



COMMITTEE ON MATERIALS & PAVEMENTS

2018 Annual Meeting – Cincinnati, OH

Thursday August 10, 2018

11:30 AM – 12:30 PM EST

TECHNICAL SUBCOMMITTEE 5b Bridge and Pavement Preservation

I. Call to Order and Opening Remarks

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

II. Roll Call

First Name	Last Name	Company	Designation	Type	
Derek	Nener-Plante	Maine DOT	Chair	Voting	X
Travis	Walbeck	West Virginia DOT	Vice Chair	Voting	X
Jason	Dietz	FHWA	Ex Officio	Non-Voting	
Morgan	Kessler	FHWA	Ex Officio	Non-Voting	
Lyndi	Blackburn	Alabama DOT	Member	Voting	X
Scott	George, P. E.	Alabama DOT	Member	Non-Voting	
Stewart	Linz	Arkansas DOT	Member	Voting	
Kyle	Lester	Colorado DOT	Member	Non-Voting	X
Jay	Goldbaum	Colorado DOT	Member	Voting	
Bartholomew	Sweeney	Connecticut DOT	Member	Non-Voting	X
Ian	Rish	Georgia DOT	Member	Voting	X
Brian	Pfeifer	Illinois DOT	Member	Non-Voting	X
LaDonna	Rowden	Illinois DOT	Member	Voting	
Richard	Barezinsky	Kansas DOT	Member	Voting	X
Tracy	Nowaczyk	Kentucky Trans.Cabinet	Member	Voting	X
Sejal	Barot	Maryland DOT	Member	Voting	X
John	Staton	Michigan DOT	Member	Voting	
Curt	Turgeon	Minnesota DOT	Member	Voting	X
John	Donahue	Missouri DOT	Member	Voting	X
Kent	Miller	Nebraska DOT	Member	Voting	
Changlin	Pan	Nevada DOT	Member	Voting	X
Anita	Bush	Nevada DOT	Member	Non-Voting	
Paul	Hanczaryk	New Jersey DOT	Member	Voting	
Clark	Morrison	North Carolina DOT	Member	Voting	X
Gary	Angles	Ohio DOT	Member	Voting	X
Bruce	Johnson	Oregon DOT	Member	Voting	
Jose	Lima	Rhode Island DOT	Member	Non-Voting	
Mark	Felag	Rhode Island DOT	Member	Voting	
Temple	Short	South Carolina DOT	Member	Voting	X
Brian	Egan	Tennessee DOT	Member	Non-Voting	X
Danny	Lane	Tennessee DOT	Member	Voting	
Mark	Woods	Tennessee DOT	Member	Non-Voting	
Michael	Lee	Texas DOT	Member	Voting	X
James	Stevenson	Texas DOT	Member	Non-Voting	
Charles	Babish	Virginia DOT	Member	Voting	X
Jeffrey	Milton	Virginia DOT	Member	Non-Voting	



First Name	Last Name	Company	Designation	Type	
Christopher	Ohm	Wisconsin DOT	Member	Voting	
Greg	Milburn	Wyoming DOT	Member	Voting	X
Becca	Lane	Ontario Ministry Of Transportation	Ass.Member	Voting	X
Amir	Hanna	Transportation Research Board	Ass.Member	Non-Voting	
Robert	Horan	Asphalt Institute	Friend	Non-Voting	
Larry	Tomkins	Ergon Asphalt and Emulsions, Inc.	Friend	Non-Voting	
Jeff	Shoger	Flint Hills Resources	Friend	Non-Voting	
Larry	Scofield	International Grooving and Grinding Association	Friend	Non-Voting	
Delmar	Salomon	Pavement Preservation Systems LLC	Friend	Non-Voting	
Katheryn	Malusky	AASHTO	Liaison	Non-Voting	
Casey	Soneira	AASHTO Re:source	Liaison	Non-Voting	x
John	Malusky	AASHTO Re:source	Liaison	Non-Voting	

III. Approval of Technical Subcommittee Minutes

Mid-Year Minutes distributed with this agenda as **Appendix A**.
No comments or discussion. CT; TN. Minutes approved.

IV. Old Business

A. Construction Guide Specifications – Approved AASHTO Joint Resolution included as **Appendix B**.

COC, COM, and COMP had discussions about how best to handle the relationship between committees and the pavements. A resolution was passed at the Spring meeting. 5b has been tasked with the approval and publication of construction guide specifications. 3-5 members of COC and COM will serve as members on 5b to represent their respective committees. Chair is seeking input for how we will go about doing this. COMP is exclusively charged with overseeing development/revisions of the documentation. The other committees weigh in on the ballots through their representatives on the tech subcommittee. The construction guide specs will eventually go through full COMP ballot.

NE: we are looking to this group to weigh in on and coordinate within their agency departments to communicate ballot items.

B. COMP Ballot Items

1. Materials for Emulsified Asphalt Scrub Seal - Removed from the publication process after the Emulsion Task Force raised a significant concern with one of the specification items in Table 1 of the standard. To summarize, the technical issue with the draft standard is with the MSCR Percent Recovery at 3.2 kPa, 10°C (50°F) specification limit of minimum 55% on the distilled residue. It was determined after the standard was submitted for review that, technically, an unmodified CRS-2 residue could potentially pass this minimum 55% recovery limit at the 10C/50F test temperature. As written the standard could potentially allow for an unmodified emulsion to be used in the application, and the standard specifically calls for the use of a polymer-modified rejuvenating emulsion (PMRE). It is understood in practice that the successful performance of this

product in the field is linked to the use of a PMRE. The pulling of the standard from the publication process was authorized by the Steering Committee as has been done in the past. The ETF will look to resolve this issue and resubmit the standard in the future.

C. 2018 5B TS Ballot #1

Ballot Results and all comments are included as **Appendix C & D**.

1. Item 1 - Guide Construction Specification for Diamond Grinding for Pavement Preservation

- i. Ballot Results – 20 affirmative/1 negative/6 not returned
- ii. Negative from Alabama and comments from Alabama, Kansas, Maine, Michigan, Nevada, Ontario, South Carolina, West Virginia, & Wisconsin
- iii. **Request Larry Scofield to address negative votes and the comments from the TS ballot and incorporate as necessary for another TS ballot in September 2018.**

MO: Larry Scofield will follow up with John Donahue

ME(C): there are too many substantial comments to comfortably put this to COMP ballot. There's a need to harmonize the layouts of the design specs. They look like materials standards but include construction information. Will people from construction know how to use a design guide that is in a format that's written more like a materials spec?

2. Item 2 - Guide Construction Specification for Application of Thin Overlay Treatments Using a Binder Resin System and Aggregates for Concrete Surfaces

- i. Ballot Results – 19 affirmative/2 negative/6 not returned
- ii. Negative from Nevada, Ohio and comments from Arkansas, Kansas, Maine, Nevada, Ohio, Ontario, South Carolina, Tennessee & West Virginia
- iii. **Request Danny Lane to address negative votes and the comments from the TS ballot and incorporate as necessary for another TS ballot in September 2018.**

D. Task Force Reports

V. **New Business**

A. Research Proposals

1. Quick turnaround RPS
2. Full NCHRP RPS

B. AASHTO Technical Service Programs Items

1. AASHTO Re:source Updates – Casey Soneira

AASHTO re:source has 22 accredited labs for slurry surfacing and micro surfacing mix designs. There are 30 labs participating in PSP samples. We're continuing to grow slowly.

C. NCHRP Issues

Amir Hanna:

D. Correspondence, calls, meetings

E. Presentation by Industry/Academia

F. Proposed New Standards

- i. Emulsion Task Force Update

ME and IL attended the ETF. The ETF is developing standards and doing research that is feeding standards into 5b.

G. Proposed New Task Forces

- i. Do the guide specifications need to have standard headings and sections of some sort?

ME (Nener-Plante) proposed a TF to flush out the details of what these new guide specs should look like and what sections to include; what needs to be included for them to be used in contracts. Walbeck (WV – VC) volunteered to chair; AL volunteers; MO, GA, CT, Deb Kim (AASHTO), Casey Soneira (AASHTO); OH; VT (other committees will be solicited to weigh in)

H. Standards Requiring Reconfirmation

Full Standards

- i. AASHTO M 224-91 Use of Protective Sealers for Portland Cement Concrete

Provisional Standards

- i. AASHTO MP 22-13 (2017) Fiber-Reinforced Polymer Composite Materials for Highway and Bridge Structures - **Promote or 1 year extension**

- I. COMP Ballot Items (including any ASTM changes/equivalencies/harmonization)

VI. Open Discussion

TN: will we resolve the comments for the current guide spec before moving on to balloting the new one? ME: Hopes that the task force will have answers by September so that we can move forward in the right direction with this.

VII. Adjourn

TN; MD adjourn

Technical Subcommittee 5B Standards

M 224-91 (2014)	Use of Protective Sealers for Portland Cement Concrete
MP 22-13 (2017)	Fiber-Reinforced Polymer Composite Materials for Highway and Bridge Structures
MP 27-16 (2018)	Materials for Emulsified Asphalt Chip Seals
MP 28-17 (2018)	Materials for Micro Surfacing
MP 32-17	Materials for Slurry Seal
MP 33-17	Materials for Emulsified Asphalt Fog Seal
MP 34-18	Materials for Sand Seals
MP 35-18	Thin Overlay Treatments Using a Binder Resin System and Aggregate for Concrete Surfaces
PP 82-16 (2018)	Emulsified Asphalt Chip Seal Design
PP 83-16 (2018)	Micro Surfacing Design
PP 87-17	Slurry Seal Design
PP 88-17	Emulsified Asphalt Fog Seal Design
PP 90-18	Sand Seal Design
PP 91-18	Emulsified Asphalt Scrub Seal Design



SUBCOMMITTEE ON MATERIALS

2017 Mid-Year Webinar Meeting

Minutes

November 15, 2017

1:00 - 3:00 pm EST

TECHNICAL SECTION 5b

Bridge and Pavement Preservation

Derek Nener-Plante (ME) Chair and Travis Walbeck (WV) Vice Chair

AASHTO Support – Casey Soneira and John Malusky

I. Call to Order and Opening Remarks

Casey Soneira briefly covered the Meeting Guidelines for web meetings. The meeting was called to order at 1:05 PM.

II. Roll Call

Roll call of members of the Technical Section was done by voice. The following names and contact information were exported from the webinar. They are in alphabetical order by State or Company

State/Company	Last Name	First Name	Email Address
AASHTO	Knake	Maria	mknake@ashtoresource.org
AASHTO	Malusky	Katheryn	kmalusky@ashto.org
AASHTO	Smith	Greta	gsmith@ashto.org
AL	Blackburn	Lyndi	blackburnl@dot.state.al.us
ERGON	Tomkins	Larry	larry.tomkins@ergon.com
FHWA	Kessler	Morgan	Morgan.Kessler@dot.gov
FLINT HILLS RESEARCH	Shoger	Jeff	jeff.shoger@fhr.com
GA	Flournoy	Monica	mflournoy@dot.ga.gov
GA	Rabun	JT	JRabun@dot.ga.gov
IL	Pfeifer	Brian	brian.pfeifer@illinois.gov
ME (Chair)	Nener-Plante	Derek	derek.nener-plante@maine.gov
MI	Kennedy	Kevin	kennedyk@michigan.gov
MO	Donahue	John	john.donahue@modot.mo.gov

NC	Morrison	Clark	cmorrison@ncdot.gov
NC	Peoples	Chris	cpeoples@ncdot.gov
NE	Miller	Kent	kent.miller@nebraska.gov
NJ	Hanczaryk	Paul	Paul.Hanczaryk@dot.nj.gov
NV	Pan	Charlie	cpan@dot.state.nv.us
NV	Tedford	Darin	dtedford@dot.nv.gov
OR	Johnson	Bruce	bruce.v.johnson@odot.state.or.us
PA	Ramirez	Timothy	tramirez@pa.gov
SC	Short	Temple	shorttk@scdot.org
SD	Hodges	Darin	darin.hodges@state.sd.us
TECHNOPAVE	Salomon	Delmar	delmar@technopave.com
TN	Hall	Heather	heather.purdy.hall@tn.gov
UT	Andrus	Scott	scottandrus@utah.gov
VA	Babish	Charles	andy.babish@vdot.virginia.gov
WI	Paye	Barry	barry.paye@dot.wi.gov
WV (Vice Chair)	Walbeck	Travis	travis.b.walbeck@wv.gov

III. Approval of Technical Section Meeting Minutes

Minutes from the last meeting in August were distributed electronically. A motion was made by Virginia and a second by Alabama to approve the minutes. The motion passed unopposed.

IV. Old Business

A. COMP / TS Ballot – review comments

All ballots passed both the tech section ballot and the COMP ballot. Comments were received, many of which were of an editorial nature. The documents will be sent to AASHTO publications staff for clarification on what is editorial and what is not. Redline changes will be sent to the Tech Section for full review of changes being made.

Ballot Item	COMP		Tech Section	
	Positives	Negatives /No Vote	Positives	Negatives /No Vote
<p>Standard Specification for Materials for Sand Seals MP 27 will be changed to new material specification wherever it appears.</p> <p>Wording changes suggested in Section 5.2.1, and 5.2.2.</p> <p>Table 1 Title was noted as not being descriptive enough.</p> <p>Language in Section 5.2.5 will be updated so that it does not conflict with 5.3.1 and 5.3.2.</p>	44	0/7	22	0/5
Standard Specification for Materials for Emulsified Asphalt Scrub Seal	44	0/7	22	0/5

<p>Many comments were received on Table 1, including listing the standard that each material property comes from.</p> <p>Other minor changes made throughout.</p> <p>A question was asked if rejuvenators should be mentioned as an additive (section 5.5.9).</p>				
<p>Standard Specification for Thin Overlay Treatments Using a Binder Resin System and Aggregate for Concrete Surfaces</p> <p>There was discussion about being more clear in the summary what materials this standard applies to.</p> <p>Footnote a in Table 3 was suggested that this be changed to “Polyester Resins with low viscosities”</p> <p>Decimal place inconsistencies will be addressed in Section 7.</p> <p>Unit is missing in 7.1.9.3 (should be hours).</p> <p>In Section 7.1.10, strength should be changed to 24 h instead of 7 days.</p> <p>Wording in Section 6.1.16 will be softened from “rejection” since this is a contract issue that should be left up to each state in terms of acceptance.</p>	44	0/7	22	0/5
<p>Standard Specification for Sand Seal Design</p> <p>M 82 will be added to Referenced Documents</p> <p>There was discussion around M82 took place, and whether it should actually be referenced in this standard at all, since it is a specification for medium curing cutbacks, not emulsified asphalt and should be removed. Members indicated that the reference to M82 could be removed. This would have to be sent to TS ballot.</p>	44	0/7	22	0/5
<p>Standard Practice for Scrub Seal Design</p> <p>There was a question as to whether the MNDOT manuals needed to be referenced in the standard.</p> <p>The term “traffic whip-off” was not known to some members, and will be changed to more commonly understood wording.</p> <p>Change “emulsion” to “emulsified asphalt” throughout</p>	44	0/7	22	0/5

V. New Business

VI. Open Discussion

Diamond Grinding and Application of Overlay Systems were not balloted on the last COMP ballot, since they are more constructions-related. The Subcommittee on Maintenance passed a resolution to take over responsibility for these standards. More updates will come from the chair as AASHTO figures out how this will be handled and how these standards will be published and logistics of how Maintenance will work with TS 5b. TS 5b will likely still play an active role.

Note from TN: States should realize that specifications should be handled by each state individually, especially in regards to calcine bauxites used in high-friction surface courses. Manufacturers will begin using these specs when published. NTPEP is looking closely at these products.

This Tech Section has taken over newly approved provisional standards. The chair will be developing a survey to send to members regarding who is using these standard. If there are standards that are working well, there is no need to wait the full 8 years for the life of a provisional standard, and they can be made into a standard.

If you have new standards to propose, proposing them as early as possible in the balloting process so that they can be vetted and changed early.

In addition to Diamond Grinding, there are other (5-6) repair-type standards that will be considered for ballot in the future.

VII. Adjourn

The meeting adjourned at 2:17 PM EST

**AASHTO Committee on Maintenance
Administrative Resolution**

**Title: Establish a Collaborative Review Process for Pavement Preservation Treatment
Construction Guidance Specifications**

WHEREAS, The AASHTO Highways Committee on Maintenance is seen as a leading technical resource for extending pavement life through the timely use of pavement preservation, a proven strategy used throughout the nation to keep highways, roads, and streets in good condition; and

WHEREAS, Many AASHTO member departments look to their maintenance staff to construct pavement preservation treatments using in-house personnel, or when contracted, perform construction inspection; and

WHEREAS, The AASHTO TSP-2 has created a Pavement Preservation Emulsion Task Force and a Concrete Pavement Preservation Task Force consisting of technical experts from AASHTO member agencies, material suppliers, contractors, consultants, academia, and FHWA to develop specification documents for Design, Materials, and Construction that will improve the reliability and performance of pavement preservation treatments; and

WHEREAS, The Pavement Preservation Emulsion Task Force and Concrete Pavement Preservation Task Force have submitted and received approval on many Design and Material Specifications from the Committee on Materials and Pavements; and

WHEREAS, AASHTO approved construction guidance specifications for preservation treatments are needed by agencies and industry alike to ensure uniform application techniques and construction practices; and

WHEREAS, The Committee on Materials and Pavements has recently formed a Technical Subcommittee-5b that routinely meets to review Bridge and Pavement Preservation specifications related to design and materials; and

WHEREAS, Maintenance input is critical in the review and approval process of construction guidance specifications for pavement preservation treatments; and

WHEREAS, The AASHTO member departments can be best served by a collaborative effort with the Committees on Maintenance (COM), Materials and Pavements (COMP), and Construction (COC) to implement a thorough and timely review process for pavement preservation construction guidance specifications; and

NOW, THEREFORE, BE IT RESOLVED, That the AASHTO Highways Committee on Maintenance recommends to the Highways and Streets Council of the AASHTO Transportation Policy Forum to assign to the Committee on Materials and Pavements, Technical Subcommittee 5b, for a five year period, the responsibility for reviewing, maintaining, and publishing pavement preservation materials standards and pavement preservation treatment construction guidance specifications to the corresponding publications (e.g. AASHTO Materials Book or AASHTO Construction Guide); and that the COMP Technical Subcommittee 5b add 3 to 5 voting representatives from each of the Committees on Maintenance and Construction for the development and review of preservation construction guidance specifications.

Appendix C: Technical Subcommittee 5B Ballot #1 Comments

Diamond Grinding for Pavement Preservation

Agency	Individual Name	Comments
Alabama Department of Transportation	Lyndi D Blackburn	This standard does not appear complete. The reference section is not completed. It appears that some references to AASHTO standards may be beneficial in this standard. Please see the attached document with tracked changes for more comments and suggestions.
Kansas Department of Transportation	Richard A Barezinsky	<p>3.2.2 Suggested rewording: blade spacing—Refers to the separation between cutting blades mounted in series on the cutting head (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 and size of the aggregate of the material being diamond ground; particularly for concrete pavement.</p> <p>3.2.x Add a definition: grinding cutting head —Refers to the location of diamond blades mounted in series on the drum (rotating shaft) on the grinding equipment. The cutting head width typically ranges from 48-50 inches.</p> <p>3.2.3 Add "Portland cement" before "concrete"</p> <p>3.2.4 DMI stands for Distance Measuring instrument. To be consistent with 3.2.6 add the word "longitudinal" before "distance" in the definition</p> <p>3.2.7 International Roughness Index (IRI): Suggest using the same definition as AASHTO R435.1: Add "(DBR)" after Dowel Bar Retrofit since the abbreviation is used in 8.3.</p> <p>5.3 & 5.4 & 8.6 & 8.7: Suggest changing "ensure" to "verify"</p> <p>8.9 Why not use 125 inches per mile to be consistent with IGGA guide spec? 160 in/mi is awfully rough.</p> <p>Table 1: I prefer the 0.35 factor that's in IGGA guide spec be used in lieu of the 0.6</p>
Maine Department of Transportation	Derek John Nener- Plante	<ul style="list-style-type: none"> - ASTM reference needs to be addressed in Section 3.1 - Recommend making the headings more general to cover construction specifications (i.e. description, materials, construction, acceptance, method of measurement, basis of payment etc.)
Michigan Department of Transportation	John F Staton	Comment. Suggest adding a note to section 9.2 discussing that the width of feather grinding should be a minimum 2 ft and may be increased to up to 4 feet based on site conditions. The intent is to provide positive cross drainage. The additional feathering width into the shoulder may be required if the shoulder elevation is greater than the mainline pavement elevation, which would then provide for a better cross slope transition to get the water away from the longitudinal joint.

Nevada Department of Transportation	CHANGLIN PAN	Several AASHTO Standards should be referenced for IRI measurement and inertial profiling system. Are "method of measurement" and "basis of payment" sections needed in the AASHTO Standard? Section 1.4 is not needed since no SI unit values in the specification.
Ohio Department of Transportation	Gary Edward Angles	The specification is very similar to Ohio's 257 spec. which mirrors the IGGA spec.
Ontario Ministry Of Transportation	Becca Lane	Diamond Grinding – slurry disposal for larger projects is a significant environmental requirement - may need a settlement pond. Smoothness - need to check out improvements proposed.
South Carolina Department of Transportation	Temple Short	Section 2.2 - Add ASTM E1926 and also add a placeholder of ASTM XXXX Section 3.2.1 - Add "at least" before "...a continuous 25-ft length of IRI..." Section 8.2 - Rewrite the next to last sentence to remove both trademarked names from the standard. Sections 8.7 & 8.8: This all sounds like contract language that should be left up to the states/owners and not part of the standard. Section 8.9: Do we need to specify the ProVAL software?
Texas Department of Transportation	James Russell Stevenson	There has been increased use of diamond grinding for preservation in Texas. This is an excellent topic for review.
West Virginia Department of Transportation	Travis Blake Walbeck	We would like to make the suggestions made in the attached (track changes) document.
Wisconsin Department of Transportation	Christopher Alan Ohm	7.1 In rural areas slurry can be placed on gravel shoulders. 9.2 Why pay extra for the feathering into adjoining pavement? Their isn't any extra effort to do the match into non-diamond ground pavement.

Standard Specification for

Diamond Grinding for Pavement Preservation

AASHTO Designation: M xxx-19¹

**Technical Subcommittee: 5b, Bridge and Pavement
Preservation**

Release: Group 1 (April)



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

Guide Specification for

Diamond Grinding for Pavement Preservation

AASHTO Designation: M xxx-19¹



**Technical Subcommittee: 5b, Bridge
and Pavement Preservation**

Release: Group 1 (April)

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.
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2. REFERENCED STANDARDS

- 2.1. *AASHTO Standards:*
 - 2.2. *ASTM Standards:*
-

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

Commented [BL1]: Negative vote is really based on this standard appears to be incomplete.

Commented [BL2]: See Note above.

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 pounds 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.

Commented [BL3]: If you want attention paid to it - then it needs to be specific and not in slang language.

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-inch 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-inch in 12 feet when measured with a 12-foot 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 g~~Grinding operations ~~is~~shall not consist of 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-inch 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-inch. No unground surface area between passes will be permitted.

Commented [BL4]: Define acceptable ride or put in a reference where acceptable ride is defined.

Commented [BL5]: Our FHWA will not let us match existing. What if the pre-grind slope is incorrect? Suggest wording - "...match the construction plan requirements...."

Commented [BL6]: Define acceptable ride or put in a reference where acceptable ride is defined.

6. FINAL SURFACE FINISH

- 6.1. The grinding process shall produce a pavement surface that ~~is true~~meets the contract plan requirements in grade. ~~and~~ Ground surface shall be 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-inch +/- 1/16-inch 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 ft 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 - 60 blades per ft as necessary to provide the designated texture. Harder aggregate may require the use of 55 – 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.

Commented [BL7]: How would this be determined? I can see many arguments over this one but don't really see another way to write it.

7. SLURRY HANDLING AND REMOVAL

- 7.1. Slurry shall be collected, processed and disposed of in accordance with [the agency's](#) 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, spall repair, etc. The profile ~~will~~ shall 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 s-~~segment locations from the control profile shall 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 hrs 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 [inertial profiler](#) equipment as the contractor. When light weight profilers are used, ~~it is of great importance that~~ a proper guide shall ~~be~~ be 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

Commented [BL8]: Is there an AASHTO standard that can be referenced here?

Commented [BL9]: Who certifies? Is this per agency requirements? We have extensive requirements for our profiler certification.

Commented [BL10]: For approval to exclude. This needs to be addressed in 6.4 that the Engineer will review and approve the depressed areas.

Commented [BL11]: Is this also done on the control profile - it was not mentioned.

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 regrounding 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-inch in 25 feet. For roadways with posted speeds greater than 45 mph, the localized roughness (IRI) will be less than or equal to 160 inches per mile, 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-inch variance in a 12-foot 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	≤0.6* (Existing Segment MRI)
>45	≤130	<78
	>130	≤0.6* (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 This full standard was first published in 2019.

[Standard Guide Construction](#) Specification for

Diamond Grinding for Pavement Preservation

AASHTO Designation: M xxx-19¹

**Technical Subcommittee: 5b, Bridge and Pavement
Preservation**

Release: Group 1 (April)



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

Diamond Grinding for Pavement Preservation

AASHTO Designation: M xxx-19¹



Technical Subcommittee: 5b, Bridge
and Pavement Preservation

Release: Group 1 (April)

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. AASHTO Standards: [AASHTO R-54](#), [AASHTO R-56](#)
- 2.2. ASTM Standards:

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 pounds 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, stitching, and dowel bar retrofit, and the like treatments 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-inch 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-inch in 12 feet when measured with a 12-foot 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-inch 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-inch. No unground surface area between passes will be permitted.

Commented [WTB1]: We use a 10 ft straight edge for some testing, it's 12 ft the better number for this?

Do we want language to allow for LiDAR or other measurement methods?

Commented [WTB2]: I suggest that we change this to "the grinding operation MAY not texture the wheel path."

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-inch +/- 1/16-inch 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 - 60 blades per #foot as necessary to provide the designated texture. Harder aggregate may require the use of 55 - 60 blades per #foot.
- 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.
- 6-4-6.5. 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, spall 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 hrs 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

Commented [WTB3]: Should we have the profiler be calibrated in accordance with the AASHTO R-56.

Commented [WTB4]: Should we reference Table 2 in AASHTO R-54...?

found to be in error. Segments found not meeting the smoothness requirements will require regrounding 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-inch in 25 feet. For roadways with posted speeds greater than 45 mph, the localized roughness (IRI) will be less than or equal to 160 inches per mile, 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-inch variance in a 12-foot 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.

Commented [WTB5]: Agency vs Department vs Contracting Authority

It appears that they are all used, maybe interchangeably. Would it be better to use one term?

Commented [WTB6]: By what method?

Commented [WTB7]: Should this be the only method allowed?

Do we need to establish a method or just say, "less than 160 in/mi"?

Table 1—Smoothness Requirements

Posted Speed Limit (MPH)	Existing MRI	Required Post Grind MRI
≤45	≤230	<138
	>230	≤0.6* (Existing Segment MRI)
>45	≤130	<78
	>130	≤0.6* (Existing Segment MRI)

Commented [WTB8]: Should we move Table 1 closer to the reference to minimize confusion with localized roughness?

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 This full standard was first published in 2019.

Appendix D: Technical Subcommittee 5B Ballot #1 Comments

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

Agency	Individual Name	Comments
Arkansas Department of Transportation	Stewart Linz	<p>General consistency and flow of entire document: While the document meets the required formatting most sections could be condensed to fewer subsections. Reads like a bullet list with several areas having duplicate information or stating same information in a separate section.</p> <p>2.: Include references for materials? M235M/M 235-13, MP 35-18</p> <p>4.1.2: clarify that requirement is up to point of product achieving final cure.</p> <p>5.12.9.: the owner agency may allow the reuse of excess aggregate.....</p> <p>Why limit to semi-automated and fully automated applications. For smaller areas manual mixing and hand broadcasting of components can give quality results.</p>
Kansas Department of Transportation	Richard A Barezinsky	<p>1.2 & 4.4 Suggest removing Ramps as they can be on grade pavements</p> <p>4.4.3 Suggest a CSP of 6-7 range. A weak CSP 5 doesn't always remove contaminants.</p> <p>5.5 Remove "by the owner" as knowing what is compatible with the contractor's binder resin system is likely unknown until the contractor has secured the materials.</p> <p>5.9 Remove "the owner agency may"</p> <p>5.10 Remove "the owner agency may" and put "a" after "Apply".</p> <p>5.14.7 Why the 5 seconds? What happens if the aggregate is not placed within 5 seconds? Should this be based on the gelling of the binder resin?</p> <p>Table 1 - Suggest adding a pull-off test to verify the bond with the underlying surface.</p>
Maine Department of Transportation	Derek John Nener-Plante	<p>- Strongly recommend making the headings more general to cover construction specifications (i.e. description, materials, construction, acceptance, method of measurement, basis of payment etc.)</p>
Nevada Department of Transportation	CHANGLIN PAN	<p>Section 2.2, ASTM E1911 has been withdrawn in 2018</p> <p>Section 7, Table 1, ASTM E965 should be English unit for consistency</p> <p>There is no definition, or reference of material properties for the binder resin system or aggregates. This is my main concern for the negative.</p> <p>AASHTO PP79 can be a good example to follow for this standard. I assume this application uses similar materials with two lift applications.</p>

Ohio Department of Transportation	Gary Edward Angles	<p>What is the spec being proposed for friction improvement or protection? Spec does not include any requirements for materials. Is this a performance spec.</p> <p>5.6 - define gelled.</p> <p>5.11.1 - Does this tolerance need to be specified since proportioning is per the manufacturer?</p> <p>5.11.2 - How is the thickness of application measured?</p> <p>5.11.7 - What are spiked shoes?</p> <p>5.11.8 - Should a minimum cure period be specified?</p> <p>5.12.1 & 5.12.6 - What is proper embedment?</p> <p>5.12.5 - Where is multiple lifts specified?</p> <p>5.14.5 - What kind of heating system?</p> <p>5.14.12 & 5.15.6 - What data is being provided?</p> <p>I don't think this is ready for adoption.</p>
Ontario Ministry Of Transportation	Becca Lane	<p>Thin Overlay – Binder Resin – Automated system is preferred. With semi-automatic or manual system it will be difficult to get good uniformity.</p>
South Carolina Department of Transportation	Temple Short	<p>Section 2.2 - delete "1" at the end of the ASTM E965 title</p> <p>This standard practice doesn't mention anything about aggregate requirements. My question is, should it? I'm fine with it not and letting the owner specify.</p> <p>Section 2.2 - switch the order of the two ASTM standards to make them sequential.</p> <p>Section 2.3 - (1) Remove the "2013" from the ICRI document unless it absolutely has to be the 2013 version. (2) IRCI Guideline No. 310.2R is not referenced in this standard so either reference it in the body of the standard or remove it from this list.</p> <p>Section 4.2: is it necessary to have this here and also repeat it in Sections 5.2 and 5.3?</p> <p>Section 5.12.9: I think changing the wording to "reuse of excess aggregate" would be clearer.</p> <p>Section 6.1.1 - Add "a minimum of" before 250 yd².</p>
Tennessee Department of Transportation	Mark E Woods	<p>Could the title of this be revised to avoid confusion with asphalt thin overlays? There seems to be room for confusion.</p>
Texas Department of Transportation	James Russell Stevenson	<p>This type of work has been done in several TxDOT Districts. The work methods and procedures can be found in the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014) under Item 439, Bridge Deck Overlays</p>
West Virginia Department of Transportation	Travis Blake Walbeck	<p>We would like to make the suggestions made in the attached (track changes) document.</p>

Standard Practice for the

Commented [WTB1]: This should match with the other construction guide specifications. Or standard practice for...

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

AASHTO Designation: PP xxx-19¹

Technical Subcommittee: 5b, Bridge and Pavement Preservation

Release: Group 1 (April)



**American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
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Application of Thin Overlay Treatments Using a Binder Resin System and Aggregates for Concrete Surfaces

AASHTO Designation: PP xxx-19¹



**Technical Subcommittee: 5b, Bridge and
Pavement Preservation**

Release: Group 1 (April)

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 Standards:*
 - ASTM E1911, Standard Test Method for Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester
 - ASTM E965, Standard Test Method for Measuring Pavement Macrotecture Depth Using a Volumetric Technique¹
- 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. QUALIFICATION OF INSTALLER

- 3.1. *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.
- 3.2. *Key Personnel:*
- 3.2.1. Provide contact information for key personnel.
 - 3.2.2. Designate a project superintendent who shall have full authority to institute any action necessary for the successful operation of the QC plan.
 - 3.2.3. 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.
- 3.3. *Equipment:*
- 3.3.1. Equipment calibration records of metering devices and application monitoring devices to ensure compliance with this specification.
 - 3.3.2. Cleaning and maintenance schedule for application equipment.
- 3.4. *Materials:*
- 3.4.1. Provide procedures for storage and protection of materials both stockpiled and onsite.
- 3.5. *Installation of Thin Overlay:*
- 3.5.1. Provide procedures for mixing and placement of materials for thin overlay.
 - 3.5.2. Provide procedures for monitoring, recording, and submittal of ambient conditions (air temperature, surface temperature, relative humidity).
 - 3.5.3. Provide procedures for recording of quantities of materials installed.
 - 3.5.4. 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.
- 3.5.5-3.6. Submit the QC plan to the engineer for approval at least 30 days prior to the placement.
- 3.5.6-3.7. 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.

Commented [WTB3]: This is an incomplete sentence.

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4. RECOMMENDED CONSTRUCTION PRACTICES

- 4.1. *Storage of Materials:*
- 4.1.1. Materials shall be stored in accordance to the manufacturer's recommendations.
 - 4.1.2. At no time shall the aggregate be exposed to rain, or moisture.

4.1.3. 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.

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

4.2. *Application Conditions:*

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

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

4.3. *Preparation of Surfaces:*

4.3.1. 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.

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

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

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

Commented [WTB4]: Some rewording may be needed here.

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

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

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

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

Commented [WTB5]: Should we define "CSP 5"?

4.4.4. 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.

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

5. **APPLICATION**

Commented [WTB6]: Some of the early parts of this section seem out of place with the later sections. We need to review the order.

5.1. Apply the thin overlay, in accordance with this specification.

Commented [WTB7]: Does this really need to be stated?

5.2. Apply the thin overlay material on a prepared surface, when the surface temperatures are within manufacturer's recommendation.

5.3. 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.

5.4. 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.

5.5. 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.

Commented [WTB8]: Could this be done by contract with the other work..?

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

Commented [WTB9]: Isn't this one of the lifts...? This seems out of place.

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

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

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

5.10. The owner agency may apply thin overlay to the barrier as each of the overlay applications is performed.

5.11. *Binder Application:*

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

5.11.2. The binder resin system shall be applied at a uniform thickness of 65 ± 5 mils (2.96 to 2.54 yd² per gal) onto a prepared pavement surface.

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

5.11.4. 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.

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

5.11.6. 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.

5.11.7. 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~~ Contractor's expense.

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

5.12. *Aggregate Application:*

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

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

- 5.12.3. Aggregate shall completely cover the uncured binder resin system to achieve a uniform surface.
- 5.12.4. 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.
- 5.12.5. When placing in multiple lifts, ensure that the aggregate used is the same material as the final riding surface.
- 5.12.6. It is the responsibility of the ~~installers-Contractor~~ to ensure proper embedment of the aggregate.
- 5.12.7. 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.
- 5.12.8. Remove the excess aggregate by sweeping or vacuuming before opening to traffic.
- 5.12.9. The owner agency may allow the reuse of excess aggregate if it is clean, dry, free from foreign matter, and meets gradation requirements.
- 5.12.10. Recovered aggregate must be blended prior to reuse at a ratio of a minimum of three parts virgin material to one part recycled material.
- 5.12.11. All applications will require additional sweeping 3–7 days after installation is completed.
- 5.13. *Application Methods:*
- 5.13.1. Utilize one of the following methods to apply the binder resin and aggregate wearing course.
- 5.14. *Fully-Automated Application:*
- 5.14.1. Mechanically apply the thin overlay by a continuous self-contained application vehicle.
- 5.14.2. The application vehicle shall provide continuous pumping and proportioning devices.
- 5.14.3. 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.
- 5.14.4. 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.
- 5.14.5. Heating system may be necessary if required by the binder resin system manufacturer to ensure proper installation.
- 5.14.6. Limited touch-up of the resin with hand tools is permitted for areas less than 2 ft².
- 5.14.7. Within 5 s after placing the binder resin system; the aggregate is applied at a minimum rate of 14–16 lb per yd².
- 5.14.8. Hand application of aggregate is allowed only to assist in completely covering the binder resin system to achieve a uniform surface.

- 5.14.9. 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.
 - 5.14.10. 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 surfacing aggregate.
 - 5.14.11. 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.
 - 5.14.12. 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.
 - 5.14.13. In case of equipment malfunction, calibration can also be done by measuring the total gallons used divided by the number of square yards applied.
 - 5.14.14. ~~Coarse textured surfaces may cause the~~ application rate ~~to be adjusted~~ may be adjusted in order to achieve overall desired mil thickness of finished product.
 - 5.14.15. Ensure that application equipment is capable of applying binder uniformly in one pass to obtain the desired mil thickness.
 - 5.14.16. 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.
 - 5.14.17. The binder resin system manufacturer shall approve the use of their material with said automated continuous application device.
- 5.15. *Semi-Automated Application:*
- 5.15.1. Use a semi-automated application machine that mixes, meters, pumps, blends, and applies the binder resin system.
 - 5.15.2. A heating system may be necessary if required by the binder resin system manufacturer to ensure proper installation.
 - 5.15.3. The semi-automated application machine shall have positive displacement volumetric metering pumps.
 - 5.15.4. 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.
 - 5.15.5. 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.
 - 5.15.6. 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.
 - 5.15.7. 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

- 5.15.8. Mechanically apply the aggregate at a minimum rate of 14–16 lb per yd² 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.
- 5.15.9. Hand application of aggregate is allowed only to assist in completely covering the binder resin system to achieve a uniform surface.

6. DEMONSTRATION OF THIN OVERLAY

- 6.1. *Test Section:*
 - 6.1.1. The ~~installer~~-Contractor shall construct a test section of 250 yd².
 - 6.1.2. 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.
 - 6.1.3. The test section shall be part of the thin overlay quantity of the project and approved by the project engineer.

7. VERIFICATION TESTING

- 7.1. 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).
- 7.2. Verification testing shown in Table 1 may be performed by the installer or owner agency, as indicated in the project documents.

Table 1—Verification Testing

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

8. KEYWORDS

- 8.1. Binder resin system; concrete surfaces; thin overlay treatment.

¹ This provisional standard was first published in 2019.