standards – (5 minutes)
1. MP 22-17 – "Fiber-Reinforced Polymer Composite Materials for Highway and Bridge Structures" – *Adopt, revise, or extend 2 years*
2. MP 32-17 – "Materials for Slurry Seal" – *Adopt or no action*
3. MP 33-17 – "Materials for Emulsified Asphalt Fog Seal" – *Adopt or no action*
4. PP 87-17 – "Slurry Seal Design" – *Adopt or no action*
5. PP 88-17 – "Emulsified Asphalt Fog Seal Design" – *Adopt or no action*

J. SOM Ballot Items (including any ASTM changes/equivalencies)

VI. Open Discussion (5 minutes)

VII. Adjourn

Technical Section 5b Members List

FirstName	LastName	Company	State Code	Designation	Member Type
Derek	Nener-Plante	Maine Department of Transportation	ME	Chair	Voting
Mark	Felag	Rhode Island Department of Transportation	RI	Vice Chair	Voting
Bill	Schiebel	Colorado Department of Transportation	CO	Member	Voting
Bruce	Johnson, P.E., S.E.	Oregon Department of Transportation	OR	Member	Voting
Changlin	Pan	Nevada Department of Transportation	NV	Member	Voting
Charles	Babish	Virginia Department of Transportation	VA	Member	Voting
Christopher	Peoples	North Carolina Department of Transportation	NC	Member	Voting
Curt	Turgeon	Minnesota Department of Transportation	MN	Member	Voting
Danny	Lane	Tennessee Department of Transportation	TN	Member	Voting
Greg	Milburn	Wyoming Department of Transportation	WY	Member	Voting
John	Staton	Michigan Department of Transportation	MI	Member	Voting
Kent	Miller	Nebraska Department of Roads	NE	Member	Voting
LaDonna	Rowden	Illinois Department of Transportation	IL	Member	Voting
Lyndi	Blackburn	Alabama Department of Transportation	AL	Member	Voting
Michael	Lee	Texas Department of Transportation	TX	Member	Voting
Paul	Hanczaryk	New Jersey Department of Transportation	NJ	Member	Voting
Richard	Barezinsky	Kansas Department of Transportation	KS	Member	Voting
Sejal	Barot	Maryland Department of Transportation	MD	Member	Voting
Stewart	Linz	Arkansas State Highway and Transportation Department	AR	Member	Voting
Temple	Short	South Carolina Department of Transportation	SC	Member	Voting
Travis	Walbeck	West Virginia Department of Transportation	WV	Member	Voting
William	Oliva	Wisconsin Department of Transportation	WI	Member	Voting
Becca	Lane	Ontario Ministry Of Transportation	ON	Associate Member	Voting
Evan	Rothblatt	AASHTO	DC	AASHTO Staff	Non-Voting
Amir	Hanna	Transportation Research Board	DC	Associate Member	Non-Voting
Jason	Dietz	Federal Highway Administration	DC	Ex Officio	Non-Voting
Larry	Tomkins	Ergon Asphalt and Emulsions, Inc.	MS	Friend	Non-Voting
Larry	Scofield	International Grooving and Grinding Association	NY	Friend	Non-Voting
Robert	Horan	Asphalt Institute	VA	Friend	Non-Voting
Casey	Soneira	AASHTO Re:source	MD	Liaison	Non-Voting
John	Malusky	AASHTO Re:source	MD	Liaison	Non-Voting
Bartholomew	Sweeney	Connecticut Department of Transportation	CT	Member	Non-Voting
Brian	Egan	Tennessee Department of Transportation	TN	Member	Non-Voting
Brian	Pfeifer	Illinois Department of Transportation	IL	Member	Non-Voting
Christopher	Ohm	Wisconsin Department of Transportation	WI	Member	Non-Voting
Jeffrey	Milton	Virginia Department of Transportation	VA	Member	Non-Voting
Jose	Lima	Rhode Island Department of Transportation	RI	Member	Non-Voting
Kyle	Lester	Colorado Department of Transportation	CO	Member	Non-Voting
Scott	George	Alabama Department of Transportation	AL	Member	Non-Voting

SUBCOMMITTEE ON MATERIALS

2017 Mid-Year Meeting
April 7th, 2017
1:00 - 2:00 pm EST

TECHNICAL SECTION 5b
Bridge and Pavement Preservation

I. Call to Order and Opening Remarks

Welcome by Casey Soneira and explanation of rules and guidance for the webinar.

Chair- rational for meeting is to be brought up to speed on the new standard that was brought to this tech section.

II. Roll Call

Attendance list from webinar will be attached to the end of this document.

III. Presentation to be given by Larry Scofield on Diamond Grinding Specification for Pavement Preservation –

From TSP-2 Concrete Task Force- Proposal to start TF was in 2016. TF is part Agency, Industry, and Consultation/University. Started with IGGA Document. Specification/Standard was based off percent improvement (texture based). Most of the data presented is pavement management data. It isn't before/after data. Also, data is taken by spot sampling rather than line laser. Main goal is to improve ride characteristics. Not intended for new construction acceptance.

IV. Open Discussion

RI (Franco)- Do you expect any type of fin or separation left over? The grinding process is intended to minimize the presence of fins. They may not break off easily with more durable aggregates but yes, the presence of fins should be minimized. **RI (Franco)-** Do you want to remove the slurry afterward? Yes. Vacuum extraction is used, but then what do you do with

it? Some agencies allow you to move it to the side of the road or move it elsewhere. It is agency specific.

AL-Agrees with Section 4.4.4. It may be state specific. Section 5.1 needs to have a statement about cleaning joints. Why is outside edge referenced rather than centerline in Section 6.1.? Is there a benefit to referencing outside edge? It may just be an oversight. Going to defer response to a later date after review. It may be for consistency.

RI (Franco)- is any workmanship or is there anything that can be held to evaluate a contractor's performance? Creating a fin specification can be problematic since they are in the eye of the beholder. The owners of the projects just need to say that the grinding is unacceptable upon inspection.

RI (Franco)- How can you get a contractor to maintain groove sizes/spacing? This spec is not about grooving. There are other specifications regarding that subject.

Question was sent to Larry**:** If there are states that do not seal, then this grind needs to be blown out.

ME (CHAIR)- What are the next steps? Do we want to send this to TS ballot? Are any revisions needed or should we proceed and allow the ballot process to work out?

AL- Send it to TS ballot.

Chair- Any objections? None. ***We will move forward with a draft standard in the beginning of May and move to a TS Ballot***. If you have any additional thoughts, please contact Chair, Vice-Chair, or AASHTO liaison.

Larry- is a terminology statement needed? See section 3.1 of proposed standard.

Chair- is there anyone on the concrete TF who can resolve the issue?

Vice Chair (Felag)- Not all sections need to be filled in. It may be optional.

Larry- we may just want the section to be removed.

Chair- we can remove other sections such as the Keywords or Annexes.

V. New Business:

TN- Putting final touches on high friction treatments. It is going to stay in 4c. Also, have a thin-overlay system (practice and application) that will be sent over to 5b.

Jason- Comment on a tack coat spec. Issue with term of "trackless tack". There weren't enough suppliers to add this in right now. Is there anyone who could follow up with this? **RI (Franco)-** this will need to go through TS2a (EML). There is a ballot out there and it will probably come back through. We can make revisions at that time and then re-ballot. It was recommended that contact be made with the Chair of TS2a. **RI (Franco)**-

what is the agreement between TS2a and 5b regarding the transfer of standards? **Chair**- The standards that are being developed would stay with 2a until they were full standards/specs, then be brought into 5b for maintenance.
RI (Franco)- ETF Meeting will be in Denver in May. If you would like to be part of the group, please reach out to Colin.

Chair- This TS will meet at the SOM Meeting in Phoenix. It is tentatively schedule for Wednesday morning the week of SOM.

VI. Adjourn

Attendance List:

Last Name	First Name	Email Address
Nener-Plante (C)	Derek	derek.nener-plante@maine.gov
Felag (VC)	Mark	mark.felag@dot.ri.gov
Barezinsky	Rick	rick.barezinsky@ks.gov
Blackburn	Lyndi	blackburnl@dot.state.al.us
Byrne	Mike	michael.byrne@dot.ri.gov
Colin	Franco	colin.franco@dot.ri.gov
Curtis	Jeff	jcurtis@mdot.ms.gov
Darter	Michael	midarter@gmail.com
George	Scott	georges@dot.state.al.us
Hanczaryk	Paul	Paul.Hanczaryk@dot.nj.gov
Horner	Ron	rhorner@nd.gov
Lane	Danny	danny.lane@tn.gov
Malusky (L)	John	jmalusky@aashtoresource.org
Metcalfe	Oak	rmetcalfe@mt.gov
Peoples	Chris	cpeoples@ncdot.gov
Rothblatt	Evan	erothblatt@aashto.org
San Angelo	Michael	michael.sanangelo@alaska.gov
Scofield	Larry	lscofield@pavement.com
Seiter	Scott	sseiter@odot.org
Short	Temple	shorttk@scdot.org
Soneira (L)	Casey	csoneira@aashtoresource.org
Tedford	Darin	dtedford@dot.nv.gov
Uhlmeyer	Jeff	ulhmeyj@wsdot.wa.gov
Zwanka	Merrell	mzwanka@scdot.org

Tech Section 5B Spring/Summer Ballot

Greetings 5B members,

Please find the first ballot for Technical Section 5B attached. There are seven proposed standards on this ballot. Please bear with me as this is my first ballot as a new technical section chair.

Thanks and let me know if you have any questions.

Derek Nener-Plante, P.E.
Chair, Technical Section 5b
AASHTO Subcommittee on Materials

Ballot Table of Contents

Standard Specification for

Diamond Grinding for Pavement Preservation

AASHTO Designation: M xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

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

Standard Specification for

Diamond Grinding for Pavement Preservation

AASHTO Designation: M xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

1. SCOPE

1.1. This specification covers the requirements for diamond grinding pavements to improve the ride characteristics, texture, and frictional properties of the roadway surface. The specifications are intended for use when continuous diamond grinding is required. These specifications are applicable to either asphalt concrete or Portland cement concrete pavements.

1.2. These specifications are not intended for use with bump grinding which is conducted during the new construction process to eliminate discrete location roughness. Although the use of these specifications for that application will still provide satisfactory results, it may eliminate equipment which may otherwise satisfactorily accomplish the intended goal.

1.3. These specifications are not intended for application on local streets that contain utilities such as water valves, man holes, and curb and gutter. Often these roadway features as well as intersecting roadway grades prevent achieving the smoothness tolerances.

1.4. The values stated in either inch-pound or SI units are to be regarded separately as the standard; the SI units are shown in brackets. The values stated in each system are not exactly equivalent; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. REFERENCED STANDARDS

2.1. *ASTM Standard*:

- ASTM XXXX

3. TERMINOLOGY

3.1. The terminology section of ASTM XXXX is applicable to this specification.

3.2. *Definition of Terms Specific to this Standard*:

3.2.1. *area of localized roughness*—Any point with a continuous 25-ft length of IRI exceeding specification requirements.

3.2.2. *blade spacing*—Refers to the separation between cutting blades (measured as the number of blades per ft) spaced along the drum (rotating shaft) on the grinding equipment. The blade spacing

is impacted by the hardness of the aggregate of the material being diamond ground; particularly for concrete pavement.

3.2.3. *diamond grinding*—Diamond grinding is the removal of a thin layer of hardened concrete or asphalt concrete pavement surface using a self-propelled machine outfitted with a series of closely spaced diamond saw blades mounted on a rotating shaft.

3.2.4. *distance measurement device (DMI)*—A device used to measure the distance between two points.

3.2.5. *effective wheel base*—The effective wheel base is defined as the distance from the front wheel assembly transverse pivot point to the transverse pivot point of the profile/depth control/ground drive wheels.

3.2.6. *inertial profiler*—A commercial device produced to measure pavement profile. The device uses an accelerometer to form an inertial reference, a laser-height sensor to measure the pavement surface location relative to that reference, and a DMI to measure the longitudinal distance traveled during the testing. These sensor outputs are used by the equipment to produce the pavement profile.

3.2.7. *international roughness index (IRI)*—A roughness statistic that summarizes the impact of pavement profile on vehicle response for a passenger car, of specified properties, traveling at 50 mph. The IRI is computed from a single longitudinal profile using a quarter-car simulation as described in ASTM E1926.

3.2.8. *mean roughness index (MRI)*—A roughness statistic calculated by averaging the IRI values computed for the left and right wheelpath profiles, respectively.

3.2.9. *pavement preservation*—In the context of this specification, refers to in-service asphalt concrete or Portland cement concrete pavements in need of surface modification to improve ride quality, enhance frictional properties, increase texture, improve roadway template, or reduce tire-pavement noise generation. Diamond grinding for these activities is generally conducted as a continuous grinding operation throughout the entire project.

3.2.10. *percent ride improvement*—A measure of the change in ride quality as a result of the diamond grinding operation. Percent improvement is determined by measuring the roadway profile before and after the grinding operation. The equation is: Percentage of Improvement= $(S_b - S_a)/S_b \times 100$, where S_b is the smoothness (IRI) before grinding and S_a is the smoothness (IRI) after grinding.

4. EQUIPMENT

4.1. Grinding shall be performed using diamond blades mounted on a self-propelled machine designed for grinding and texturing pavement. The grinding equipment shall be a minimum 35,000 lb including the grinding head, and of a size that will grind a strip at least 3 ft wide. The effective wheel base of the machine shall be no less than 12 ft.

4.2. The equipment shall have a positive means of vacuuming the grinding residue from the pavement surface, leaving the surface in a clean, near-dry condition.

4.3. Grinding equipment that causes raveling, aggregate fractures, or disturbance to the joints shall not be permitted.

4.4. The equipment shall be maintained to ensure it is in proper working order, with attention paid to the roundness of the match and depth control wheels.

5. CONSTRUCTION

5.1. The construction operation shall be scheduled and proceed in a manner that produces a neat, uniform finished surface. Full- and partial-depth concrete repairs, slab stabilization and dowel bar retrofit shall be completed prior to any grinding. Joint sealing shall be completed subsequent to the diamond grinding operations.

5.2. Grind joint or crack faults so there is no more than a $^{1}/_{16}$-in. differential between adjacent sides of the joints and cracks. Grinding will also address pavement conditions such as warp and curl to provide an acceptable ride.

5.3. Lateral drainage shall be achieved by maintaining a constant cross slope between grinding extremities in each lane. The finished cross slope shall match the pre-grind cross slope and shall have no depressions or misalignment of slope greater than $^{1}/_{4}$-in. in 12 ft when measured with a 12-ft straightedge placed perpendicular to the centerline. Steps will be taken to ensure that wheel path rutting is removed to the agency requirements and that the grinding operation is simply not texturing the wheel path depressions. Areas of deviation shall be reground. Straightedge requirements will not apply across longitudinal joints or outside the ground area. Shoulder, auxiliary, or ramp lane grinding shall transition from the edge of the mainline as required to provide drainage leaving no more than a $^{3}/_{16}$-in. ridge and an acceptable riding surface.

5.4. Grinding shall begin and end at lines normal to the pavement centerline at the project limits. Passes of the grinding head shall not overlap more than 1 in. No unground surface area between passes will be permitted.

6. FINAL SURFACE FINISH

6.1. The grinding process shall produce a pavement surface that is true in grade and uniform in appearance with longitudinal line-type texture. The line-type texture shall contain corrugations parallel to the centerline and present a narrow ridge corduroy type appearance. The peaks of the ridges shall be $^{1}/_{8}$ in. $\pm$ $^{1}/_{16}$ in. higher than the bottom of the grooves with evenly spaced ridges.

6.2. It shall be the contractor's responsibility to select the number of blades per foot to be used to provide the proper surface finish for the aggregate type and concrete present on the project.

Note 1— The number of blades used for grinding will range between 50 and 60 blades per foot as necessary to provide the designated texture. Harder aggregate may require the use of 55 to 60 blades per ft.

6.3. The engineer may require removal of unbroken fins at the contractor's expense.

Note 2— The project conditions may dictate that the contractor has to make multiple passes with the equipment to meet the specifications.

6.4. It is the contractor's responsibility to determine the proper sequence of operations to meet the specification. If multiple passes of the grinding equipment are required, the area will only be considered for payment once. A minimum of 95 percent of any 100-ft section of pavement surface shall be textured. Depressed pavement areas due to subsidence or other localized causes will be exempted from texture and smoothness requirements.

7. SLURRY HANDLING AND REMOVAL

7.1. Slurry shall be collected, processed and disposed of in accordance with applicable requirements.

8. SMOOTHNESS REQUIREMENTS

8.1. An initial MRI representative of portions of the project may be available. When available, this information represents the conditions that existed at the time the survey was made. The contractor is cautioned to note the survey date survey, since conditions may have changed over time. This profile is for informational purposes only, to give the contractor an idea of the conditions that existed at the time of the survey. The contractor assumes the risk of error if the information is used for any purpose other than as stated. Contractors are responsible for visiting the project site to make their own condition determination prior to bidding.

8.2. Prior to performing any grinding work, the contractor shall provide a control profile developed using an inertial profiler with a laser that simulates the tire footprint. Single point lasers shall not be used. Line laser equipment such as RoLine™, Gocator™ or an approved equivalent shall be used. All equipment shall have current certification and be approved by the contracting authority.

8.3. The control profile will be used to identify the required smoothness for the project as indicated in Table 1. The control profile will be obtained after any and all corrective work which impacts the pavement roughness such as slab repairs, DBR, pothole repair, etc. The profile will be obtained in 0.1 lane mile-long segments (528 ft), and the location of each segment accurately established, either through stationing or GPS coordinates.

8.4. The finished surface shall have a final MRI improvement in accordance with Table 1 and grinding will not be considered acceptable until the smoothness requirements are achieved. It is important that the segment locations from the control profile match the segment locations tested in the smoothness acceptance measurements.

8.5. Depressed pavement areas due to subsidence or other localized causes will be excluded from the smoothness requirements. These areas shall be reviewed by the engineer for approval.

8.6. The contractor shall measure profiles in both wheel paths and average the resulting IRI to determine acceptance (i.e. MRI). The profiles shall be measured 3 ft from each lane line. A guide shall be used to ensure proper alignment of the profile. The contractor shall notify the agency when profile testing will be conducted. The contractor shall provide the profile traces to the agency within 24 hr after testing.

8.7. The engineer shall conduct comparison profiles on no less than 10 percent of the segments using the same type of certified equipment as the contractor. When light weight profilers are used, it is of great importance that a proper guide is used to ensure that all testing is completed over the same track. The contractor and agency testing should be completed during the same time of day and under similar climatic conditions. The results of these verification profiles shall not vary more than 10 percent from the contractor profiles.

8.8. The engineer may choose to accept isolated sections if the variance between the two profiles is less than 15 percent. When the difference exceeds 15 percent on an isolated basis or 10 percent on a consistent basis, referee testing will be required to determine which device is providing an accurate evaluation of the pavement surface. The party found to have the inaccurate equipment will pay for the referee testing. The engineer may choose to withhold payment for segments that do not meet these criteria until the problem is resolved. The engineer may choose to obtain verification profiles on the entire project if the comparison profiles are constantly outside the allowable tolerance. The engineer will charge for additional testing if the contractor's operation is found to be in error. Segments found not meeting the smoothness requirements will require regrinding at no additional cost to the department.

8.9. For roadways with posted speeds less than or equal to 45 mph, the finished ground surface shall not include any bumps exceeding 0.3 in. in 25 ft. For roadways with posted speeds greater than

45 mph, the localized roughness (IRI) will be less than or equal to 160 in./mi, when determined using the ProVAL Assurance Module with a 25-ft baseline.

8.10. The conditions of smaller municipal projects may not be suited for the above type of smoothness requirements. In these cases, the only smoothness requirement may be $^1/_8$-in. variance in a 12-ft straightedge test.

8.11. Incentives and disincentives can be used to increase the quality of construction.

8.12. Agencies are encouraged to develop their own smoothness requirements based on local conditions and pavement performance.

Table 1—Smoothness Requirements

Posted Speed Limit (mph)	Existing MRI	Required Post Grind MRI
≤45	≤230	<138
	>230	≤ 0.4* (Existing Segment MRI)
>45	≤130	<78
	>130	≤ 0.4* (Existing Segment MRI)

9. METHOD OF MEASUREMENT

9.1. Grinding will be measured by the square yard of area diamond ground. The measurement will be the final textured surface area regardless of the number of passes required to achieve acceptable results. Minor areas of unground pavement within the designated areas to be ground will be included in the measurement.

9.2. When conditions require a feather pass into the shoulder or auxiliary or ramp lanes, measurement for payment will be by the square yard based on a width of 2 ft times the length of the required feather pass. The minimum length of feather pass will be 100 ft.

10. BASIS OF PAYMENT

10.1. Grinding will be paid for at the contract price per square yard. Payment shall be full compensation for all labor, equipment, materials and incidentals to complete this work, including hauling and disposal of grinding residue.

11. KEYWORDS

11.1. Blades; concrete pavement preservation; diamond grinding; friction; inertial profiling; pavement preservation; roughness; slurry; smoothness; texture.

[1] New standard endnote TBD. (Different for provisional vs. full standard.)

Standard Specification for

Materials for Emulsified Asphalt Sand Seals

AASHTO Designation: MP xx-yy[1]
Release: Group x (date)

AASHTO

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

Standard Specification for

Materials for Emulsified Asphalt Sand Seals

AASHTO Designation: MP xx-yy[1]
Release: Group x (date)

AASHTO

1. SCOPE

1.1. A sand seal is an application of emulsified asphalt, followed immediately by an application of a single layer of fine graded cover aggregate, which is then rolled for embedment. The seal may be applied in multiple lifts depending on traffic demands and existing road surface conditions.

1.2. This standard specifies quality requirements for aggregate and emulsified asphalt for sand seals.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 140, Emulsified Asphalt
- M 208, Cationic Emulsified Asphalt
- T 11, Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 176, Plastic Fines in Graded Aggregates and Soils by Use of Sand Equivalent Test
- T 304, Fine Aggregate Angularity

3. TERMINOLOGY

3.1. *Definitions*:

3.1.1. *Rapid-setting type emulsified asphalt*—any emulsified asphalt containing the CRS, CHFRS, HFRS, or RS designation as referenced in M 140, or M 208.

3.1.2 *Medium-setting type emulsified asphalt*—any emulsified asphalt containing the MS or HFMS designation as referenced in M140.

3.1.2. *Cationic slow-setting*—any emulsified asphalt containing the CSS-1 or CSS-1h designation as reference in M 208.

4. SIGNIFICANCE AND USE

4.1. This standard specification may be used to select and evaluate materials for the construction of emulsified asphalt sand seals.

5. EMULSIFIED ASPHALT REQUIREMENTS

5.1. Emulsified asphalt for sand seals shall meet the requirements of rapid-setting, medium-setting or cationic slow-setting type emulsified asphalt in M 140 or M 208.

5.2. The emulsified asphalt residue hardness classification is determined by the Owner Agency utilizing regional climatic and traffic conditions.

6. AGGREGATE REQUIREMENTS

6.1. Sand seal aggregate shall be durable, uniform in quality, and free from deleterious materials. Gradations and quality requirements are specified in Table 1. All percentages are by mass. The nominal maximum aggregate size (NMAS) to be used will be as specified by the Owner Agency.

Table 1—Requirements for Sand Seal Aggregates

Sieve Size (see T 11 or T 27)	Passing, %		
	I	II	III
$^{3}/_{8}$ in.	100	100	100
No. 4	100	90–100	70–90
No. 8	90–100	65–90	45–70
No. 16	65–90	45–70	28–50
No. 30	40–65	30–50	19–34
No. 50	25–42	18–30	12–25
No. 100	15–30	10–21	7–18
No. 200	10–20	5–15	5–15

Note, stockpile tolerances may be set by the local paving authority

Sand Equivalent Test	45 minimum for all aggregate types

7. KEYWORDS

7.1. Aggregate; sand seal; emulsified asphalt.

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

Standard Specification for

Materials for Emulsified Asphalt Scrub Seal

AASHTO Designation: M xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

AASHTO

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

Standard Specification for

Materials for Emulsified Asphalt Scrub Seal

AASHTO Designation: M xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

1. SCOPE

1.1. A scrub seal is the application of emulsified asphalt with a scrub broom followed immediately by an application of a single layer of cover aggregate. The treatment can be applied as a wearing surface or as an interlayer.

1.2. This standard specifies quality requirements for aggregate and emulsified asphalt for scrub seals.

2. REFERENCED STANDARDS

2.1. *AASHTO Standards*:

- M 140, Emulsified Asphalt
- M 208, Cationic Emulsified Asphalt
- M 316, Polymer-Modified Emulsified Asphalt
- R 66, Sampling Asphalt Materials
- R 78, Recovering Residue from Emulsified Asphalt Using Low-Temperature Evaporative Techniques
- T 11, Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 49, Penetration of Bituminous Materials
- T 96, Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- T 111, Mineral Matter or Ash in Asphalt Materials
- T 179, Effect of Heat and Air on Asphalt Materials (Thin Film Oven Test)
- T 201, Kinematic Viscosity of Asphalts (Bitumens)
- T 202, Viscosity of Asphalts by Vacuum Capillary Viscometer
- T 240, Effect of Heat and Air on a Moving Film of Asphalt Binder (Rolling Thin-Film Oven Test)
- T 301, Elastic Recovery Test of Asphalt Materials by Means of a Ductilometer
- T 335, Determining the Percentage of Fracture in Coarse Aggregate
- T 350, Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer

2.2. *ASTM Standards*:

- D471, Standard Test Method for Rubber Property—Effect of Liquids
- D4124, Standard Test Method for Separation of Asphalt into Four Fractions
- D7226, Standard Test Method for Determining the Viscosity of Emulsified Asphalts Using a Rotational Paddle Viscometer
- D7403, Standard Test Method for Determination of Residue of Emulsified Asphalt by Low Temperature Vacuum Distillation
- D7944, Standard Practice for Recovery of Emulsified Asphalt Residue Using a Vacuum Oven

2.3. *Federal Lands Highway (FLH) Standard*:

- FLH T 508, Flakiness Index Value

3. TERMINOLOGY

3.1. *Definition*:

3.1.1. *polymer modified rejuvenating emulsion (PMRE)*—Medium setting emulsified asphalt for scrub seal application that meets the requirements of Table 1 and includes components that meet the requirements of Tables 2 and 3.

4. SIGNIFICANCE AND USE

4.1. This standard may be used to select and evaluate materials for the construction of emulsified asphalt scrub seals

5. POLYMER MODIFIED REJUVENATING EMULSION (PMRE) REQUIREMENTS

5.1. Sample, store, and test within the time frame specified in section 3.1 of M 316. Refer to Section 3.1 for definition of sample condition that is indicative of a compromised sample that must be discarded.

5.2. Emulsified asphalt (PMRE) for scrub seal shall meet the requirements of medium setting type cationic emulsified asphalt, rejuvenating agent, and modifier in Tables 1 through 3.

5.2.1. Product certification and acceptance testing requires only one of the alternate test methods provided in Table 1 for emulsion viscosity. The product can be certified and accepted using either method provided the requirements in Table 1 are met.

Table 1—Requirements for Scrub Seal Emulsified Asphalt (PMRE)

Grade	PMRE[a] Min	PMRE[a] Max
Tests on Emulsified Asphalt		
Viscosity, Saybolt Furol, 50°C (122°F)[b], s	50	400
Viscosity, Rotational Paddle Viscometer, 50°C (120°F), cPs	110	880
Storage stability test, 24 h, %[b]		1.0
Demulsibility, 35 mL, 0.8% Sodium Dioctyl sulfosuccinate, %	Report Only	
Sieve test, %:		0.10
Particle charge	Positive	
Distillation[c]:		
Oil distillate, by volume of emulsified asphalt, %		1
Residue, %	65	
Tests on residue from distillation[d]:		
Penetration, 4°C (39°F), 200 g, 60 s, 0.1 mm	40	
MSCR Percent Recovery at 3.2 kPa, 10°C (50°F), %	55	—
Ash Content, %		1
Viscosity, 60°C (140°F), Pa·S	—	5000

[a] Samples of emulsified asphalt will be taken in accordance with R 66, M 140, M 208, and M 316. Samples must be stored at a temperature of not less than 4°C until tested.

[b] This test requirement and associated specification limits are waived if successful applications of the material are achieved in the field.

[c] Distill to 175°C (347°F).

[d] Residue preparation for testing may use the alternate methods, R 78, ASTM D7403, or ASTM D7944, so as not to negatively affect the properties of any polymer modifiers contained therein.

5.3. Alternate recovery methods as defined in Table 1, Note d may be used to prepare the emulsified asphalt residue for testing in accordance with Table 5, if approved by the owner. Properties of the residue recovered using alternate methods may differ from those obtained after distillation. The same method to prepare the residue must be used when comparing test results from the residue.

Table 2—Tests on Rejuvenating Agent

	Method	Min	Max
Tests on Rejuvenating Agent			
Viscosity, 60°C (140°F), CST	T 201	50	300
Flash Point, °C (°F)	T 48	193 (380)	
Saturates, %	ASTM D4124		30
Tests on TFO or RTFO Residue			
Mass Change, %	T 179 or T 240		6.5
Viscosity Ratio	T 179 or T 240		3

Table 3—Tests on Modifier

	Method	Min	Max
Tests on Modifier			
Mass Change, %	ASTM D471 (modified)		60%

5.4. *Modify ASTM D471 as follows*:

5.4.1. Place 0.8 g of modifier into an 18-mm diameter DSR mold.

5.4.2. If necessary, dry at ambient lab conditions for 72 hr.

5.4.3. Remove the modifier from the mold and place the sample into a forced draft oven on release paper for 48 hr at 40°C.

5.4.4. After 48 hr, cool and weigh the sample to the nearest 0.0001 g. Record the weight.

5.4.5. Pour 30 g of rejuvenating agent in a 90-mL metal container.

5.4.6. Place modifier sample in the container and add another 30 g of rejuvenating agent. Ensure the latex or polymer sample is completely covered; add more rejuvenating agent if necessary.

5.4.7. Cover the container with a metal lid and place it into a 40°C oven for 48 hr.

5.4.8. Remove the sample from the container. Use a paper towel to blot the surface of the sample to remove excess rejuvenator. Allow sample to cool to room temperature and weigh to the nearest 0.0001 g.

5.4.9. Calculate the mass change, expressed in Equation 1. Mass change will be positive.

$$\text{Mass Change (\%)} = \frac{M_2 - M_1}{M_1} \qquad (1)$$

where:

M_1 = Mass of modifier sample before being conditioned in the rejuvenating agent (g); and

M_2 = Mass of modifier sample after conditioning in the rejuvenating agent (g).

6. AGGREGATE REQUIREMENTS

6.1. Scrub seal aggregate shall be durable; uniform in quality; and free from wood, bark, roots, and other deleterious materials. Gradations and quality requirements are specified in Table 4. All percentages are by weight. The aggregate size to be used will be as shown in the plans. Aggregate retained on the 4.75-mm (No. 4) screen shall be crushed by mechanical means meeting the requirements shown in Table 5.

Table 4—Chip Seal Aggregate Gradation Limits T 11/T 27

	Passing, %		
Nominal Sieve Size	Type I	Type II	Type III
12.5 mm (1/2 in.)	100	100	100
9.5 mm (3/8 in.)	90–100	90–100	100
7.9 mm (5/16 in.)	—	—	90–100
4.75 mm (No. 4)	5–20	10–30	10–80
2.36 mm (No. 8)	0–5	0–10	5–30
1.18 mm (No. 16)	0–5	0–5	0–15
0.075 mm (No. 200)	0–3	0–3	0–5

Table 5—Fracture and Quality Requirements

	Scrub Seal Application	
Property	Interlayer	Surface Treatment
Fracture, 1 Face,% min T 335	70	85
Fracture, 2 Faces,% min T 335	60	80
Los Angeles Abrasion, max. % loss, T 96	37	35
Flakiness Index Value, max. % , FLH T 508	35	30

Note 1—Adopt additional tests or revised limits based on aggregate quality standards in the state of application.

7. KEYWORDS

7.1.

[1] New standard endnote TBD. (Different for provisional vs. full standard.)

Provisional Standard Specification for

Thin Overlay Treatments Using a Binder Resin System and Aggregate for Concrete Surfaces

AASHTO Designation: MP xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
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1. SCOPE

1.1. This specification describes the materials for thin overlay treatments using a binder resin system and aggregates for concrete surfaces. The application of the thin overlay is comprised of a minimum of two layers using a binder resin system and surface-applied aggregate.

1.2. Use the thin overlay in a double lift application (binder resin system and aggregate) for above-grade concrete surfaces (such as bridges, ramps, overpasses, directional flyovers, stacked interchanges, and viaducts).

1.3. Binder resin systems include low modulus epoxies, methyl methacrylate, and polyester resins.

1.4. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use*.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 235M/M 235, Epoxy Resin Adhesives
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 96, Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- T 242, Frictional Properties of Paved Surfaces Using a Full-Scale Tire
- T 255, Total Evaporable Moisture Content of Aggregate by Drying

2.2. *ASTM Standards*:

- C25, Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
- C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
- C778, Standard Specification for Standard Sand
- C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

- C884/C884M, Standard Test Method for Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay
- D638, Standard Test Method for Tensile Properties of Plastics
- D695, Standard Test Method for Compressive Properties of Rigid Plastics
- D2240, Standard Test Method for Rubber Property—Durometer Hardness
- D2556, Standard Test Method for Apparent Viscosity of Adhesives Having Shear-Rate-Dependent Flow Properties Using Rotational Viscometry
- D3278, Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
- E573, Standard Practices for Internal Reflection Spectroscopy

3. TERMINOLOGY

3.1. *binder resin system*—a polymeric resin used to bond a surface-applied aggregate to an asphalt or concrete pavement.

3.2. *prime coat*—a polymeric resin that is used to fill cracks and voids in existing pavement surface that is compatible with the binder resin system.

3.3. *thin overlay treatment*—a binder resin system and surface-applied aggregate utilized to preserve concrete against chloride intrusion and provide a wearing surface.

4. SUMMARY

4.1. This specification describes furnishing a thin overlay material for concrete above-grade surfaces.

4.2. The thin overlay is comprised of a double layer using a binder resin system that holds a surface applied aggregate firmly in place.

4.3. The thin overlay may be applied by either mechanical or manual techniques.

5. SIGNIFICANCE AND USE

5.1. The thin overlay is used primarily for preserving a concrete structure from deterioration by providing a wearing surface and a barrier against chloride intrusion.

5.2. Typically, recommended locations for thin overlay installations include concrete surfaces above grade (such as bridges, ramps, overpasses, directional flyovers, stacked interchanges, and viaducts) and other identified structures where preservation of existing concrete is required.

5.3. Thin overlay can provide improved friction on a concrete structure by utilizing a high friction aggregate. However, this specification is not intended to address these high friction surface treatments.

6. MATERIALS

6.1. *Binder Resin Systems*:

6.1.1. *Binder Resin System*—Binder resin systems shall be recommended by the manufacturer as suitable for use on the intended pavement surface and for the potential range of atmospheric exposure.

6.1.2. *Prime Coat*—A primer shall be used before application of the binder resin system when recommended by the manufacturer.

6.1.3. The properly proportioned and mixed binder shall conform to the requirements of Table 1, Low Modulus Epoxy; Table 2, Methyl Methacrylate (MMA); and Table 3, Polyester Resins. See Section 7.0 for sample preparation and testing procedures.

Table 1——Physical Requirements for Low Modulus Epoxy

Property	Test Method	Requirements
Viscosity	ASTM C881/C881M /AASHTO M 235M/M 235	1000 Centipoise minimum[a]
Flash Point	ASTM D3278 (see Note 3 of D3278)	See safety data sheet (SDS)
Gel Time	ASTM C881/C881M /AASHTO M 235M/M 235	10 minutes minimum
Compressive Modulus:	ASTM D695	
7 days		130,000 psi maximum
Compressive Strength:	ASTM C579 Test Method B	
3 hours		1000 psi minimum
24 hours		3000 psi minimum
Tensile Strength:	ASTM C881/C881M /AASHTO M 235M/M 235	
7 days		2000–5000 psi
Tensile Elongation	ASTM C881/C881M /AASHTO M 235M/M 235	30% minimum
Absorption	ASTM C881/C881M /AASHTO M 235M/M 235	1.0% maximum
Type D Hardness	ASTM D2240	60–80
Thermal Compatibility	ASTM C884/C884M	PASS
Infrared Spectrum	ASTM E573	Combined and Components[b]

[a] Epoxies with low viscosities may be unsuitable for some heated mechanical applications.

[b] Methodologies for comparisons should be similar.

Table 2—Physical Requirements for Methyl Methacrylate (MMA)

Property	Test Method	Requirements
Viscosity	ASTM C881/C881M /AASHTO M 235M/M 235	1500–2500 Centipoise minimum
Flash Point	ASTM D3278 (see Note 3 of D3278)	See SDS
Gel Time	ASTM D2471 (60 g)	15 minutes minimum
Compressive Modulus:	ASTM D695	
7 days		130,000 psi maximum
Compressive Strength:	ASTM C881/C881M /AASHTO M 235M/M 235	
7 days		1500–3000 psi
Tensile Strength:	ASTM C881/C881M /AASHTO M 235M/M 235	
7 days		500–1000 psi
Tensile Elongation	ASTM C881/C881M /AASHTO M 235M/M 235	50% minimum
Absorption	ASTM C881/C881M /AASHTO M 235M/M 235	1.0% maximum
Type D Hardness	ASTM D2240 Cure specimen for 7 days	50–60
Infrared Spectrum	ASTM E573	Combined and Components[a]

[a] Methodologies for comparisons should be similar.

Table 3—Physical Requirements for Polyester Resins

Property	Test Method	Requirements
Viscosity	ASTM C881/C881M /AASHTO M 235M/M 235	1000 Centipoise minimum[a]
Flash Point	ASTM D3278 (see Note 3 of D3278)	See SDS
Gel Time	ASTM C881/C881M /AASHTO M 235M/M 235	10 minutes minimum
Compressive Strength:	ASTM C579 Test Method B	
3 hours		1000 psi minimum
24 hours		3000 psi minimum
Tensile Strength:	ASTM C881/C881M /AASHTO M 235M/M 235	
7 days		2000–5000 psi
Tensile Elongation	ASTM C881/C881M /AASHTO M 235M/M 235	30% minimum
Absorption	ASTM C881/C881M /AASHTO M 235M/M 235	1.0% maximum
Type D Hardness	ASTM D2240 Cure specimen for 7 days	60–80
Thermal Compatibility	ASTM C884/C884M	PASS
Infrared Spectrum	ASTM E573	Combined and Components[b]

[a] Epoxies with low viscosities may be unsuitable for some heated mechanical applications.

[b] Methodologies for comparisons should be similar.

6.1.4. For each project, provide independent laboratory reports documenting that the resin binder meets the requirements of Section 6.

6.1.5. A sample of the resin binder or components lot/batch shall be supplied upon request.

6.1.6. Failure to comply with the specified material properties shall result in rejection of the material lot/batch provided.

6.2. *Aggregates*:

6.2.1. Surface Applied Aggregate:

6.2.2. The type of aggregate shall be a hard, durable, polish-resistant, quality aggregate that is clean, dry, and free from foreign matter and specified by the Owner Agency.

6.2.3. The surface-applied aggregate shall meet the grading requirements of Table 4. See Section 7 for sample preparation and testing procedures.

Table 4—Aggregate Grading Requirements

Property	Test Method	Requirements
Aggregate Grading:	AASHTO T 27	% Passing:
No. 4 Sieve		100% minimum
No. 6 Sieve		95% minimum
No. 16 Sieve		5% maximum
No. 30 Sieve		0.2% maximum

6.2.4. A sample of the aggregate lot/batch shall be supplied upon request.

7. METHOD OF TESTING

7.1. *The binder resin systems tests shall be completed in accordance with the following*:

7.1.1. *Viscosity*—ASTM D2556.

7.1.1.1. Prepare a 1-Pt sample following the manufacturer's recommendation and mix for 2 to 3 min before testing. Take viscosity readings at 73 ± 2°F (23 ± 1°C).

Note 1—Mixing may cause resin to increase in temperature. Lowering of component temperatures may be necessary to take the viscosity readings at 73 ± 2°F (23 ± 1°C).

7.1.1.2. Use ASTM D2556-11 Appendix X1.1 for spindle selection.

7.1.2. *Flash Point*—ASTM D3278 (see Note 3 when testing organic peroxides).

7.1.3. *Gel Time*—AASHTO M 235M/M 235 or ASTM C881/C881M.

7.1.3.1. Prepare a 60-g sample of mixed resin following the manufacturer's recommendation.

7.1.3.2. Perform testing at a temperature of 73 ± 2°F (23 ± 1°C).

7.1.4. *Ultimate Tensile Strength*—AASHTO M 235M/M 235 or ASTM C881/C881M.

7.1.4.1. Prepare sample following the manufacturer's recommendation.

7.1.4.2. Prepare Type I specimens in accordance with ASTM D638.

7.1.4.3. Cure specimens for 7 days at 73 ± 2°F (23 ± 1°C).

7.1.4.4. Test specimens at 73 ± 2°F (23 ± 1°C) without delay.

7.1.5. *Elongation at Break Point*—AASHTO M 235M/M 235 or ASTM C881/C881M.

7.1.5.1. Prepare sample following the manufacturer's recommendation.

7.1.5.2. Prepare Type I specimens in accordance with ASTM D638.

7.1.5.3. Cure specimens for 7 days at 73 ± 2°F (23 ± 1°C).

7.1.5.4. Test specimens at 73 ± 2°F (23 ± 1°C) without delay.

7.1.6. *Durometer Hardness*—ASTM D2240.

7.1.6.1. Prepare sample following the manufacturer's recommendation.

7.1.6.2. Use the Type 1 Precision-Type D Durometer Method.

7.1.6.3. Cure specimens for 7 days at 73 ± 2°F (23 ± 1°C).

7.1.6.4. Test specimens at 73 ± 2°F (23 ± 1°C) without delay.

7.1.7. *Compressive Strength at 3 h*—ASTM C579 Test Method B.

7.1.7.1. Prepare sample following the manufacturer's recommendation.

7.1.7.2. Prepare specimen according to Method B, 2-in. cube, using 2.75 parts of sand to one part of mixed polymer resin binder by volume.

7.1.7.3. Sand shall meet ASTM C778 for 20–30 sand.

7.1.7.4. Cure specimens for 3 h at 73 ± 2°F (23 ± 1°C).

7.1.7.5. Test specimens at 73 ± 2°F (23 ± 1°C) without delay.

7.1.8. *Compressive Strength at 7 days*—ASTM C579 Test Method B.

7.1.8.1. Prepare sample following the manufacturer's recommendation.

7.1.8.2. Prepare specimen according to Method B, 2-in. cube, using 2.75 parts of sand to one part of mixed polymer resin binder by volume.

7.1.8.3. Sand shall meet the requirements of ASTM C778 for 20–30 sand.

7.1.8.4. Cure specimens for 7 days at 73 ± 2°F (23 ± 1°C).

7.1.8.5. Test specimens at 73 ± 2°F (23 ± 1°C) without delay.

7.1.9. *Compressive Strength at 7 days*—M 235M/M 235 or ASTM C881/C881M.

7.1.9.1. Prepare sample following the manufacturer's recommendation.

7.1.9.2. Cure specimens for 7 days at 73 ± 2°F (23 ± 1°C).

7.1.9.3. Test specimens at 73 ± 2°F (23 ± 1°C) without delay.

7.1.10. *Water Absorption*—M 235M/M 235 or ASTM C881/C881M.

7.1.10.1. Prepare sample following the manufacturer's recommendation.

7.1.10.2. Cure specimens for 14 days at 73 ± 2°F (23 ± 1°C) before immersion.

7.1.10.3. Test specimens at 73 ± 2°F (23 ± 1°C) without delay after immersion.

7.1.11. *Thermal Compatibility*—ASTM C884.

7.1.11.1. Prepare sample following the manufacturer's recommendation.

7.1.11.2. Cure specimens for 7 days at 73 ± 2°F (23 ± 1°C).

7.1.12. *Infrared Spectrum*—ASTM E573.

7.1.12.1. *Spectroanalysis (FTIR)*—Fourier transform infrared (FTIR) analysis provides a chemical fingerprint of a material system that can be used to compare one material to another and to compare batches of a particular material.

7.1.12.2. Analysis can be carried out by transmission or by internal reflection (usually with an attenuated total reflectance accessory).

7.1.12.3. Analyses of the same material may not be comparable when data is collected in different modes (i.e., transmission vs. reflectance) or when different sample preparation techniques are used.

7.1.12.4. When comparing spectra, it is important to ensure that data was collected under the same conditions, including sample preparation and instrument conditions.

7.1.12.5. Materials can be analyzed as received (including any pigment or filler), or after processing such as dissolution or solvent extraction.

7.1.12.6. Comparative analyses need to be carried out with the same sample preparation techniques.

7.1.12.7. Review and familiarization with the referenced test methods is essential for correctly performing the spectroanalysis, including sample preparation and data analysis.

7.1.12.8. *Procedure*—Use ASTM E573 for testing by reflectance (attenuated total reflectance or other method).

7.2. *Aggregate Grading*—AASHTO T 27.

8. PACKAGING

8.1. *Binder Resin System Packaging*:

8.1.1. Binder resin system components shall be packaged in suitable, well-sealed containers clearly labeled as to the type of material and the ratio of the components to be mixed by volume. Any special instructions regarding mixing shall be included.

8.1.1.1. The label shall show resin or hardener components, brand name, name of manufacturer, lot or batch number, temperature range for storage, expiration date, and the quantity contained therein.

8.1.1.2. Caution warnings regarding contact of the binder with skin and eyes shall be included on the labels.

8.2. *Aggregate Packaging*:

8.2.1. All aggregates shall be furnished in appropriate packaging that is clearly labeled and protects the aggregate from any contaminates on the jobsite and from exposure to rain or other moisture.

8.2.1.1. The label shall show the name of the manufacturer and location of processing.

9. MATERIALS CERTIFICATION

9.1. At the request of the purchaser, the manufacturer of the binder resin system shall certify through testing that the binder resin system meets the requirements of this specification.

9.2. Such certification shall consist of either a copy of the manufacturer's independent test report or a statement by the manufacturer, accompanied by a copy of the current test results, that the binder resin system has been sampled and tested.

9.3. Such certification shall indicate the date of testing and shall be signed by the manufacturer.

9.4. At the request of the purchaser, the manufacturer of the aggregate shall certify that the aggregate meets the requirements of this specification.

9.5. Such certification shall consist of either a copy of the manufacturer's test report or a statement by the manufacturer, accompanied by a copy of the current test results, that the aggregate has been sampled and tested.

9.6. Such certification shall indicate the date of testing and shall be signed by the manufacturer.

9.7. The manufacturer shall maintain and make available upon request complete records of sampling, testing, actions taken to correct problems, and quality control inspection results.

10. FIELD EVALUATIONS OF THIN OVERLAY

10.1. *The National Transportation Product Evaluation Program (NTPEP) serves the member departments of the American Association of State Highway and Transportation Officials (AASHTO)*:

10.1.1. The results of this program may be used to provide AASHTO Member States a list of tested HFTO resins and primers, by type and manufacturer, which have been evaluated in accordance with AASHTO, AASHTO-AGC-ARTBA Task Force 34, and ACI materials specifications and guidelines.

10.1.2. Member Departments are encouraged to apply this information to improve their specifications or establish approved or prequalified product lists as they deem appropriate for their individual programs.

10.2. *The National Transportation Product Evaluation Program (NTPEP) evaluation of high friction and thin overlays for bridges and pavements (HFTO)*:

10.2.1. This program consists of a battery of laboratory evaluations and 36-month field evaluations.

10.2.2. Field test sites will be selected on asphalt pavement, concrete pavement, and concrete bridge deck.

10.2.3. These evaluations are intended to assess the product adhesion properties and any improved skid resistance of the applied products.

11. KEYWORDS

11.1. Binder resin system; concrete surfaces; thin overlay treatment.

[1] This provisional standard was first published in 2018.

Provisional Standard Practice for the

Application of Thin Overlay Treatments Using a Binder Resin System and Aggregates for Concrete Surfaces

AASHTO Designation: PP xxx-18[1]

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1. SCOPE

1.1. This practice describes the application of thin overlay treatments using a binder resin system and aggregates for concrete surfaces. The application of the thin overlay is comprised of a minimum of two layers using a binder resin system and surface-applied aggregate.

1.2. Use the thin overlay in a double lift application (binder resin system and aggregate) for above grade concrete surfaces (bridges, ramps, overpasses, directional flyovers, stacked interchanges, and viaducts).

1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. REFERENCED STANDARDS

2.1. *AASHTO Standard*:

- T 242, Frictional Properties of Paved Surfaces Using a Full-Scale Tire

2.2. *ASTM Standard*:

- ASTM E1911, Standard Test Method for Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester

2.3. *International Concrete Repair Institute Guideline*:

- ICRI Guideline No. 310.2R-2013, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

3. MATERIALS CERTIFICATION

3.1. At the request of the purchaser, the manufacturer of the binder resin system shall certify that the binder resin system meets the requirements of this specification.

3.2. Such certification shall consist of either a copy of the manufacturer's test report or a statement by the manufacturer, accompanied by a copy of the current test results, that the binder resin system has been sampled and tested.

3.3. Such certification shall indicate the date of testing and shall be signed by the manufacturer.

3.4. At the request of the purchaser, the manufacturer of the aggregate shall certify that the aggregate meets the requirements of this specification. Such certification shall consist of either a copy of the manufacturers' test report or a statement by the manufacturer, accompanied by a copy of the current test results, that the aggregate has been sampled and tested.

3.5. Such certification shall indicate the date of testing and shall be signed by the manufacturer.

3.6. The manufacturer shall maintain and make available upon request complete records of sampling, testing, actions taken to correct problems and quality control inspection results.

4. QUALIFICATION OF INSTALLER

4.1. The installer shall submit a minimum of five projects with the owner's contact information on which a cumulative minimum of 25,000 yd of thin overlay have been placed within the past 3 yr.

4.2. *Quality Control (QC) Plan*—The QC plan shall be project specific detailing installer's key personnel, equipment, materials, proposed methods of installation for binder and aggregate, materials blending procedures, and proposed curing table by temperature.

4.3. *Key Personnel*:

4.3.1. Provide contact information for key personnel.

4.3.2. Designate a project superintendent who shall have full authority to institute any action necessary for the successful operation of the QC plan.

4.3.3. Designate a lead technician who shall be present at the job site and be responsible for the required field quality control sampling and testing in conformance with the approved QC plan and contract documents.

4.4. *Equipment*:

4.4.1. Equipment calibration records of metering devices and application monitoring devices to ensure compliance with this specification.

4.4.2. Cleaning and maintenance schedule for application equipment.

4.5. *Materials*:

4.5.1. Provide procedures for storage and protection of materials both stockpiled and onsite.

4.6. *Installation of Thin Overlay*:

4.6.1. Provide procedures for mixing and placement of materials for thin overlay.

4.6.2. Provide procedures for monitoring, recording, and submittal of ambient conditions (air temperature, surface temperature, relative humidity).

4.6.3. Provide procedures for recording of quantities of materials installed.

4.6.4. Corrective Action: The quality control plan shall include corrective actions to address unsatisfactory installation, such as failure to cure, failure to meet friction values, spills, and job site hazards.

4.6.5. Submit the QC plan to the engineer for approval at least 30 days prior to the placement.

4.6.6. Any deviation from the approved QC plan shall be cause for immediate suspension of operations until corrective action is complete and approved by the owner agency.

5. RECOMMENDED CONSTRUCTION PRACTICES

5.1. *Storage of Materials*:

5.1.1. Materials shall be stored in accordance to the manufacturer's recommendations.

5.1.2. At no time shall the aggregate be exposed to rain, or moisture.

5.1.3. Safety data sheet (SDS), product data sheet, and other information pertaining to the safe practices for the storage, handling, and disposal of the materials, and to their health hazards shall be obtained from the manufacturer and posted at storage areas.

5.1.4. A copy of such information shall be provided to the engineer.

5.2. *Application Conditions*:

5.2.1. Do not apply thin overlay on a wet surface or when the surface temperature is outside the manufacturer's recommendation.

5.2.2. Do not apply when anticipated weather conditions would prevent proper application and curing of the thin overlay.

5.3. *Preparation of Surfaces*:

5.3.1. Utilities, drainage structures, curbs, and any other structure within or adjacent to treatment location shall be protected from the surface preparation and installation of the thin overlay.

5.3.2. Pavement markings that conflict with the thin overlay installation shall be removed by methods acceptable to the engineer.

5.3.3. Prepare all pavement surfaces immediately prior to the installation of thin overlay.

5.3.4. Pavement surfaces contaminated with oils, greases, or other deleterious materials not removed by the surface preparation shall be prepared according to the manufacture's recommendation.

5.4. *Concrete Surfaces above Grade (Bridges, Ramps, Overpasses, Directional Flyovers, Stacked Interchanges, Viaducts)*:

5.5. Clean concrete surfaces by shot blasting and air wash.

5.5.1. Shot blast all surfaces to remove all curing compounds, loosely bonded mortar, surface carbonation, and deleterious material.

5.5.2. The prepared surface shall comply with the International Concrete Repair Institute (ICRI) standard for surface roughness CSP 5.

5.5.3. After shot blasting, air wash, with a minimum of 180 cfm of clean and dry compressed air, all surfaces to remove all dust, debris, and deleterious material.

5.5.4. Maintain the tip of the air lance within 12 in. of the surface.

6. APPLICATION

6.1. Apply the thin overlay, in accordance with project specifications.

6.2. Apply the thin overlay material on a prepared surface, when the surface temperatures are above 50°F and within manufacturer's recommendation.

6.3. Do not apply the thin overlay material if the anticipated weather or pavement surface conditions would prevent the proper application of the surface treatment as determined by thin overlay installer.

6.4. Pre-treat with the mixed binder resin system specified joints and cracks greater than $^1/_4$ in. and less than $^1/_2$ in. in width.

6.5. Cracks greater than $^1/_2$ in. in width shall be repaired by the owner prior to thin overlay installation with a material compatible with the binder resin system.

6.6. Once the binder resin system in the pre-treated areas has gelled, the installation may proceed.

6.7. Use the thin overlay in a double lift application (binder resin system and aggregate) for concrete surfaces.

6.8. Both lifts of the thin overlay shall be applied to the full width of the structure per project plans.

6.9. On concrete surfaces with continuous concrete barrier rails apply the thin overlay to a minimum height of 6 in. above the concrete surface.

6.10. Apply thin overlay to the barrier as each of the overlay applications is performed.

6.11. *Binder Application*:

6.11.1. Proportion and mix the binder resin system to the correct ratio as determined by the binder resin system manufacturer (±2 percent by volume).

6.11.2. The binder resin system shall be applied at a uniform thickness of 65 ± 5 mils (2.96 to 2.54 yd^2 per gal) onto a prepared pavement surface.

6.11.3. Coverage rate is based upon expected variances in the surface profile of the existing pavement.

6.11.4. Ensure that any blushing (waxy surface coating on the epoxy) caused by a reaction of the moisture with the hardening agent does not occur during the application process.

6.11.5. Evaluate and remedy as needed any areas that show signs of blushing that typically cause adhesion issues to occur.

6.11.6. Operations should proceed in a manner that will not allow the binder resin system to separate, cure, dry, be exposed, or otherwise harden in such a way as to impair retention and bonding of the aggregate.

6.11.7. Walking, standing, or any form of contact or contamination with the wet uncured binder resin system prior to application of the aggregate without the use of spiked shoes to minimize the disturbance to the binder layer will result in that section of binder resin system being removed and replaced at the installer's expense.

6.11.8. Contractor equipment and traffic is not permitted on the thin overlay treatment during curing period.

6.12. *Aggregate Application*:

6.12.1. The aggregate material must be properly embedded into the binder resin system.

6.13. The placement of this material does not require any compaction.

6.13.1. Aggregate shall completely cover the uncured binder resin system to achieve a uniform surface.

6.13.2. During the placement of the aggregate, by mechanical means, the aggregate will be dropped in a manner to not displace the wet binder resin system.

6.13.3. When placing in multiple lifts, ensure that the aggregate used is the same material as the final riding surface.

6.13.4. It is the responsibility of the installers to ensure proper embedment of the aggregate.

6.13.5. Immediately cover any wet spots of excess binder resin with aggregate prior to the gelling of the binder resin system to assure proper skid resistance and macro texture depth.

6.13.6. Remove the excess aggregate by sweeping before opening to traffic.

6.13.7. Excess aggregate can be reused if it is clean, dry, free from foreign matter, and meets gradation requirements.

6.13.8. It must be blended prior to reuse at a ratio of a minimum of three parts virgin material to one part recycled material.

6.13.9. All applications will require additional sweeping 3–7 days after installation is completed.

6.14. *Application Methods*:

6.14.1. Utilize one of the following methods to apply the binder resin and aggregate wearing course.

6.15. *Fully-Automated Application*:

6.15.1. Mechanically apply the thin overlay by a continuous self-contained application vehicle.

6.15.2. The application vehicle shall provide continuous pumping and proportioning devices.

6.15.3. The system shall mechanically mix, meter, monitor, and apply the thin overlay (binder resin system and aggregate) in one continuous pass without the use of squeegees or other tools to spread the binder.

6.15.4. Ensure the binder resin system manufacturer has approved the installer's application equipment for spreading their material as stated in the installer's QC plan.

6.15.5. Heating system may be necessary if required by the binder resin system manufacturer to ensure proper installation.

6.15.6. Limited touch-up of the resin with hand tools is permitted for areas less than 2 ft^2.

6.15.7. Within 5 s after placing the binder resin system; the aggregate is applied at a minimum rate of 14–16 lb per yd^2.

6.15.8. Hand application of aggregate is allowed only to assist in completely covering the binder resin system to achieve a uniform surface.

6.15.9. Apply the thin overlay so no seams are visible in the middle of the traffic lanes of the finished work after application of the surface aggregate.

6.15.10. Operations will proceed in such a manner that will not allow the binder resin system material to separate in the mixing lines, cure, dry, or otherwise impair retention bonding of the high-friction surfacing aggregate.

6.15.11. The application machine shall be equipped with flushing systems such that blockages of lines will not occur, and installation operations are not delayed, stopped, or otherwise compromised.

6.15.12. Data shall be provided to the engineer for each individual pass (start to stop) to compare manual depth checks for mil thickness to ensure equipment is properly calibrated.

6.15.13. In case of equipment malfunction, calibration can also be done by measuring the total gallons used divided by the number of square yards applied.

6.15.14. Coarse textured surfaces may cause the application rate to be adjusted in order to achieve overall desired mil thickness of finished product.

6.15.15. Ensure that application equipment is capable of applying binder uniformly in one pass to obtain the desired mil thickness.

6.15.16. Ensure that operations proceed in a manner that does not allow the binder resin system to separate, gel, or set up in a way that would impair the retention of the aggregate.

6.15.17. The binder resin system manufacturer shall approve the use of their material with said automated continuous application device.

6.16. *Semi-Automated Application*:

6.16.1. Use a semi-automated application machine that mixes, meters, pumps, blends, and applies the binder resin system.

6.16.2. A heating system may be necessary if required by the binder resin system manufacturer to ensure proper installation.

6.16.3. The semi-automated application machine shall have positive displacement volumetric metering pumps.

6.16.4. Use motionless, in-line mixing so as to not overly shear the material or entrap air in the mix. Maximize material working time by mixing it immediately before dispensing.

6.16.5. After manually dispensing, spread the binder resin system with a serrated squeegee on to the prepared pavement surface to meet the required uniform application thickness.

6.16.6. Data shall be provided to the engineer for each individual pass (start to stop) to compare manual depth checks for mil thickness to ensure equipment is properly calibrated.

6.16.7. Maintain a "wet line" of resin without aggregate 2 ft wide ahead of the aggregate placement operation, then follow the resin manufacturer recommendations for dwell time for placement of aggregate on the wet line based on ambient and surface temperatures

6.16.8. Mechanically apply the aggregate at a minimum rate of 14–16 lb per yd^2 onto the binder resin system by means of blower, spreader bucket, or suitable device in such a manner as to not displace the resin binder.

6.16.9. Hand application of aggregate is allowed only to assist in completely covering the binder resin system to achieve a uniform surface.

7. INSTALLATION OF THIN OVERLAY

7.1. *Test Section*:

7.1.1. The installer shall construct a test section of 250 yd^2.

7.1.2. This test section shall be used to demonstrate the semi-automated or fully-automated application machine has been properly calibrated and to verify application rates and cure time.

7.1.3. The test section shall be part of the thin overlay quantity of the project and approved by the project engineer.

8. VERIFICATION TESTING

8.1. The verification of the thin overlay quantities used shall be based on data collected for each day's production and for each individual pass (start to stop).

8.2. Verification testing shown in Table 1 may be performed by the installer or owner agency, as indicated in the project plans.

Table 1—Verification Testing

Property	Test Method	Requirement
Skid Resistance	T 242	Owner Agency-Specified
	ASTM E1911	Owner Agency-Specified
Macro Texture Depth (Sand Patch)	ASTM E965	1.0 mm min

8.3. The owner agency will inspect the roadway and determine compliance of the work to this specification before finalization is completed.

8.4. Any ordered repairs or removal and replacement of material will be at no additional expense to the owner agency.

8.5. A repair procedure shall be submitted to the owner agency within 10 days of receiving notice that repairs are needed to a particular section.

8.6. The repair procedure shall be acceptable to the owner agency and shall be completed within 30 working days of receiving approval of repair procedure.

9. KEYWORDS

9.1. Binder resin system; concrete surfaces; thin overlay treatment.

[1] This provisional standard was first published in 2018.

Provisional Standard Specification for

Emulsified Asphalt Sand Seal Design

AASHTO Designation: PP xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

AASHTO

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

Provisional Standard Specification for

Emulsified Asphalt Sand Seal Design

AASHTO Designation: PP xxx-18[1]

Technical Section:

Release: Group 1 (April 2018)

1. SCOPE

1.1. A sand seal is the application of emulsified asphalt, followed 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.

1.2. This standard practice determines application quantities for applied graded cover aggregate and emulsified asphalt for sand seals. Sand seals are an economical technique to seal existing pavement surfaces or primed compacted road bases. They are intended for use on low volume roads and when high quality aggregate sources may not be available.

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. *Materials*—Emulsified asphalt and aggregate used in the design should meet MP 27. 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.

5.2.1. *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.

5.2.2. *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—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)

5.2.3. *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.

5.2.4. *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 2018.

Standard Practice for

Emulsified Asphalt Scrub Chip Seal Design

AASHTO Designation: R xxx-18[1]

Technical Section: 5b, Bridge and Pavement Preservation

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Technical Section: 5b, Bridge and Pavement Preservation

Release: Group 1 (April 2018)

1. SCOPE

1.1. This standard practice determines application quantities for applying aggregate chips and emulsified asphalt for scrub seals. A scrub chip seal is the application of emulsified asphalt, followed immediately by a scrub broom to push the emulsion into the cracks in the pavement finished with an application of a single layer of cover aggregate, with the option of including a fog seal to help with chip retention.

2. REFERENCED STANDARDS

2.1. *AASHTO Standards*:

- MP XX-15, Materials for Emulsified Asphalt Rejuvenating Scrub 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

2.2. *State Agency Guidance Documents*:

- Minnesota Seal Coat Handbook (2006, MnDOT)
- Minnesota Pavement Distress Manual (2003, MnDOT)

3. TERMINOLOGY

3.1. *Definitions*:

3.1.1. *average least dimension*—Reduction of median particle size to account for flat particles by using flakiness index. Represents the sealcoat thickness in the wheel path where traffic forces flat aggregate to orient on its flattest side.

3.1.2. *badly pocked, porous, oxidized*—Severe raveling of surface with much cracking.

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

3.1.4. *median particle size*—Theoretical aggregate size that corresponds to 50 percent passing on the gradation curve.

3.1.5. *medium cracking*—Medium severity transverse, longitudinal, and/or longitudinal joint cracking. Spalling is observed at the crack edge and some cracks have begun to become interconnected. Block cracking, with cracks creating sections approximately 1 to 3 ft in width also falls under this distress category.

3.1.6. *severe cracking*—High severity transverse, longitudinal, and/or longitudinal joint cracking. There is significant spalling at crack edges and cracks have become interconnected. Alligator cracking is also included in this distress category. Use caution in applying maintenance treatments on pavements with severe cracking distress.

3.1.7. *slight cracking*—Single or well-spaced low severity transverse or longitudinal cracks. Also includes low severity longitudinal joint cracking.

3.1.8. *slightly pocked, porous, oxidized*—Raveling beginning to show with moderate cracking.

3.1.9. *smooth, non-porous*—Some free asphalt on the pavement surface, but with some cracking.

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 scrub chip seals. Practitioners may select one of the two design methods detailed in this practice.

5. EMULSIFIED ASPHALT CHIP SEAL DESIGN REQUIREMENTS

5.1. *Materials*—emulsified asphalt and aggregate used in the design should meet M xxx specifications and be representative of the materials used for the project.

5.2. *Modified Kirby Design Method*:

5.2.1. *Aggregate Application Rate*—Fabricate a board measuring 3 ft by $1^1/_2$ ft. Three quarter-in. thick particle board works well for this item. Attach 1 in. by 2 in. pine wood strips to the edge of the board to create a raised edge. Weigh the completed board and record the weight in pounds. Place the chips to be used on the project on the board. The quantity will vary depending on the gradation, shape, and crushed content of the chips but should be no less than 5 lb and no greater than 25 lb. Try to fit as many chips on the board within the confines of the edging as possible. The chips should not overlap each other and should be only one stone thick. Push the chips against the edge of the board. Place as many chips as possible onto the board until every gap is filled. Reweigh the board containing the chips in pounds. Subtract the weight of the empty board from the weight of the board with chips. Multiply this value by 2. This is the quantity of chips to be used on the chip seal in pounds per square yard. Record this quantity as *Q*.

5.2.2. *Emulsified Asphalt Application Rate* —The emulsified asphalt quantity for a conventional chip seal is estimated by calculating the amount of asphalt needed to fill the voids between the chips to a specific embedment depth. That relationship is expressed as follows:

$$A = \frac{\left\{5.61e \times d \times \left[1 - \left(\frac{W}{6.24G}\right)\right]T\right\} + V}{R} \qquad (1)$$

where:

A = emulsified asphalt quantity, gal/yd^2;

e = percent embedment from Figure 1 expressed as a decimal;

d = 1.33 Q/W;

Q = quantity of chips from the board test, lb/yd^2;
W = dry loose unit weight of chips, pcf (see T 19M/T 19, Section 12 on shoveling);
G = dry bulk specific gravity of chips (see T 84 and T 85);
T = traffic correction factor from Table 1;
V = pavement surface correction factor; and
R = emulsion residue, expressed as a decimal, e. g., 0.65 = 65 percent.

The result of the calculation for Equation 1 is the estimated emulsified asphalt spray rate.

Table 1—Traffic Correction Factor, *T*

	AADT[a]			
	<100	100–250	250–500	500–1000
Traffic Correction Factor, *T*	1.20	1.15	1.10	1.05

[a] From 1000 to 5000 AADT requires no correction. Greater than 5000 AADT has not been evaluated sufficiently to develop a recommended traffic correction factor.

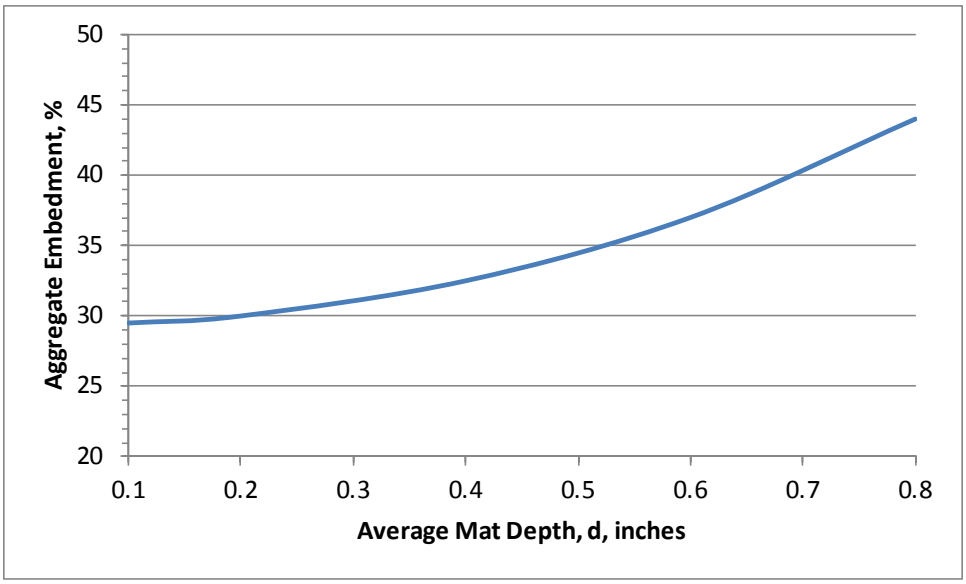


Figure 1—Aggregate Embedment, percent, *e* (before rolling)

Table 2—Substrate Surface Condition, *V*

Existing Surface Condition	Correction Factor, *V*, gal/yd^2
Flushed-bleeding	–0.06
Smooth, non-porous[a]	–0.03
Slightly porous, slightly oxidized	0.00
Slightly pocked, porous, oxidized[b]	+0.03
Badly pocked, porous, oxidized[b]	+0.06

[a] A quantitative method using the ball penetration test has also been reported in NCHRP Report 680.
[b] A quantitative method using the sand patch test has also been reported in NCHRP Report 680.

5.3. *McLeod Design Method*:

5.3.1. *Aggregate Application Rate*:

5.3.1.1. Measure gradation (T 11 and T 27), unit weight (T 19M), and specific gravity (T 84 and T 85) of cover aggregate.

5.3.1.2. Estimate median particle (*M*) size by identifying the location of 50 percent passing on the aggregate gradation (percent passing vs. sieve size) curve and drawing a vertical line to the x-axis.

5.3.1.3. Determine aggregate flakiness index in inches using procedure FLH T 508.

5.3.1.4. Determine aggregate average least dimension (*H*) using Equation 2.

$$H = \frac{M}{1.139285 + (0.011506 \times FI)} \quad (2)$$

where:

H = average least dimension;
M = median particle size; and
FI = flakiness index.

5.3.1.5. Determine the voids in loose aggregate according to AASHTO T19M/T19.

5.3.1.6. Determine the cover aggregate application rate using Equation 3.

$$C = 46.8 \times \left[1 \times \left(0.4 \times V \times H \times G \times E\right)\right] \quad (3)$$

where:

C = cover aggregate application rate, lb/yd^2;
V = voids in loose aggregate, %;
G = bulk specific gravity of aggregate; and
E = wastage factor for traffic whip-off, Table 3.

Table 3—Aggregate Wastage Factor, *E* (*MnDOT Seal Coat Manual*)

Percentage Waste Allowed for[a]	Wastage Factor, *E*
1	1.01
2	1.02
3	1.03
4	1.04
5	1.05
6	1.06
7	1.07
8	1.08
9	1.09
10	1.10
11	1.11
12	1.12
13	1.13
14	1.14
15	1.15

[a] Due to traffic whip-off and handling.

Note 1—Calculated application rate can be verified by fabricating a board measuring 0.5 yd^2 in area (3 ft by $1^1/_2$ ft) with 1 in. by 2 in. pine wood strips attached to create a raised edge. Weigh the completed board and record the weight in pounds. Place the chips to be used on the project on the board in the quantity determined in Section 5.2.7. The chips should not overlap each other and

should be only one stone thick. Push the chips against the edge of the board. If necessary, add chips onto the board until every gap is filled. Reweigh the board containing the chips in pounds. Subtract the weight of the empty board from the weight of the board with chips. Multiply this value by 2. This is the quantity of chips to be used on the chip seal in pounds per square yard.

5.3.2. *Emulsion Application Rate*:

5.3.2.1. Calculate the target emulsion application rate for wheelpath areas and non-wheelpath areas using Equation 4.

$$EAR = \frac{\left[2.224 \times (H, M) \times T \times V\right] + S + A}{R} \quad (4)$$

where:

EAR = emulsion application rate, gal/yd^2;
H = aggregate average least dimension, in., used to calculate *EAR* for wheelpath areas;
M = aggregate median particle size, in., used to calculate *EAR* for non-wheelpath areas;
T = traffic factor, Table 5;
S = surface condition factor, Table 6;
A = aggregate absorption factor, Table 4; and
R = residual asphalt content of emulsion, percent.

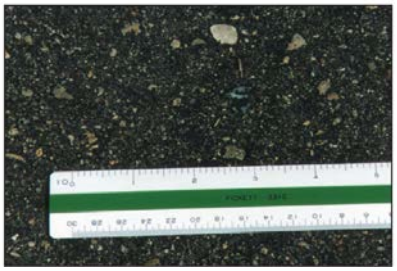
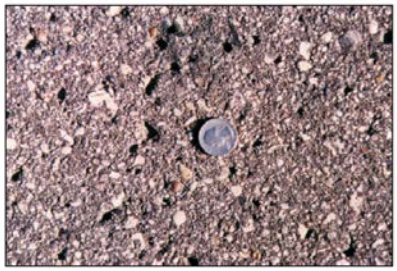
Table 4—Aggregate Absorption Factor

Aggregate Absorption	Correction Factor
<1.5%	0
≥1.5%	0.02

Table 5— Traffic Correction Factor—McLeod Method

	Average Annual Daily Traffic (AADT)				
	<100	100–500	500–1000	1000–2000	>2000
Traffic Factor, *T*	0.85	0.75	0.70	0.65	0.60

Table 6—Surface Condition Factor

Condition	Example	Correction (gal/yd^2)
Black, flushed asphalt	N/A	–0.01 to –0.06
Smooth, non-porous		0.00
Slightly porous and oxidized		+0.03
Slightly pocked, porous, and oxidized		+0.06
Badly pocked, porous, and oxidized		+0.09

5.3.3. Determine the design emulsion application rate, defined as the average of the wheelpath and non-wheelpath emulsion application rates.

5.4. Adjustment for Cracking—Increase the design emulsion application rate determined in Section 5.3 or 5.4 by multiplying the design application rates by the factors provided in Table 7. Select distress level based on state highway agency practice for the project location.

Table 7—Emulsion Application Rate Adjustments Based on Severity and Extent of Cracking

Type and Amount of Cracking	Added Emulsion
Slight	1.06
Moderate	1.10
Severe	1.20

5.5. Maintain an application rate of target rate ±0.05 gal/yd^2. Adjust as needed according to project specific conditions.

Note 2—Field adjustments to application rate can be made to ensure at least a 4-in. wave of emulsion remains in front of the lead broom.

Note 3—Severe cracking is indicative of a structural issue in the pavement that will not be fully addressed by selection of a maintenance treatment. Reduce expectations for extension in service life of the pavement when maintenance treatments are placed over pavements with high extent/severity of cracking.

5.6. *Extra Chips to Avoid Roller Pick-Up*—Some extra aggregate should be spread during scrub seal construction with emulsions than is actually needed to produce a one-stone layer. This extra material is applied to aid in reducing the potential for chips to be picked up by pneumatic rollers during construction. The amount of excess material will vary, but should be approximately 5 to 10 percent and never more than 10 percent. Adjustment up or down is necessary based on when the rollers begin to pick up the chips.

5.7. All design work will be carried out using aggregate either directly from the job site stockpile or equivalent material from the same source and having substantially the same material properties.

6. REPORT

6.1. *Report the following*:

6.1.1. Design method used.

6.1.2. Aggregate spread rate, *Q*, in pounds per square yard to the nearest 1.0 lb/yd^2.

6.1.3. Report the emulsified asphalt spray rate, *A*, in gallons per square yard to the nearest 0.01 gal/yd^2.

7. KEYWORDS

7.1. Modified emulsion; pavement maintenance; rejuvenator; surface treatment.

[1] New standard endnote TBD. (Different for provisional vs. full standard.)

AASHTO Electronic Balloting System

Ballot Detail Report

Ballot Detail

Ballot Name:	Tech Section 5B Spring/Summer Ballot
Ballot Manager:	Derek John Nener-Plante
Ballot Start Date:	6/2/2017
Ballot Due Date:	6/23/2017

Tech Section 5B Spring/Summer Ballot

Item Number:	**1**
Description:	"Standard Specification for Diamond Grinding for Pavement Preservation" - to be balloted for full standard.
Decisions:	Affirmative: 15 of 23 Negative: 3 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Resp Attac
New Jersey Department of Transportation (Paul Andrew Hanczaryk) (Paul.Hanczaryk@dot.nj.gov)	Note: (Correction) In section 8.1 you have survey twice in the same sentence, "survey date survey". Remove the second "survey" so it reads just "survey date".	Affirmative	
Kansas Department of Transportation (Richard A Barezinsky) (rick.barezinsky@ks.gov)	3.2.4 The term "Instrument" should be used in the definition instead of "device" since they used the abbreviation "DMI" 8.1 remove the second "survey" in "survey date survey"	Affirmative	
Illinois Department of Transportation (LaDonna Rowden) (LaDonna.Rowden@illinois.gov)	Should there be a limit on the number of times grinding can be performed to achieve the required ride quality index, or a maximum depth removed? Section 8.6: If ASTM E 950 is referenced, there is a discrepancy with the balloted item. In ASTM E 950, the width of the lasers is less than 72 inches, which would make the distance from the lane line greater than 3 feet. Section 8.7: This item specifies one testing pass; however, many states are requiring multiple passes and the average of all passes is reported as the final ride quality index. Will one pass provide adequate	Affirmative	

	precision and bias? Section 8.8: In the last sentence of this section, should the word "department" be replaced with "agency" to be consistent with the rest of the item?	
Michigan Department of Transportation (John F Staton) (statonj@michigan.gov)	section 8.2, paragraph 2: "The control profile will be obtained after any and all corrective action work..." We always do the initial (control) run before any construction. Doing control run after patching encourages the contractor to leave the patches rough, which ultimately could artificially report a relative greater percent improvement after grinding. Section 8.6: "The contractor shall measure profiles...to determine acceptance (i.e. MRI)." The Michigan Division of the FHWA prohibits the contractor from conducting acceptance runs. The agency measures the profile for acceptance, whereas, the contractor's profile measurements are intended for their quality control purposes. Table 1: suggest that the symbol (*)be spelled it as (times). 4 times in lieu of 4* . I see the * and automatically start looking for a footnote.	Affirmative
Maine Department of Transportation (Derek John Nener-Plante) (derek.nener-plante@maine.gov)	Section 2.1 & 3.1 - remove ASTM references if they are not to be used	Affirmative
Ontario Ministry Of Transportation (Becca Lane) (Becca.Lane@ontario.ca)	-Document only uses imperial units (i.e. no SI in brackets) -Recommend that Section 3.2.6 include a requirement that the inertial profiler be certified by the agency or according to AASHTO R56. -Add ASTM E1926 to the reference list	Affirmative
Alabama Department of Transportation (Lyndi D Blackburn) (blackburnl@dot.state.al.us)	The ASTM Standard XXXX does not exist. This proposed AASHTO standard does not appear complete so I question balloting as a full standard. This standard is also written more as a construction specification - I believe it should be revised to reflect the material requirements desired as a final product and describe the practice on how we determine what those requirements need to be based	Negative

	on factors such as the existing material surface characteristics and traffic.	
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	Reason for Negative - Section 1.4 - All units are in inch-pound so this should read, "The values stated in inch-pound units are to be regarded as the standard." Editorial - Delete Sections 2.1 and 3.1 since there are no ASTM standards listed. Section 4.1 - Why is there a need for a minimum weight of machine? Section 5.4 - No more than 1 inch overlap. Why is that if multiple passes may be allowed to meet specificaitons? Section 7.1 - Should we include wording such as 'in accordance with applicable or local regulations'? Editorial - Section 8.1 - Should 'survey date survey' just be 'survey date'? Section 8.2 - Is there criteria we could include to define the line laser equipment rather than specify some products or equivalents? Section 8.9 - 2nd Sentence - Does this conflict with the Table 1 requirements? Sections 8.10, 8.11, and 8.12 - Seem like they should be deleted since they refer to changes to this standard that the owner can do. As a compromise they could be left as Notes. Reason for Negative - Table 1 - The required post grind for less than existing 230 or 130 is 0.6. The 0.4 factor seems like a mistake and that it should be 0.6. Otherwise, for a >45 of an existing 130 you would need a required of 78 but for an existing of 132 you would need to achieve a 52! Table 1 - For <=45 the value of 138 seems high for a correction.	Negative
South Carolina Department of Transportation (Temple Short)	Need to remove the "contract" language and leave that up to the states. Also the basis of payment.	Negative

(shorttk@scdot.org)	Sections 6, 8, and 10. Section 2.1 - incomplete

Item Number:	**2**
Description:	"Standard Specification for Materials for Emulsified Asphalt Sand Seals" - to be balloted for provisional status.
Decisions:	Affirmative: 16 of 23 Negative: 2 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Responce Attachment
South Carolina Department of Transportation (Temple Short) (shorttk@scdot.org)	Clean up formatting (numbering, footers, titles, etc.)	Affirmative	
Alabama Department of Transportation (Lyndi D Blackburn) (blackburnl@dot.state.al.us)	Under 2.0 Referenced Documents- T 176 and T 304 are referenced but these test methods are not referenced anywhere else in the standard.	Affirmative	
Kansas Department of Transportation (Richard A Barezinsky) (rick.barezinsky@ks.gov)	2.1 Change title of T 304 to "Uncompacted Void Content of Fine Aggregate" May need to add M 316, Polymer Modified Emulsified Asphalt because CHFRS listed in 3.1.1 is not in M 208 3.1.1 CHFRS is not in M 140 or M 208, however you will find it in M 316 5.1 Based on comment above, M 316 may need to be added to this list Table 1 - the percent passing the No. 200 seems quite high for a sand seal.	Affirmative	
Maine Department of Transportation (Derek John Nener-Plante) (derek.nener-plante@maine.gov)	Section 6.1 - I'm not sure the note below Table 1 adds anything to the standard This standard is quite brief, is there	Affirmative	

	any potential to add this into the Design Practice document for just one standard instead of two?	
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	Section 6.1 - Last sentence, 'The nominal maximum aggregate size (NMAS) to...' should be changed to "The aggregate size I, II, or III to ...." There should be a section for a supplier to submit a Certified Test verifying the properties of the emulsified asphalt and that they are in accordance with the specifications. See section 9 of the Thin Overlay Treatment standard. Editorial - Since this standard is very short it should be combined into the Emulsified Sand Seal Design. No need to have two standards on this.	Negative
Maryland Department of Transportation (Sejal Barot) (sbarot@sha.state.md.us)	We have no experience: do not cast a vote.	Negative

Item Number:	**3**
Description:	"Standard Specification for Materials for Emulsified Asphalt Scrub Seal" - to be balloted for provisional status.
Decisions:	Affirmative: 16 of 23 Negative: 2 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Responce Attachment
Ergon Asphalt and Emulsions, Inc. (Larry E Tomkins) (larry.tomkins@ergon.com)	*For the binder - The proposed AASHTO specification is inadequate to identify the presence of polymer in the emulsion. Specifically, the polymer content can be minimized or even eliminated and still allow for the emulsion residue to possess greater than 55% recovery on the MSCR test at 10 Â°C. The deformation values are so small in the MSCR test that the % recovery*		

	easily exceeds 55% even with unmodified emulsion residues, like CRS-2. *For the aggregate - why are the gradations so much different in the scrub seal spec versus the chip seal spec?*	
Alabama Department of Transportation (Lyndi D Blackburn) (blackburnl@dot.state.al.us)	General Comments - Several reference errors occur through out the document. The documents needs to be edited. Section 5.2.1 - The wording in the 1st sentence implies to me that only one test method may be used by the owner agency - what if I want to run both? Suggest deleting the 1st sentence and editing the second to say "Table 1 provides two viscosity test methods for certification and acceptance testing either one or both can be used. Table 1 gives the specification requirements for both viscosity test methods." Section 5.3 - References Table 5 which is the aggregate testing required but this item is discussing testing the emulsified asphalt residue for testing? The last two sentences beginning "Properties of the residue..." appears better suited to be a Note. Section 6.1 Third sentence - indicates aggregate size will be shown in the plans - suggest revising this to state "The aggregate Type will be determined by the owner agency." Suggest adding 6.2 Aggregates shall be testing according to T 11 and T 27. and delete the strange reference in the Table 4 title.	Affirmative
Illinois Department of Transportation (LaDonna Rowden) (LaDonna.Rowden@illinois.gov)	Section 6.1: In the first sentence, remove "wood, bark, roots, and other" as "deleterious materials" would cover all of these items.	Affirmative
Nevada Department of Transportation (CHANGLIN PAN) (cpan@dot.state.nv.us)	Section 5.4, are we suppose to include test procedures in a material standard?	Affirmative

	Table 1, as a national standard, it would be better to have options of emulsion for different climate regions.	
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	Note 1 - A state can do this at any time for any part of a standard that meets their criteria. No need to include this here. This should be deleted. Reason for Negative - There should be a section for a supplier to submit a Certified Test verifying the properties of the emulsified asphalt and that they are in accordance with the specifications. See section 9 of the Thin Overlay Treatment standard. Keywords need to be added editorially. Should we roll this into the Scrub Seal Design? Long term it would be less standards to track and easier for users to access and use.	Negative
Maryland Department of Transportation (Sejal Barot) (sbarot@sha.state.md.us)	We have no experience: do not cast a vote.	Negative

Item Number:	**4**
Description:	"Standard Specification for Thin Overlay Treatments Using a Binder Resin System and Aggregate for Concrete Surfaces" - to be balloted for provisional status.
Decisions:	Affirmative: 15 of 23 Negative: 3 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Responce Attachment
Rhode Island Department of Transportation (Jose S Lima) (jose.lima@dot.ri.gov)	Affirmative - Reference to "asphalt" in 3.1 and 10.22 raises the question if this specification is for concrete only as stated in 1.1or can it also be used on asphalt surfaces?		
Kansas Department of Transportation (Richard A Barezinsky)	Table 4. Disagree with using the non-standard No. 6 sieve. Should use the standard No. 8 sieve for gradation	Affirmative	

(rick.barezinsky@ks.gov)	control.	
Illinois Department of Transportation (LaDonna Rowden) (LaDonna.Rowden@illinois.gov)	Illinois requires a test for chloride permeability. Since this is part of the purpose of the treatment, should this test be included? Tables 1, 2, and 3: In all of the tables, the "Test Method" column includes material standards. Shouldnâ€™t all of these be replaced with the actual test method that measures each property and determine the values listed in the "Requirements" columns? Section 6.2.2: Should a requirement of a Mohâ€™s hardness value be added rather than a subjective description of the type of aggregate (i.e., "6 or greater" rather than "hard, durable")? Section 7.1.1.2: We cannot locate Appendix X1.1 in ASTM D 2556-14. Sections 7.1.5.3; 7.1.6.3; 7.1.7.4; 7.4.8.4; 7.1.9.2; 7.1.10.2; and 7.1.11.2: Should a relative humidity requirement be added for the curing period?	Affirmative
Nevada Department of Transportation (CHANGLIN PAN) (cpan@dot.state.nv.us)	Section7, are we suppose to include test procedures in a material standard? The MP and PP for thin overlay treatments should reference each other in the standard. Section 7.2 has been mentioned in Table 4. The aggregate requirements should be more than just gradations.	Affirmative
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	Should this be combined with the Application for this material.	Negative

	Reason for Negative although Editorial - Tables - The AASHTO Test should be listed first. Seems Section 7 should come before Section 6. Section 6.1.4 - This should be provided by the supplier. Remove 'Section 6' and insert 'this specification'. Section 9 should be divided into one section - 9.1 Binder Resin System with 9.1 being 9.1.1 and 9.2 being 9.1.2 and 9.3 being 9.1.3. Section 9 should be divided into another section - 9.2 Aggregate with 9.4 being 9.2.1 and 9.5 being 9.2.2 and 9.6 being 9.1.3. Section 9.7 should be 9.3	
South Carolina Department of Transportation (Temple Short) (shorttk@scdot.org)	Section 10 should be removed or made an appendix/note/informational. NTPEP should not be part of the standard.	Negative
Maryland Department of Transportation (Sejal Barot) (sbarot@sha.state.md.us)	We have no experience: do not cast a vote.	Negative

Item Number:	**5**
Description:	"Standard Practice for Application of Thin Overlay Treatments Using a Binder Resin System and Aggregates for Concrete Surfaces" - to be balloted for provisional status.
Decisions:	Affirmative: 16 of 23 Negative: 2 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Responce Attachment

Alabama Department of Transportation (Lyndi D Blackburn) (blackburnl@dot.state.al.us)	General comment - in some places this practice is written a construction specification - suggest revising some areas to reflect recommended practice for example the Section 7.1 the Test Section. The Test section should describe the benefits of their use, the best methods to specify such as quantity or size, and what project documents they are best incorporated into. Also suggest changing any references to "project plans" to "project documents" Under 6.2 may want to add a maximum temperature Under 6.9 and 6.10 suggest leaving this requirement up to the owner agency - this language appears mandatory. Section 7. - The title seems after the fact since Section 6 described Application which to me is also Installation. In Table 1 suggest changing "skid resistance" to "frictional properties"	Affirmative
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	Should this be combined with the Material for this process. Section 3 should be divided into one section - 3.1 Binder Resin System with 3.1 being 3.1.1 and 3.2 being 3.1.2 and 3.3 being 3.1.3. Section 3 should be divided into another section - 3.2 Aggregate with 3.4 being 3.2.1 and 3.5 being 3.2.2 and 3.6 being 3.1.3. Section 4.1 - Please add underlined text, "....of <u>this type</u> of thin overlay.." Section 5.5 should be 5.4.1, 5.5.1 should be 5.4.2....etc. Section 6.13 should be 6.12.2. Check numbering for the rest of this section for	Affirmative

	accuracy.	
Kansas Department of Transportation (Richard A Barezinsky) (rick.barezinsky@ks.gov)	6.15.10 This is not a high-friction surface specification and the use of the term "high-friction surfacing aggregate" should be changed to "surfacing aggregate". Sections 3.1 and 3.4 suggest that a material specification is included in this specification for the binder resin system and the aggregates, yet neither is provided or referenced in the spec.	Affirmative
Illinois Department of Transportation (LaDonna Rowden) (LaDonna.Rowden@illinois.gov)	Section 5.5.3: How do you know the surface is clean? Should a pull-off test requirement be added? Section 6.13.7: Illinois does not allow reuse of excess aggregates due to dust and bonding of recycled aggregate. Georgia also does not allow.	Affirmative
Nevada Department of Transportation (CHANGLIN PAN) (cpan@dot.state.nv.us)	Please include ASTM E965 in the referenced standard	Affirmative
South Carolina Department of Transportation (Temple Short) (shorttk@scdot.org)	Remove all contract language as this should be left up to the states (sections 4 and 8). Also suggest changing "skid" resistance to just friction (table 1)	Negative
Maryland Department of Transportation (Sejal Barot) (sbarot@sha.state.md.us)	---------- ---------- We have no experience: do not cast a vote.	Negative

Item Number:	**6**
Description:	"Standard Specification for Emulsified Asphalt Sand Seal Design" - to be balloted for provisional status.
Decisions:	

	Affirmative: 17 of 23 Negative: 1 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Responce Attachment
South Carolina Department of Transportation (Temple Short) (shorttk@scdot.org)	Clean up formatting (titles, footers, etc.)	Affirmative	
Alabama Department of Transportation (Lyndi D Blackburn) (blackburnl@dot.state.al.us)	Section 1.2 suggest deleting the word "economical" from the 2nd sentence as this is may or may not be true depending on several factors and appears more as commentary than helpful to the practice. Section 2 - None of the Test methods listed are referenced in the document. Section 4.2 - is the 750 given ADT or AADT? Section 5.2 - a stripping test is mentioned but one is not recommended. Do we want to recommend one?	Affirmative	
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	The standard for the Sand Seal should be rolled into this standard.\ Section 4.1 - I am not sure what this means and why this is here.	Affirmative	
Kansas Department of Transportation (Richard A Barezinsky) (rick.barezinsky@ks.gov)	5.2.1 Spelling â€“ 3rd sentence, anticipate should be "anticipated"	Affirmative	
Illinois Department of Transportation (LaDonna Rowden) (LaDonna.Rowden@illinois.gov)	Section 5.2.4: Should a requirement for either ISSA TB-114 or an approved alternative stripping test method be added? Section 6.1.2: Illinois pays for emulsions by pounds of residual asphalt.	Affirmative	
Maryland Department of	We have no experience: do not cast a	Negative	

Transportation (Sejal Barot) (sbarot@sha.state.md.us)	vote.

Item Number:	**7**
Description:	"Standard Practice for Emulsified Asphalt Scrub Chip Seal Design" - to be balloted for provisional status.
Decisions:	Affirmative: 17 of 23 Negative: 1 of 23 No Vote: 5 of 23

Agency (Individual Name)	Comments	Decision	Responce Attachment
Alabama Department of Transportation (Lyndi D Blackburn) (blackburnl@dot.state.al.us)	General comment - This standard has several inconsistent references to other document locations that do not exist. Section 5.2 - The Modified Kirby Design Method should be written out like the McLeod Design Method was done in Section 5.3. It was hard to follow written in just two paragraphs. Also is any testing of the materials needs as given in Section 5.3 for Section 5.2? How is Equation 1 used if the dry loose unit weight and dry bulk specific gravity testing is not performed? Section 5.5 and Note 2 - appear to be related to construction and not the design. Are they included to instruct the designer to set a range for the rate? Section 5.7 - This requirement should be stated much earlier in the standard and should apply to both design methods.	Affirmative	
Rhode Island Department of Transportation (Mark E Felag) (mark.felag@dot.ri.gov)	Should we roll the material standard into this Scrub Seal Design? Long term it would be less standards to track.	Affirmative	
Kansas Department of Transportation (Richard A Barezinsky) (rick.barezinsky@ks.gov)	Is there a reason we need both Note 1 and Section 5.2.1?	Affirmative	

Ontario Ministry Of Transportation (Becca Lane) (Becca.Lane@ontario.ca)	All units are imperial, no SI units are provided.	Affirmative
Maryland Department of Transportation (Sejal Barot) (sbarot@sha.state.md.us)	We have no experience: do not cast a vote.	Negative

Date: 6/28/2017