MDOT
Michigan Department of Transportation

CAPITAL PREVENTIVE MAINTENANCE MANUAL

December 2020

CONSTRUCTION FIELD SERVICES DIVISION

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Engineering Manual Preamble

This manual provides guidance to administrative, engineering, and technical staff. Engineering practice requires that professionals use a combination of technical skills and judgment in decision making. Engineering judgment is necessary to allow decisions to account for unique site-specific conditions and considerations to provide high quality products, within budget, and to protect the public health, safety, and welfare. This manual provides the general operational guidelines; however, it is understood that adaptation, adjustments, and deviations are sometimes necessary. Innovation is a key foundational element to advance the state of engineering practice and develop more effective and efficient engineering solutions and materials. As such, it is essential that our engineering manuals provide a vehicle to promote, pilot, or implement technologies or practices that provide efficiencies and quality products, while maintaining the safety, health, and welfare of the public. It is expected when making significant or impactful deviations from the technical information from these guidance materials, that reasonable consultations with experts, technical committees, and/or policy setting bodies occur prior to actions within the timeframes allowed. It is also expected that these consultations will eliminate any potential conflicts of interest, perceived or otherwise. MDOT Leadership is committed to a culture of innovation to optimize engineering solutions.

The National Society of Professional Engineers Code of Ethics for Engineering is founded on six fundamental canons. Those canons are provided below.

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform Services only in areas of their competence.
3. Issue public statement only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, reasonably, ethically and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

CAPITAL PREVENTIVE MAINTENANCE PROGRAM

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CHAPTER 1

CAPTIAL PREVENTIVE MAINTENANCE PROGRAM

1.1 DEFINITION OF PREVENTIVE MAINTENANCE

The performance of a highway depends upon the type, time of application, and quality of the maintenance it receives. Pavement maintenance can be classified into three activity groups which are preventive, reactive, and routine maintenance. ***Preventive Maintenance*** is the planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration and maintains or improves the functional condition of the system without (significantly) increasing structural capacity. Preventive maintenance activities protect the pavement and decrease the rate of deterioration. ***Reactive maintenance*** are activities that must be done in response to events beyond the control of the Department. Some events require response as soon as possible to avoid profound consequences because a present or imminent danger exists. Reactive maintenance cannot be scheduled because they occur without warning and often must be immediately addressed. Examples of reactive maintenance activities include pothole patching, removing and patching pavement blowups, or unplugging drainage facilities. ***Routine maintenance*** is the day-to-day maintenance activities that are scheduled or whose timing is within the control of maintenance personnel. Examples of routine maintenance include filling potholes and filling cracks in pavement, painting pavement markings or cleaning ditches. Delays in preventive maintenance increase the quantity of pavement defects and their severity so that, when corrected, the cost is much greater. Consequently, the life cycle costs of the pavement will be considerably increased.

1.2 PROGRAM DESCRIPTION

The intent of the Capital Preventive Maintenance (CPM) Program is to implement planned strategies of cost effective treatments to existing roadway systems that preserve the system, retard future deterioration, and maintain or improve the functional condition of the system without substantially increasing structural capacity. The program was initiated by the Michigan Department of Transportation's Maintenance Division (currently the program resides in the Construction Field Services Division) in 1992, in cooperation with the Federal Highway Administration. Funding for the program is a combination of federal and state transportation dollars. The CPM Program should be closely coordinated with the region's road rehabilitation/reconstruction (R&R), non-freeway resurfacing program (NFRP), and region maintenance programs.

The CPM program has two subgroups, Pavement Sealing (Surface Sealing) and Functional Enhancements, to encourage a balanced CPM strategy that will complement the region's pavement strategy. A discretionary budget and an emerging technology budget also exist to supplement either group to achieve the most cost-effective preventive maintenance strategy. The discretionary budget can be used for pavement sealing, functional enhancements, or emerging technologies. CPM fixes are primarily done on roads with a remaining service life (RSL) of greater than two years at the time of obligation. Ideally, each region should develop a preventive maintenance action plan for their newly constructed pavements.

Chapter 3 of the manual lists all the standard CPM treatments and current emerging technology (ET) fixes. This chapter will also provide descriptions of the treatments, guidelines when to use a fix, and indicates whether the treatment is a pavement seal or a functional enhancement.

1.3 PROGRAM CONTACTS

The Capital Preventive Maintenance Program is administered by the Construction Field Services Division. The contacts for the CPM program are:

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CHAPTER 2

PROJECT SCOPING CONSIDERATIONS

2.1 PROJECT IDENTIFICATION AND SELECTION

Project selection for preventive maintenance utilizes both visual inspection and data from the Pavement Management System (PMS). Recommended pavement condition levels are listed for each preventive maintenance treatment. These condition levels have been identified to aid the Engineer in determining for what existing pavement condition a specific preventive maintenance treatment is cost effective. Pavement condition data includes Remaining Service Life (RSL), Distress Index (DI), International Roughness Index (IRI), and Rut Depth. These condition measures are consistent statewide and will ensure that preventive maintenance treatment selection for specific projects is consistent with long term network pavement strategies identified by the Department. The application of preventive maintenance treatments should be on pavements with a RSL of greater than two years. Pavements having less than two years RSL will be a candidate for either a R&R or NFRP Project. Pavement conditions that require immediate attention are ideal candidates for routine maintenance until the R&R is implemented.

Preventive maintenance projects can be performed on any highway under the jurisdiction of the Michigan Department of Transportation. These projects should be relatively simple and should focus on pavement structures with more than 2 years of remaining service life. Severely distressed pavement structures or pavements with a severely distorted cross section are generally not candidate projects for the Capital Preventive Maintenance Program. Project work should be kept between the outside edges of the shoulders or curbs because such a project qualifies for an environmental programmatic Categorical Exclusion (CE). Minor safety and drainage work can be included in Preventive Maintenance Projects, but such work should not be extensive. Examples of minor safety work include; pavement cross section corrections by either milling or by placing a HMA wedge course, the replacement of guardrail terminal endings to meet current standards, and the replacement of the existing pavement markings to current standards.

The Capital Preventive Maintenance Program uses mostly surface treatments as categories of work. These surface treatments are targeted at pavement surface defects primarily caused by the environment and by pavement material deficiencies. Occasional structural deficiencies of the pavement structure caused by traffic loading can be corrected by this program. Other preventive maintenance treatments used to protect the pavement structure and/or to slow the rate of pavement deterioration include limited shoulder work and drainage work.

All candidate selections consistent with these guidelines will be the responsibility of the Regions. Joint reviews with Construction Field Services representation is not necessary, unless requested by the Region. The form, Project Field Review Report (See Appendix A), shall be used to document the field review for each candidate project. Personnel from the TSC and/or Region office will complete the description of the proposed project and the historical data portion of the form before the field review. After the field review, the Preventive Maintenance Coordinator from the Region office will complete the form. The completed form will contain the description of the proposed project, the historical data on the highway section, and field review comments. A copy of the completed form will be sent to the Capital Preventive Maintenance Engineer for review by the CPM Sub-Committee per the annual Call for Projects instruction letter.

2.2 SAFETY CRITERIA

Projects that have been selected will no longer require a crash history analysis by the Safety Programs Unit except for HMA surfacing projects. On those projects, the regions will be required to accurately report superelevation measurements for curves that have a history of crashes. The elevation shots will be provided to the Geometric Design Unit early in the design stage of the project. A correlation of crashes to deficient geometry will require an upgrade of superelevation.

The following criteria shall apply to <u>all projects:</u>

- Gravel shoulder shall require a minimum 3 feet wide paved shoulder ribbons.

- The regions are to conduct roadside hardware inspections to determine the amount of guardrail that has severe post and guardrail deterioration. The region will determine whether the guardrail should be upgraded on the capital preventive maintenance project or delayed until a future project. Replacement of deficient guardrail on freeways should be coordinated through the Region Development Engineer and the Lansing Traffic and Safety Division.

- Cable barriers shall be upgraded to current standards or appropriate slope modifications should be made.

- Blunt and turned down guardrail endings shall be replaced with an appropriate ending from the Road and Bridge Standard Plans.

- Guardrails shall be connected to bridge rails and piers.

- The pavement markings, advance warning signs, and crossbucks for all railroad crossings shall be upgraded to meet current standards. However, railroad crossbucks with active signals or gates do not require upgrading by the capital preventive maintenance program. The railroad company will have responsibility for replacing signals and gates with prioritization independent of the roadway projects.

Approved 03-03-95 (EOC)
04-10-95 (FHWA)
Terminology Update 5-16-00,11-5-2009, 8-21-2018

Implementation of the 2016 edition of the AASHTO Manual of Assessing Safety Hardware (MASH) will be as follows:

For contracts involving MDOT roadways, or non-MDOT roadways that are part of the National Highway System (NHS), safety hardware meeting the 2016 edition of MASH criteria will be allowed for new permanent installations and full replacements. This will be determined based on the category, and possible subcategory, of roadside safety hardware required.

Therefore, designers are advised to contact the Geometric Design Unit, Design Division to obtain the latest information regarding the currently approved line of roadside safety hardware and recommendations regarding the use of MASH-compliant roadside safety devices.

The current guidance for MASH implementation regarding CPM projects will only impact projects that will be impacting existing roadside safety devices (e.g., guardrail, cable barriers, impact attenuators, etc.). If the scope of the project does not include any work impacting roadside safety devices (i.e. replacement, lowering, etc.), upgrades do not need to be made. However, if there is any impact to the existing roadside safety devices, upgrade the material to meet the new MASH requirements.

2.3 ADA CONSIDERATIONS

In 1994, the Public Rights of Way Accessibility Guideline (PROWAG) was published to address accessibility issues specific to public rights of way. Compliance with this document is mandatory for the design, construction, and alteration of pedestrian facilities in the public right-of-way. The FHWA requires that curb ramp construction and/or curb ramp upgrade be incorporated with new construction, resurfacing, and roadway alterations.

CPM projects are primarily an alteration or maintenance activity where curb ramps may need to be addressed.

The FHWA defines alteration and maintenance as follows:

Alteration refers to changes that affect or could affect the usability of an existing roadway facility. Curb ramp installation and upgrading is required prior to or at the time of a roadway alteration.

Some examples of alterations include micro-surfacing, double chip seal, cape seal, and HMA overlay. For the full list of fixes, see section 6.08.05A of the Michigan Road Design Manual.

Maintenance refers to maintenance activities that do not affect the usability of an existing road. Curb ramp accessibility upgrades are not required to be performed in conjunction with maintenance treatments. The U.S. Department of Justice and the FHWA issued a joint Technical Assistance memo in 2013 to clarify which roadway treatments fall within the definition of an alteration and which are considered maintenance.

Some examples of maintenance include crack sealing, chip seals, diamond grinding, and pavement patching. For the full list of fixes, see section 6.08.05A of the Michigan Road Design Manual.

It is important to note; two or more maintenance treatments may be combined and still be considered a maintenance treatment. However, if more than one of those treatments contains aggregate and/or filler, the combination will be considered an alteration. For example, a double chip seal is an integrated system comprised of two maintenance treatments, a chip seal over a chip seal. The top course chip seal includes aggregate to fill the voids of the aggregate of the base course chip seal. They combine as an alteration.

If the projects limits include only a portion of an intersection, all ramps within the intersection will be evaluated for compliance and the project limits extended to include all ramps. Smaller scale projects such as CPM may still require a right of way phase to accommodate consent to tie into existing sidewalk outside the right of way. See section 5.05.02 of the Michigan Road Design Manual for more information on right of way requirements. Alteration projects will likely require accurate contour and elevation information prior to designing compliant curb ramps.

2.4 CRACK DENSITY CRITERIA

Crack sealing and filling is one of the most effective and prevalent CPM treatments that can be performed on both HMA and concrete pavements. However, if too much crack filling material is placed on the roadway, a potential safety issue can form. To help aid in the selection of good crack filling candidate projects, crack density criteria was developed. The crack density criteria are intended to provide guidance on when crack sealing and filling would be effective or if a pavement seal is the appropriate fix type.

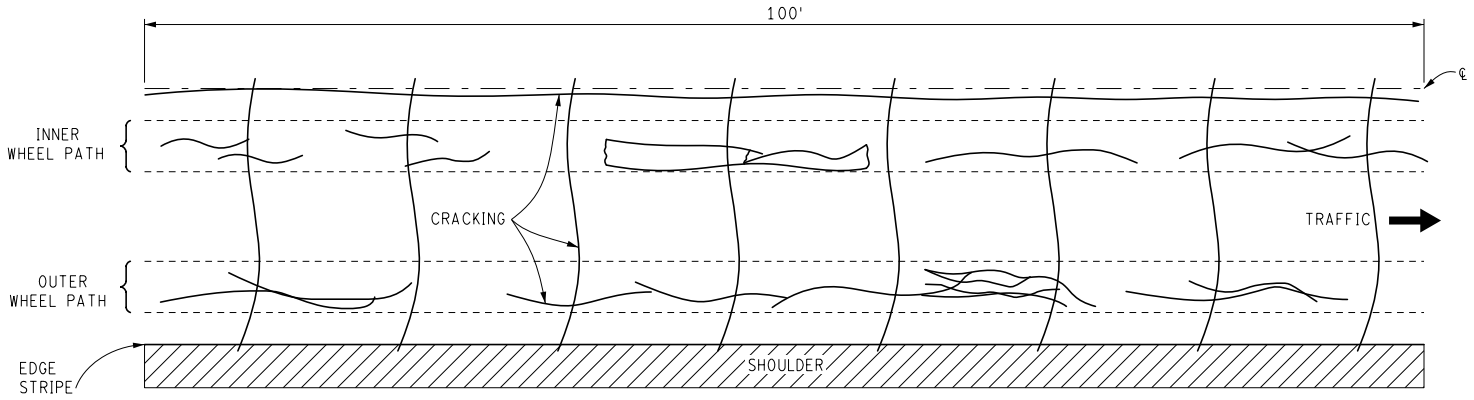
Best practice is to review candidate roadways in the spring to develop the TSC / Region wide crack seal program for that year. If this is not the current practice, it is vital that construction staff review each location prior to the crack seal work. If the density increases, to high density, from when the project was originally scoped, it is advised to omit that location. CFS staff can also aid in this process if needed.

The location of the cracking is the largest concern when deciding between stand-alone crack or using crack sealing as a pretreatment for a pavement seal.

Crack density is broken down into three categories, low, medium, and high. The following diagrams show example cracking patterns and quantities. While all patterns and configurations cannot be shown, the diagrams help provide examples of how to quantify the crack density of a roadway.

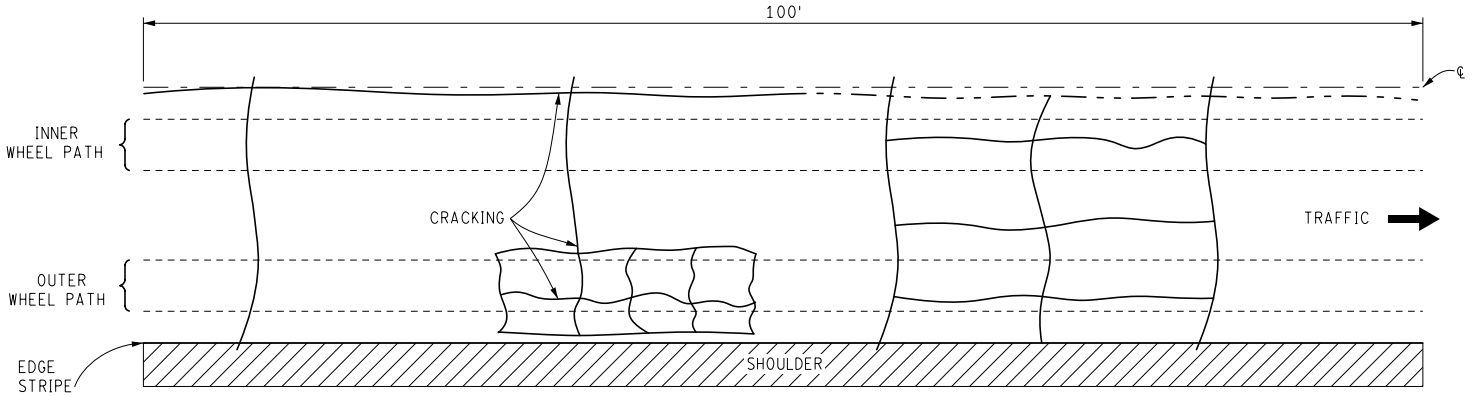
For roadways with a low crack density, crack sealing and filling is an effective treatment to preserve the road. Roadways with medium crack density, crack sealing and filling may still be effective. However, if most of the cracking is in the wheel path, it may be advised to consider a pavement seal.

For roadways exhibiting a high crack density, crack sealing may not be the most effective treatment. If there are no base or structural issues with the pavement and the cracks are not within the wheel path, crack sealing may still be an effective option. However, if the cracking is in the wheel path, a pavement seal should be considered instead.



HIGH CRACK DENSITY

350+ LINEAR FEET OF CRACKING



HIGH CRACK DENSITY

300 LINEAR FEET OF CRACKING

MDOT Michigan Department of Transportation	NO SCALE	DESIGN UNIT:	TSC: CONSTRUCTION FIELD SERVICES
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		JN:	CRACK DENSITY CRITERIA
FILE: Crack Density Standard.dgn			

DATE: 09/20	
DRAWING	SHEET
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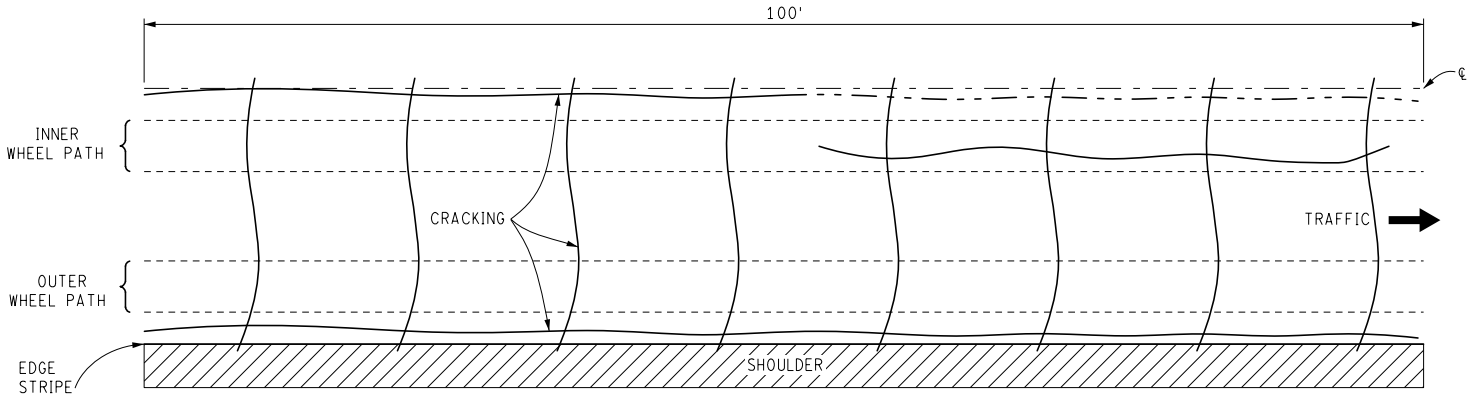
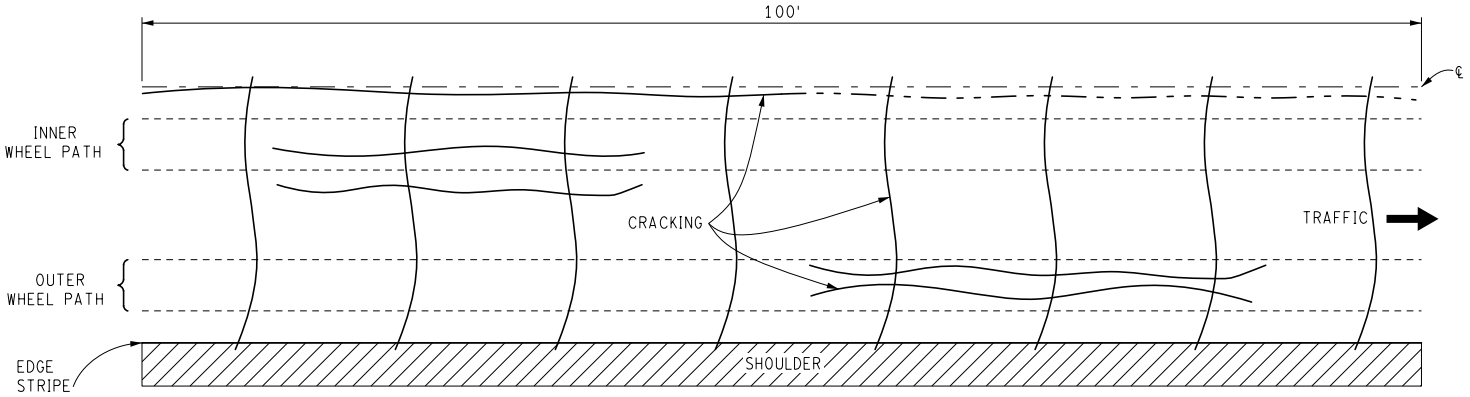


MODERATE CRACK DENSITY

300 LINEAR FEET OF CRACKING



MODERATE CRACK DENSITY

250 LINEAR FEET OF CRACKING

MDOT Michigan Department of Transportation	NO SCALE	DESIGN UNIT:	TSC: CONSTRUCTION FIELD SERVICES
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		JN:	CRACK DENSITY CRITERIA
FILE: Crack Density Standard.dgn			

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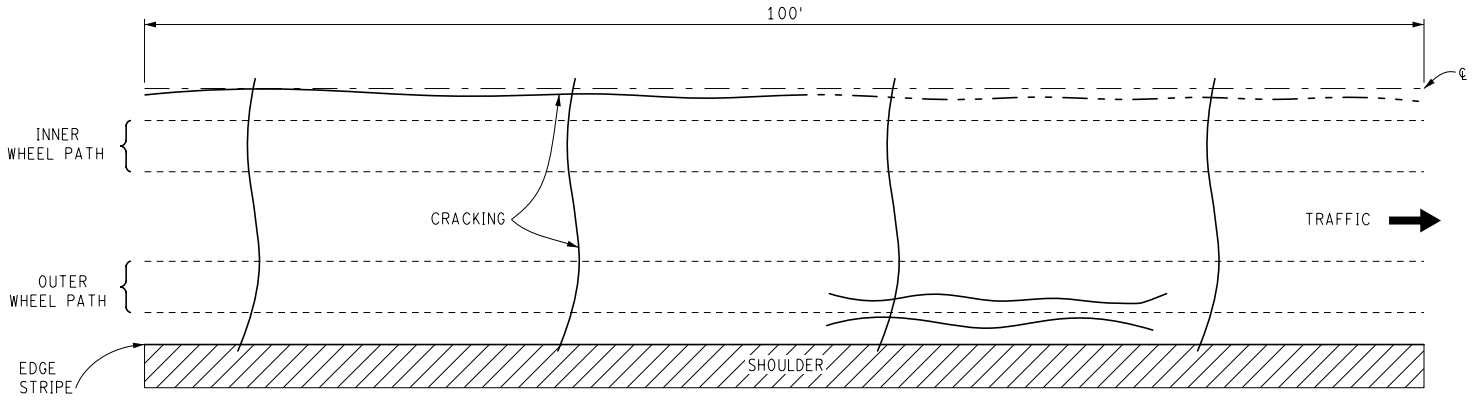
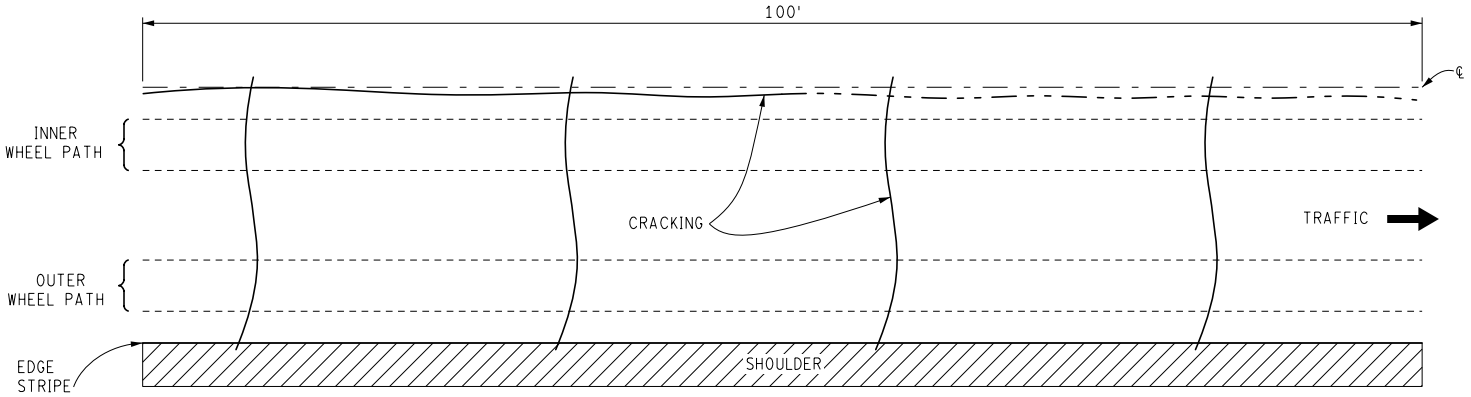


LOW CRACK DENSITY

150 LINEAR FEET OF CRACKING



LOW CRACK DENSITY

100 LINEAR FEET OF CRACKING

Linear Crack Length per 100 ft of 12 ft wide Pavement Section	Density	Comments
< 100 ft - 200 ft	Low	Good Crack Seal Candidate
> 200 ft - 300 ft	Moderate	Consider a Surface Seal or Other Fix
> 300 ft - 350 ft	High	Consider Crack Seal or Surface Seal

NOTES:

— - - — - REPRESENTS LONGITUDINAL CRACK COUNTED FOR IN AN ADJACENT PAVEMENT SECTION.

LINEAR CRACK LENGTH SHOULD BE CALCULATED FROM THE DRIVE LANE AND NOT THE SHOULDERS.

CRACK DENSITY CRITERIA IS INTENDED FOR STAND ALONE HMA CRACK TREATMENT JOBS.

HMA CRACK TREATMENT NOT RECOMMENDED FOR PAVEMENTS WITH A SIGNIFICANT AMOUNT OF ALLIGATOR CRACKING.

CAUTION SHOULD BE USED WHEN APPLYING EXCESSIVE CRACK SEALING MATERIAL IN THE WHEEL PATHS.

ENSURE LONGITUDINAL JOINT AT THE SHOULDER IS SEALED IF APPLICABLE. THE LONGITUDINAL JOINT LENGTH IS NOT TO BE INCLUDED WITH THE CRACK LENGTH CALCULATION.

EXCESSIVE CRACK FILL MATERIAL SHOULD BE AVOIDED ON PAVED SHOULDERS.

2.5 LONGITUDINAL JOINT GUIDELINES

Often, distress in a pavement begins to show at the transverse and or the longitudinal joints in a pavement. This can be especially challenging to preserve the pavement when distress present is only at the joints while the rest of the pavement is in good condition.

The most common issue that needs to be addressed is longitudinal joints in HMA pavements. However, this issue is not exclusive to only HMA pavements. Concrete pavements can experience joint distress that may not require a full depth patch. The following guidelines provide a strategy to address the distress while maximizing the service life of the rest of the pavement.

It is important to note, other factors such as if this is a stand-alone fix or a pretreatment to another surface fix should be taken into consideration when determining the best option to address the joint distress. If there will be a substantial investment across the entire pavement, a more significant joint distress fix should be selected.

Overband Crack Fill

At the first signs of cracking or separation at a longitudinal joint, apply overband crack fill. The overband material is a good sealant up to widths of 1 ¼" wide. Sealing these cracks early will help to slow the deterioration at the longitudinal joint and reduce water intrusion.

This fix is the least expensive and is typically addressed by region / TSC wide crack seal program. Overband is a great fix for a stand-alone treatment or a pretreatment to a pavement seal.

Asphalt Repair Mastic

When the width of the crack or separation at the longitudinal joint becomes wider than 1 ¼", standard sealants are no longer effective. Sealing the crack or separation with a hot applied mastic material is recommended. Mastic contain fine aggregates giving the material more body to fill the void, but still have similar elastic properties that crack seal material has. These materials are designed to fill and seal wider joints and separations.

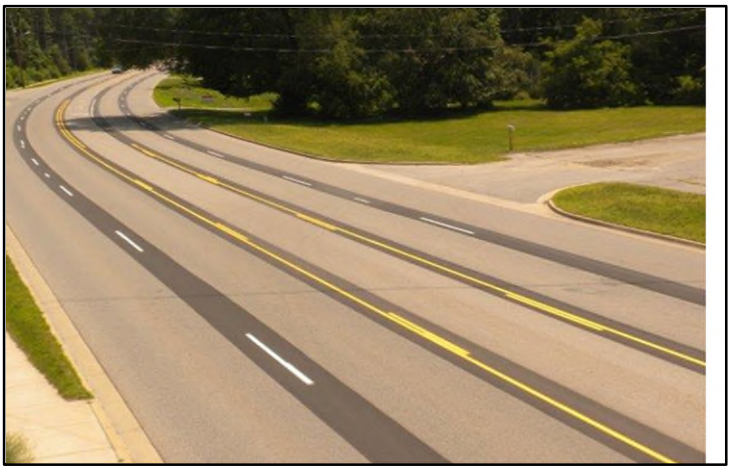
This fix is more expensive than the overband crack fill. However, it can be included with the region / TSC wide crack seal program. Mastic can be a good fix for a stand-alone treatment or a pretreatment to a pavement seal fix. This fix can also be performed on both HMA and concrete. It is flexible, waterproof, can withstand all weather and traffic conditions, provides a high-friction surface, and improves ride quality.

Mastics may be used on both transverse and longitudinal joints on both HMA and concrete pavements. Mastics can also be used to repair shallow spalls in concrete pavement. It is important to specify amounts of each when preparing project estimates as the construction practice and bid amounts will differ.

Micro-surface

An alternative to mastic or cold pour repair material for wider joints or cracks is micro-surface. Micro-surface can be applied in a two-foot wide pass to fill and seal longitudinal cracks or separations. The consistency of the micro-surface material allows it to flow into wider joints filling the voids. The micro-surface also provides a new surface to re-apply pavement markings.

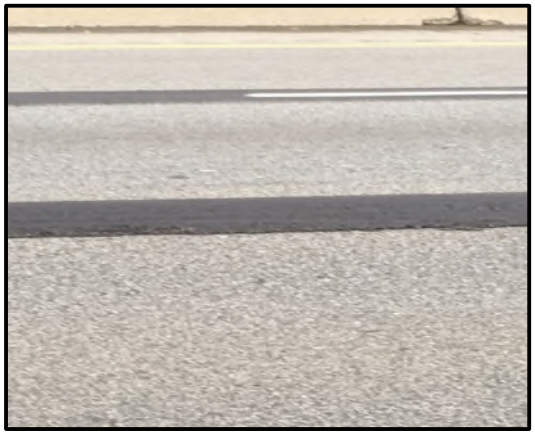
The cost of applying micro-surface at a two-foot width will be more expense then a typical micro-surface application. Micro-surface is typically performed as a stand-alone treatment to address the longitudinal joints.



Combination of Treatments

The treatments listed above can also be combined if needed. For example, joints can be filled with mastic and then topped with micro-surface. This combination provides the benefits of the elastic properties of the mastic, but a new surface for pavement markings.

When combining treatments, the cost increases for the fix. This may be necessary when trying to address longitudinal joints on an urban expressway that will require pavement markings to be replaced prior to opening to traffic. Combination of treatments are typically a stand-alone treatment but could be used as a pretreatment to a pavement seal fix.



Two-Foot Mill and HMA Hand Patch (Det 7s)

When the deterioration along a longitudinal joint is extensive, a two-foot mill and HMA hand patch (Det 7) is the best option. Milling at a depth of approximately two inches or the depth of the deterioration is advised. Care should be taken to get the best compaction on the hand patch material after placement.

This fix is the most expensive fix to address longitudinal joints. However, it addresses the most deteriorated joints. The fix can be done as a stand-alone treatment or typically a pretreatment to a more substantial pavement seal fix.

2.6 COLD MILLING GUIDELINES

Cold milling is an operation that may occur in a CPM project. The information below provides guidance on when to use one of the two specialty cold milling specifications instead of the standard cold milling specification.

Specification: *Frequently Used Special Provision Fine Texture Pavement Milling*

Special Provision Author: Kevin Kennedy

General Use Statement: Use on all trunkline, one course, non-freeway mill and resurface projects where the integrity of the existing pavement makes it suitable to allow traffic to be maintained on a milled surface for up to 72 hours and where it is desirable to expedite the project schedule and/or increase production paving. Due to the 72 hour traffic restriction the specification needs to be accompanied by a liquidated damages specification. Do not use in local agency projects.

Considerations:

1. This specification was developed by the MDOT/Industry HMA Technical Committee for use on projects as a potential quality improvement and cost saving effort.
2. Traffic is only permitted to run on the milled surface for 72-hours.

Specification: *Recommended Special Provision Micro Cold Milling Hot Mix Asphalt*

Special Provision Author: Robert Green

General Use Statement: Use on CPM Surface Seal projects that require the removal of a previous pavement seal or where improved ride quality is desired. The integrity of the pavement should be suitable to allow traffic to be maintained on the milled surface.

Considerations:

1. This was developed for use on CPM projects.
2. There is no traffic restriction written into the special provision.
3. When the SP is used on a pavement seal project, overband crack fill pretreatment is required.
4. To ensure proper adhesion of crack seal material to the milled surface, a minimum of 3 days should be allowed between the milling of the pavement and the application of the overband crack treatment.

2.7 PAVEMENT MARKING GUIDELINES

Many of the pavement seal treatments within the CPM program have unique properties when compared to HMA and require different guidance for pavement markings. Concrete CPM projects also require additional considerations. The guidelines below will provide guidance on when to remove existing markings, when to apply new markings, and material considerations for chip seal, micro-surface, and cape seal projects along with guidance for concrete CPM projects.

Chip Seal

Pavement Preparation:

- Remove existing special markings.
- Remove existing long lines. (Especially If existing markings are not waterborne. Best practice is removal of multiple layers of waterborne paint.)

During Construction:

- Use Temporary Raised Pavement Markings (TRPM).
    - Do not use Type R marking.

Permanent Pavement Markings:

- First application of permanent pavement markings must be waterborne.
- Second application of permanent pavement markings can be any material.
- Wait 14 days to cure before applying any special marking.
- Recessing markings is not advised.

Micro-Surface and Cape Seal

Pavement Preparation:

- Remove existing special markings.
- Remove existing long lines.

During Construction:

- Do not use Type R marking.
- Use Type NR paint markings for multicourse micro-surface and cape seal projects.

Permanent Pavement Markings:

- First application of permanent pavement markings must be waterborne.
- Second application of permanent pavement markings can be any material.
    - See section 811.03.D.1 of the 2020 Standard Specification for Construction
- Wait 14 days to cure before applying any special marking.
- Recessing markings is not advised.

Full Depth Concrete Pavement Repairs and Concrete Pavement Restoration

Permanent Pavement Markings:

- Remove curing compound prior to placement.

2.8 TRAFFIC CONTROL

Most CPM projects are fast moving and maintaining an orderly work zone is critical. When designing traffic control quantities for CPM projects, designers should review the guidelines provided in the Work Zone Safety and Mobility Manual. Chapter 6, Traffic Control Devices, and Implementation will be the most important to review.

Chapter 6 - Work Zone Safety and Mobility Manual

CHAPTER 3

CAPITAL PREVENTIVE MAINTENANCE TREATMENTS

3.1 STANDARD TREATMENTS

3.1.1 STANDARD TREATMENTS

The table below lists the standard treatments in the CPM program. The treatments are split between the two categories, Pavement Seal and Functional Enhancement. The following pages examine each treatment in more detail including description of treatment, PMS data criteria, pavement life extension, and performance limitations.

Standard Capital Preventive Maintenance Treatments	
Pavement Seal	**Functional Enhancement**
Flexible & Composite	*Flexible & Composite*
•HMA Crack Treatment	•Non-Structural HMA Overlay (1.5")*
•Overband Crack Fill	•Surface Milling with Non-Structural HMA Overlay (1.5")*
•Chip Seals	•HMA Overlay over Chip Seal (Texas Underseal)
•FiberMat	•HMA Shoulder Ribbons
•Micro-surfacing	
•Cape Seal	
•Ultra-Thin HMA Overlay - Low & Medium Volume (<1" thick)	
•Paver Placed Surface Seal	
Rigid	*Rigid*
•Concrete Joint Resealing with Minor Spall Repair	•Full Depth Concrete Pavement Repairs
•Concrete Crack Sealing	•Partial Depth Concrete Pavement Repairs
•Diamond Grinding and Grooving	•Dowel Bar Retrofit
	•Concrete Pavement Restoration**
	•Underdrain Outlet Clean Out and Repair

* Please see Program Guidelines for direction on when 2″ of HMA is allowed in the CPM program.

** Includes Joint Spall Repair, Surface Spall Repair, Joint/Crack Sealing, Full Depth Repairs, Diamond Grinding, and Underdrain Outlet Clean Out.

3.2 FLEXIBLE AND COMPOSITE TREATMENTS

HMA CRACK TREATMENT

Description: HMA crack treatment consists of both crack sealing and crack filling. Crack sealing is attained by the Saw/Rout and Seal Method. Crack filling is attained by the Overband Crack Fill Method.

The Saw/Rout and Seal Method consists of sawing/routing the desired reservoir shape at the primary transverse cracks in the existing HMA surface and placing a hot poured, extra low modulus, joint and crack sealant.

The Overband Crack Fill Method consists of cleaning all the primary and secondary cracks in the HMA pavement surface and placing an overband crack fill asphalt rubber product.

Specification: *Standard Specifications for Construction Section 502*

Warranty: Yes

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: No compliance is required.

Purpose: The purpose of sealing and filling cracks and construction joints in the flexible pavement surface is to reduce the amount of water and incompressible material entering the pavement structure.

Existing pavement condition: The existing HMA surface should be a relatively newly placed surface on a good base and with a good cross section. The visible surface distress may include: fairly straight open longitudinal and transverse cracks with slight secondary cracking and slight raveling at the crack face, and no patching or very few patches in excellent condition.

Refer back to the Crack Density section of the CPM Manual to determine if the amount and location of cracking present is eligible for an HMA Crack Treatment or if a pavement seal should be considered.

If considering placing an HMA crack treatment on a new single course HMA overlay that a warranty is still active on, contact the CPM Engineer and Warranty Engineer for guidance.

If the existing pavement surface is a pavement seal (micro-surface, chip seal, etc.) consideration should be given to the desired outcome of the crack treatment. If the desire is to protect the underlying pavement, the treatment may be excessive since there was likely an overbanding operation prior to the application of the surface seal. If a crack treatment is performed on a pavement seal consideration should be given to not placing a warranty on the project.

Generally, all primary transverse cracks in the traveled lanes should be sealed by the Saw/Rout and Seal Method. All other cracks in the traveled lanes and the shoulder areas can be filled by the Overband Crack Fill Method. Transverse cracks that have excessive secondary cracking around the primary crack should not be individually sealed. The presence of this type of transverse crack is an indication that the pavement surface may warrant a more extensive pavement surface treatment.

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	**10**	**<15**	**<107**	**<1/8″**
Composite	**10**	**<5**	**<107**	**<1/8″**

Existing pavement surface preparation: See the Standard Specifications for Construction, Section 502.03.C for crack preparation for HMA crack treatment.

Performance: The effectiveness of the seal will greatly depend upon the width of crack being sealed and the movement of the pavement structure at the crack.

Life Extension

Pavement	Years
Flexible	Up to 3
Composite	Up to 3

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: This treatment is not a one shot operation. In order to maintain the sealed pavement surface, this treatment should be followed up by a routine maintenance crack sealing or crack filling operations when additional cracks develop.

Current crack sealing and filling materials are only good for cracks that are 1 ¼" wide or less. For wider cracks, the use of mastic is recommended.

If the existing pavement is a pavement seal (micro-surface or chip seal) please see the Overband Crack Filling Section.

OVERBAND CRACK FILL

Description: The Overband Crack Fill Method consists of cleaning all the primary and secondary cracks in the HMA pavement surface and placing an overband crack fill asphalt rubber product.

Specification: *Standard Specifications for Construction Section 502*

Warranty: No

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: No compliance is required.

Purpose: The purpose of overband filling the cracks in the surface of the HMA pavement is to reduce the amount of water and incompressible material entering the pavement structure. This treatment can be used as a stand-alone treatment.

The Overband Crack Fill specification is used for pretreatment for all pavement sealing jobs and not HMA Crack treatment.

Existing pavement condition: The existing HMA surface should be a relatively newly placed surface on a good base and with a good cross section. The visible surface distress may include: fairly straight open longitudinal and transverse cracks with slight secondary cracking and slight raveling at the crack face, and no patching or very few patches in excellent condition. Overband crack filling should be used to fill all primary and secondary cracks.

Refer to the Crack Density section of the CPM Manual to determine if the amount and location of cracking present is eligible for overband crack filling or if a surface seal should be considered.

If considering placing an overband crack filling on a new single course overlay that a warranty is still active on, contact the CPM Engineer and Warranty Engineer for guidance.

If the existing pavement surface is a surface seal (micro-surface, chip seal, etc.) consideration should be given to the desired outcome of the overband crack filling. If the desire is to protect the underlying pavement, the treatment may be excessive since there was an overbanding operation prior to the application of the surface seal.

FOR STAND-ALONE APPLICATION

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	**7**	**<20**	**<107**	**<1/8″**
Composite	**7**	**<10**	**<107**	**<1/8″**

Existing pavement surface preparation: See the Standard Specifications for Construction, Section 502.03.C for crack preparation for HMA crack treatment.

Performance: A stand-alone overband crack filling will extend the life of the pavement structure. When used as a pretreatment overband crack filling will help extend the service life of the surface treatment it is being used with. Overband crack filling is to be used as a pretreatment to a pavement seal fix and not HMA Crack Treatment.

Life Extension

Pavement	Years
Flexible	Up to 2
Composite	Up to 2

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: If this treatment is to be used as a stand-alone, caution should be taken in the selection of a pavement where there are too many cracks. Review the crack density of the pavement to determine if overband crack fillings is the appropriate fix.

Current crack filling materials are only good for cracks that are 1 ¼" wide or less. For wider cracks, the use of mastic is recommended.

CHIP SEALS

Description: A chip seal is the application of a polymer modified asphalt emulsion with a cover aggregate. Chip seals can be applied as either a single or a double chip seal. The double chip seal uses a smaller aggregate for the top application.

Specification: *Standard Specifications for Construction Section 505*

Warranty: Yes, except when used as interlayer

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: Single Chip Seal – No compliance required.
Double Chip Seal – Compliance with the ADA is required.

Purpose: A chip seal will seal and/or retard the oxidation of an existing pavement surface, improve skid resistance of the pavement surface, seal fine surface cracks in the pavement thus reducing the intrusion of water into the pavement structure, and will retard the raveling of aggregate from a weathered pavement surface.

Existing pavement condition: The existing pavement should exhibit a good cross section and a good base. The visible surface distress may include slight raveling and surface wear, longitudinal and transverse cracks with a minor amount of secondary cracking and slight raveling along the crack face, first signs of block cracking, slight to moderate flushing or polishing and/or an occasional patch in good condition.

A chip seal may also be used on a newer HMA surface to prevent the oxidation of the asphalt. When used as a preventive maintenance treatment on a new pavement in the first few years of life, a chip seal has shown to extend the service life of the HMA pavement.

Rumble strips: If there are existing rumble strips the chip seal should be placed over the existing rumble strips, if it is the first chip seal application. Contact the CPM Engineer if the project will be the second application of a chip seal over existing rumble strips. New rumble strips may need to be established. The new rumble strips should be ground into new HMA or micro-surface placed along the centerline prior to the chip seal.

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	5 (double) 6 (single)	<30 (double) <25 (single)	<107	<1/8″
Composite	5 (double)	<15	<107	<1/8″

Existing pavement surface preparation: See the Standard Specifications for Construction, section 505.03.D.3 for the surface preparation for a single and double chip seal. If the pavement needs repairs or patching, these operations should take place prior to the chip seal.

Performance: Overband crack filling is used to pre-treat the surface prior to the application of a chip seal. The life expectancy of the chip seal may vary based on the condition of the pavement and the amount of reflective cracking.

Life Extension

Pavement	Years
Flexible:	
Single Seal	3 to 6
Double Seal	4 to 7
Composite:	
Double Seal	3 to 6

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Chip seals are used primarily on roads with and Average Daily Traffic (ADT) of 6,000 or less. However, use of chip seals on higher ADT routes are not prohibited. Special considerations for sweeping and traffic control may be required in higher ADT areas. Chip seals may perform less than expected under moderate to heavy commercial traffic because of flushing if there is a lot of turning movements.

The construction season for this work is relatively short. Chip seals should not be placed in cool weather. Nighttime construction of chip seals should also be avoided. It usually requires about one month of warm weather following construction for the aggregate particles to become reoriented and properly embedded in the emulsion. Application during periods of high temperatures and humidity may cause slow cure and excessive flushing.

Sweeping is important to remove loose aggregate not fully embedded in the emulsion preventing it from becoming airborne and possibly damaging windshields of vehicles of the traveling public. Traffic noise will also increase after a chip seal is placed. This may lessen over time as the aggregate fully embeds into the emulsion.

To reduce the risk of aggregates becoming airborne, best practice is to apply a fog seal. A fog seal is a light application of an emulsified asphalt diluted with water. A fog seal will help protect against water infiltration and weather and prevent loss of aggregate from the chip seal.

FIBERMAT

Description: A fiber reinforced bituminous membrane or Fibermat is a combination of a polymer-modified asphalt emulsion, chopped glass fiber strands and aggregate.

FiberMat can be applied in two ways, as a stand-alone finished surface (Type A) or as a stress absorbing membrane interlayer (Type B). A Type B FiberMat has a non-structural HMA overlay of 1.5 inches.

Specification: *Division 5 Template Special Provision - Fiber Reinforced Bituminous Membrane*

Warranty: No

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: Type A – No compliance is required.
Type B – Compliance with the ADA is required.

Purpose: A FiberMat when used as a stand-alone (Type A) is an enhanced chip seal that will seal and/or retard the oxidation of an existing pavement surface, improve skid resistance of the pavement surface, seal fine surface cracks in the pavement thus reducing the intrusion of water into the pavement structure, and will retard the raveling of aggregate from a weathered pavement surface.

A FiberMat when used as an interlayer (Type B) acts as a stress absorbing membrane interlayer (SAMI). The FiberMat is intended to slow the reflective cracking of the smaller cracks to the top surface.

Existing pavement condition: The existing pavement should exhibit a good cross section and a good base. The visible surface distress may include slight raveling and surface wear, longitudinal and transverse cracks with a minor amount of secondary cracking and slight raveling along the crack face, first signs of block cracking, slight to moderate flushing or polishing and/or an occasional patch in good condition.

Rumble strips: Type A: If there are existing rumble strips the FiberMat should be placed over the existing rumble strips, if it is the first seal application. Contact the CPM Engineer if the project will be the second application of a seal over existing rumble strips. New rumble strips may need to be established. The new rumble strips should be ground into new HMA or micro-surface placed along the centerline prior to the FiberMat.

Type B: New rumble strips will need to be established after the HMA overlay.

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	**5 (Type B)** **6 (Type A)**	**<30** **<25**	**<107**	**<1/8″**
Composite	**5 (Type B)** **6 (Type A)**	**<25** **<15**	**<107**	**<1/8″**

Existing pavement surface preparation: See the surface preparation section of the Special Provision. If the pavement needs repairs or patching, these operations should take place prior to the FiberMat.

Performance: Since FiberMat are used to seal the cracks and construction joints in the pavement in lieu of extensive stand-alone overband crack fill, the life expectancy may vary based on reflective cracking and time of the application.

Life Extension

Pavement	Years
Flexible: FiberMat (Type A) FiberMat (Type B)	 3 to 6** 3 to 6**
Composite: FiberMat (Type A) FiberMat (Type B)	 3 to 6** 3 to 6**
*** We acknowledge that FiberMat Type A and Type B will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Type A FiberMat are very similar to a single chip seal. Many of the limitations for chip seal are the same for a Type A FiberMat.

The Type B FiberMat is used as a SAMI. The effectiveness of the SAMI is also dependent upon the severity of the existing cracking. If the cracking is too extensive, cold milling should be considered instead.

MICRO-SURFACING

Description: Micro-Surfacing is a mixture of polymer modified asphalt emulsion, fine aggregate (2FA or 3FA), Portland cement, and water, properly proportioned, mixed, and placed on a paved surface.

Specification: *Standard Specifications for Construction Section 504*

Warranty: Yes

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: Compliance with the ADA is required.

Purpose: A single course micro-surfacing will retard oxidation and improve skid resistance in the pavement surface. A multiple course (or heavy single course) micro-surfacing is used to correct certain pavement surface deficiencies including moderate rutting, minor surface profile irregularities, polished aggregate or low skid resistance and light to moderate raveling. Micro-surfacing can perform under all traffic volumes.

Existing pavement condition: The existing pavement should exhibit a uniform cross section and a good base. The visible surface distress may include slight cracking, rutting, minor surface irregularities, flushed or polished surface and/or moderate raveling.

Rumble strips: New rumble strips will need to be established after the micro-surfacing application.

Pavement	Minimum RSL (years)	D.I.	I.R.I*	Rut
Flexible	**5 (multiple or heavy single) 10 (regular single)**	**<30 (multiple or heavy single) <15 (regular single)**	**<107**	**<1″**
Composite	**5 (double)**	**<15**	**<107**	**<1″**

Existing pavement surface preparation: See the Standard Specifications for Construction Section 504.03.C for the surface preparation for a single and multicourse micro-surface. If an existing micro-surface is in place with signs of delamination, it is recommended that micro cold milling be included to remove the existing micro-surface. If the pavement needs repairs or patching, these operations should take place prior to the micro-surface.

Performance: This treatment corrects rutting, flushing and low friction. A micro-surface performs well on high volume roadways to correct the pavement surface conditions described above.

Life Extension

Pavement	Years
Flexible:	
Single Course	3 to 5
Multiple Course	4 to 6
Composite: We acknowledge that micro-surfacing will provide a life extension to a composite pavement. However, data is not available to quantify the life extension.	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: A standard micro-surfacing formulation should not be used on a pavement with moderate to heavy surface cracks. Micro-surfacing is a hard and durable wearing surface which sometimes makes it susceptible to reflective cracking. Micro-surfacing mixes are very aggregate specific because of the chemically triggered, quick reaction characteristics of the mixture. Because micro-surfacing mixes require warm to moderate temperatures for curing, caution is recommended for late season nighttime work.

CAPE SEAL

Description: A cape seal is the application of a single chip seal followed by a single course micro-surface.

Specification: *Standard Specifications for Construction Section 504 & 505*

Warranty: Yes, only on the micro-surface

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: Compliance with the ADA is required.

Purpose: A cape seal can be used to effectively treat pavements that have a higher level of distress, including higher levels of cracking and raveling. A cape seal will seal and/or retard the oxidation of an existing pavement surface, improve skid resistance of the pavement surface, seal fine surface cracks in the pavement thus reducing the intrusion of water into the pavement structure, and will retard the raveling of aggregate from a weathered pavement surface.

Existing pavement condition: The existing pavement should exhibit a good cross section and a good base. The visible surface distress may include slight raveling and surface wear, longitudinal and transverse cracks with a minor amount of secondary cracking and slight raveling along the crack face, first signs of block cracking, slight to moderate flushing or polishing and/or an occasional patch in good condition.

For pavements with rutting issues or other distress that could be filled with micro-surfacing, the treatments can be reversed with the micro-surface below the chip seal. This provides the benefits of reprofiling the pavement, an interlayer, and a new surface.

Rumble strips: New rumble strips will need to be established after the micro-surfacing application.

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	**6**	**<25**	**<107**	**<1/2″**
Composite	**5**	**<15**	**<107**	**<1/2″**

Existing pavement surface preparation: See the Standard Specifications for Construction, section 505.03.D.3 for the surface preparation for a single seal. If the pavement needs repairs or patching, these operations should take place prior to the chip seal.

Performance: Cape seals are used to seal the cracks and construction joints in the pavement while providing a very smooth surface with an increased durability, the life expectancy may vary based on reflective cracking.

Special Considerations: The cure time between applications of the chip seal and micro-surface layers should be dictated by traffic conditions. For project specific guidance, contact the CPM Engineer.

Life Extension

Pavement	Years
Flexible	5 to 7**
Composite	4 to 6**
*** We acknowledge that a Cape Seal will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Cape seals provide a good seal for the road, however micro-surfacing is a hard and durable wearing surface which sometimes makes it susceptible to reflective cracking. Surface cracking can reappear within the first year or two after placement.

ULTRA-THIN HMA OVERLAY (LOW & MEDIUM VOLUME)

Description: A dense graded HMA mixture applied with a target application rate of 83 lbs/syd. An ultra-thin HMA overlay can be placed as an overlay or in combination with cold milling the existing surface.

Specification: *Frequently Used Special Provision 20SP-504B-01*

Warranty: Yes

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: Compliance with the ADA is required.

Purpose: An ultra-thin is a non-structural HMA overlay placed at ¾ of an inch thickness. It will help seal the existing pavement surface to reduce the intrusion of water into the pavement structure, improve friction, slow the rate of pavement deterioration, correct minor pavement surface deficiencies and improve the ride and noise qualities of the pavement.

Existing pavement condition: The existing pavement should exhibit a good base condition and a uniform cross section. The visible surface distress may include severe raveling, moderate severity longitudinal and transverse cracks, moderate block cracking, moderate patching, or moderate bleeding. Reflection cracking at joints should not exceed moderate severity level. The cross sections can exhibit minor rutting.

Rumble strips: New rumble strips will need to be established after the ultra-thin HMA overlay. It is also recommended to apply a fog seal to the new rumbles to reseal the pavement.

Pavement	Minimum RSL (years)	D.I.	I.R.I*	Rut
Flexible	**5**	**<30**	**<132**	**<1/4″**
Composite	**5**	**<20**	**<132**	**<1/4″**

**IRI values may be higher if micro cold milling is set up for the job*

Existing pavement surface preparation: Surface preparation typically includes overband crackfill pretreatment, bump removal if necessary, removal of raised pavement markers and patching large voids and potholes. Micro cold milling may also be part of the surface preparation. Ruts or other depressions greater than ¼ inch depth should be filled with a suitable material prior to the placement of the ultra-thin.

Performance: This treatment corrects minor rutting and low friction. The process may be used in lieu of extensive stand-alone overband crack fill when the cracking meets the criteria described above.

Life Extension

Pavement	Years
Flexible	4 to 8**
Composite	4 to 7**
*** We acknowledge that an Ultra-thin HMA overlay will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Ultra-thin HMA overlay should not be placed on the following existing pavement conditions:

- Severely distressed composite pavement
- Severe rutted flexible pavement
- Pavement with weak base
- Flexible surface that is debonding or severe bleeding.

PAVER PLACED SURFACE SEAL

Description: A spray paver, places a polymer modified asphalt emulsion followed immediately by an open graded HMA surface course at a target application rate of 83-90 lbs/syd.

Specification: *Standard Specifications for Construction Section 503*

Warranty: Yes

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Pavement Seal

ADA Considerations: Compliance with the ADA is required.

Purpose: A paver placed surface seal is a non-structural HMA overlay in combination with a bonding/sealing polymer modified asphalt emulsion. It will help seal the existing pavement surface to reduce the intrusion of water into the pavement structure, improve friction, slow the rate of pavement deterioration, correct minor pavement surface deficiencies and improve the ride, noise and skid qualities of the pavement.

Special Considerations: Do to the open graded mix of the paver placed surface seal, it should be noted that when in a curb and gutter section, cold milling along the curb line is not advised. The pavement should be above the gutter pan to allow the water to drain out of the pavement after a rain event.

Existing pavement condition: The existing pavement should exhibit a good base condition and a uniform cross section. The visible surface distress may include severe raveling, moderate severity longitudinal and transverse cracks, moderate block cracking, moderate patching, or moderate bleeding. Reflection cracking at joints should not exceed moderate severity level.

Rumble strips: New rumble strips will need to be established after the paver placed surface seal. It is also recommended to apply a fog seal to the new rumbles to reseal the pavement.

Pavement	Minimum RSL (years)	D.I.	I.R.I*	Rut
Flexible	**5**	**<30**	**<132**	**<1/4″**
Composite	**5**	**<15**	**<132**	**<1/4″**

**IRI values may be higher if micro cold milling is set up for the job*

Existing pavement surface preparation: See the Standard Specifications for Construction, Section 503.03.C.1 for the surface preparation for a paver placed surface seal.

Additional preparation work should be limited to minor repairs. Ruts or other depressions greater than ¼ inch depth should be filled with suitable material prior to placement of the paver placed surface seal. Cracks greater than ¼ inch wide should be sealed using an approved crack sealing method.

Performance: This treatment corrects minor rutting and low friction. The process may be used in lieu of extensive stand-alone overband crack fill when the cracking meets the criteria described above. Paver placed surface seal performs well on high volume roadways to correct the pavement surface conditions described above.

Life Extension

Pavement	Years
Flexible	**4 to 8****
Composite	**4 to 7****
*** We acknowledge that a PPSS will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Paver placed surface seal should not be placed on the following existing pavement conditions:

- Severely distressed composite pavement
- Severe rutted flexible pavement
- Pavement with a weak base
- Flexible surface that is debonding or severe bleeding

Paver placed surface seal will not stop reflective cracking. However, reflective cracking tends to be tight with little to no raveling.

NON-STRUCTURAL HMA OVERLAY

Description: A dense or stone matrix HMA mixture limited to a 165 lbs/syd (1.5 inch) application rate.

Specification: *Standard Specifications for Construction* Section 501

Warranty: Yes

Pavement Type: Flexible and Composite Pavement

Category: Functional Enhancement

ADA Considerations: Compliance with the ADA is required.

Purpose: A non-structural HMA overlay is the highest type of surface treatment fix available in the Capital Preventive Maintenance Program. It will provide some protection to the pavement structure, slow the rate of pavement deterioration, correct many pavement surface deficiencies, improve the ride quality and add some strength to the existing pavement structure.

Special Considerations: In certain cases, the use of an application rate of 220 lbs/syd (2 inch) is approved. Pre-approved cases include:

- Crown correction,
- Superpave mixes that require 2 inch lifts
- The use of a scratch course prior to a 1.5 inch HMA overlay in areas where there is a concern with crack sealing materials.

The use of 2 inch overlays is still the exception to the rule and the use of 2 inch overlays of HMA in the CPM program for any reason other than the pre-approved reasons listed above will require approval from the region system manager, FHWA, and the MDOT CPM Engineer on a case by case basis.

Existing pavement condition: The existing pavement should exhibit a good base condition and a uniform cross section. The visible surface distress should be minor and may include raveling, longitudinal and transverse cracks and small amounts of block cracking. Low associated distress may be present. The pavement should only have some minor base failures and depressions.

Rumble strips: New rumble strips will need to be established after the HMA overlay.

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	**3**	**<40**	**<163**	**<1/2″**
Composite	**3**	**<25**	**<163**	**<1/2″**

Existing pavement surface preparation: The preparation work should be limited to the repair of the minor base failures and depressions, the filling of voids in the pavement surface, the removal of any patched area with poor adhesion or a very high asphalt content that may bleed up through the new HMA surface, the correction of severely tented joints and the correction of deficient superelevations, if required.

Performance: This treatment performs best on flexible pavement structures, but is also applicable to composite pavements depending on the extent of the reflective cracking.

Life Extension

Pavement	Years
Flexible	5 to 10
Composite	4 to 9

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: A non-structural HMA overlay should not be placed on the following existing pavement conditions: severely distressed composite pavement, severely raveled or rutted HMA pavement, pavement with a weak base, or a HMA surface that is debonding. In addition, a pavement with excessive amounts of crack sealing may not be a good candidate for a non-structural HMA overlay (please see Appendix B).

SURFACE MILLING WITH NON-STRUCTURAL HMA OVERLAY

Description: The removal of an existing HMA surface by the cold milling method and placement of an HMA mixture limited to a 165 lbs/syd (1.5 inch) application rate.

Specification: *Standard Specifications for Construction* *Section 501*

Warranty: Yes

Pavement Type: Flexible and Composite Pavement

Category: Functional Enhancement

ADA Considerations: Compliance with the ADA is required.

Purpose: In the Capital Preventive Maintenance Program, the cold milling operation has been used to: (1) correct specific existing surface deficiencies, (2) correct the shape of the existing cross section and (3) produce a more economical project as compared to a non-structural HMA overlay project. The non-structural HMA overlay replaces the HMA material that is removed.

Special Considerations: In certain cases, the use of an application rate of 220 lbs/syd (2 inch) is approved. Pre-approved cases include:

- Crown correction,
- Superpave mixes that require 2 inch lifts
- The use of a scratch course prior to a 1.5 inch HMA overlay in areas where there is a concern with crack sealing materials.

The use of 2 inch overlays is still the exception to the rule and the use of 2 inch overlays of HMA in the CPM program for any reason other than the pre-approved reasons listed above will require approval from the region system manager, FHWA, and the MDOT CPM Engineer on a case by case basis.

Existing pavement condition: The existing pavement should exhibit a good base condition. The visible surface distress may include: severe surface raveling, multiple longitudinal and transverse cracking with slight raveling, a small amount of block cracking, patching in fair condition, debonding surface and slight to moderate rutting.

The cold milling operation is used to correct rutting in the existing HMA surface layer where the rutting is not caused by a weak base and when the condition of the existing pavement has deteriorated to a point where it is not practical to correct the rutting problem by a more economical treatment. The cold milling operation is also used to remove an existing HMA course that is debonding.

Existing pavement crown and superelevation sections that have been identified as having a relationship to accidents can be modified by cold milling. Often, only a single lane of the existing cross section needs a preventive maintenance treatment. In these cases, it is more economical to remove the existing HMA surface in that lane by cold milling and do nothing or do a less expensive fix on the less deteriorated portions of the cross section. In a curb and gutter section,

cold milling can be used to remove a portion of the existing HMA surface to retain the existing curb face. Cold milling can also be used in those areas where the existing pavement grade cannot be raised.

Rumble Strips: New rumble strips will need to be established after the HMA overlay.

Pavement	Minimum RSL (years)	D.I.	I.R.I*	Rut
Flexible	**3**	**<40**	**<212**	**<1″**
Composite	**3**	**<30**	**<212**	**<1″**

** Higher I.R.I values may be accepted in urban locations if the cause for the poor ride can be corrected.*

Existing pavement surface preparation:
This preparation work should be limited to the repair of the minor base failures, the correction of severely tented joints and the correction of deficient superelevations, if required.

Performance: This type of treatment will protect the remaining pavement structure, slow the rate of deterioration and improve the ride quality.

Life Extension

Pavement	Years
Flexible	5 to 10
Composite	4 to 9

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: This treatment should not be used on an existing pavement that shows evidence of a weak base.

HMA OVERLAY OVER CHIP SEAL (TEXAS UNDERSEAL)

Description: A dense or stone matrix HMA mixture limited to a 165 lbs/syd (1.5 inch) application rate that is placed over a chip seal.

Specification: *Standard Specifications for Construction Section 501 & 505*

Warranty: Yes, on the HMA overlay only

Pretreatment: Yes, Overband Crack Fill – Section 502.03.D.2

Pavement Type: Flexible and Composite Pavement

Category: Functional Enhancement

ADA Considerations: Compliance with the ADA is required.

Purpose: A HMA overlay over a chip seal is intended to extend the performance of the non-structural HMA overlay. The addition of the chip seal as a stress absorbing membrane interlayer is intended to provide a reflective barrier which allows the energy from a crack to propagate horizontally as apposed to vertically, thereby reducing and delaying reflective cracking. This reduces the amount of surface water that can penetrate the pavement.

Special Considerations: The underlying chip seal needs to go full width of the pavement. Otherwise, there is a potential to trap water under the HMA surface.

The chip seal interlayer can be preformed on milled or un-milled pavement surfaces. The application rate of the material may vary.

Existing pavement condition: The existing pavement should exhibit a good base condition and a uniform cross section. The visible surface distress should be minor and may include raveling, longitudinal and transverse cracks, and small amounts of block cracking. Low associated distress may be present. The pavement should only have some minor base failures and depressions.

Rumble strips: New rumble strips will need to be established after the HMA overlay.

Pavement	Minimum RSL (years)	D.I.	I.R.I	Rut
Flexible	**3**	**<40**	**<163**	**<1/2″**
Composite	**3**	**<25**	**<163**	**<1/2″**

Existing pavement surface preparation: The preparation work should be limited to the repair of the minor base failures and depressions, the filling of voids in the pavement surface, the removal of any patched area with poor adhesion or a very high asphalt content that may bleed up through the new HMA surface, the correction of severely tented joints and the correction of deficient superelevations, if required.

Performance: This treatment performs best on flexible pavement structures, but is also applicable to composite pavements depending on the extent of the reflective cracking. The chip seal acts as a crack relief layer to help reduce reflective cracking.

Life Extension

Pavement	Years
Flexible	5 to 10**
Composite	4 to 9**
*** We acknowledge that a Texas Underseal will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: A Texas underseal should not be placed on the following existing pavement conditions: severely distressed composite pavement, severely raveled or rutted HMA pavement, pavement with a weak base, or a HMA surface that is debonding.

3.3 RIGID TREATMENTS

CONCRETE JOINT RESEALING WITH MINOR SPALL REPAIR

Description: This work includes the removal of the existing joint seals and resealing the transverse and longitudinal joint with a hot poured, extra low modulus, joint and crack sealant.

Specification: *Standard Specifications for Construction Section 603*

Warranty: No

Pavement Type: Rigid Pavement

Category: Pavement Seal

ADA Considerations: No compliance is required.

Purpose: The purpose of resealing the concrete pavement joints is to prevent water and incompressible material from entering the pavement structure, thus slowing the rate of deterioration of the concrete pavement.

Existing pavement condition: Rigid Pavements where the existing sealant has failed. The surface should have little to no spalling present. The pavement should also have good ride quality numbers. Diamond grinding can be performed in conjunction with concrete joint resealing.

Pavement	Minimum RSL (years)	D.I.	I.R.I
Rigid	**10**	**<15**	**<107**

Existing Surface Preparation: Remove all existing joint sealant material prior to resealing with extra low modulus joint and crack sealant. Repair spalls greater than 1 ½ inches prior to resawing and sealing the pavement joints. Review existing pavement drainage for signs of pumping or sub-surface water that may inhibit adhesion of the extra low modulus joint and crack sealant.

Performance: A properly placed concrete pavement seal should benefit the service life by slowing the deterioration rate of the concrete pavement.

Life Extension

Pavement	Years
Rigid	3 to 5

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

CONCRETE CRACK SEALING

Description: Crack sealing involves the sawing, cleaning, and sealing of cracks in the concrete pavement that are ¼" or greater in width.

Specification: *Standard Specifications for Construction Section 603*

Warranty: No

Pavement Type: Rigid Pavement

Category: Pavement Seal

ADA Considerations: No compliance is required.

Purpose: The purpose of sealing the cracks in the concrete pavement is to reduce the water and incompressible material from entering the pavement structure and thus slowing the deterioration rate of the pavement.

Existing pavement condition: Concrete pavement that exhibits a slow rate of deterioration should have a high priority for crack sealing. Subsequent Preventive Maintenance crack sealing projects should follow until the condition of the pavement requires extensive work that is beyond the scope of the Capital Preventive Maintenance Program.

Pavement	Minimum RSL (years)	D.I.	I.R.I
Rigid	**10**	**<15**	**<107**

Performance: Crack sealing should help slow the deterioration rate of the concrete pavement. This treatment is best used in conjunction with other treatments of rigid pavements such as joint resealing and minor spall repair and /or full depth concrete joint repair. The benefit from sealing concrete pavements with open graded drainage course and underdrains has not been determined.

Life Extension

Pavement	Years
Rigid	Up to 3

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

DIAMOND GRINDING AND GROOVING

Description: This work consists of diamond grinding and grooving, if needed, the entire lane width and feathering onto the shoulders as specified on the plans.

Specification: *Standard Specifications for Construction Section 603*

Warranty: No

Pavement Type: Rigid Pavement

Category: Pavement Seal

ADA Considerations: No compliance is required.

Purpose: Diamond grinding is used to restore the surface longitudinal profile and crown of a concrete pavement that provides an improved ride quality. Benefits from diamond grinding include: the removal of joint and crack faults, the improvement in ride quality, the restoration of transverse drainage, and the improvement of skid resistance. If appropriate, only one lane of a multi-lane roadway can be improved by diamond grinding.

Existing pavement condition: The existing pavement should exhibit a uniform cross section and a good base. The visible surface distress may include joint and crack faults not exceeding 3/8 inch, moderate to severe polishing, or not over twenty five percent scaling of the surface area.

Pavements with moderate to advanced material related distress are not good candidates for diamond grinding.

Pavement	Minimum RSL (years)	D.I.	I.R.I
Rigid	**12**	**<10**	**90-125**

Existing pavement surface preparation: Diamond grinding should not be viewed as a one-step solution to treating the concrete pavement surface. Often other repairs should be performed prior to diamond grinding. Diamond grinding should be considered when the average International Roughness Index (IRI) is greater than 90, average friction number is 30 or less, or there are more than 30 full depth repairs per mile.

Performance: The reduced impact loading caused by diamond grinding should significantly extend the pavement service life. Faulting at the joints and cracks may return after several years of service to the condition prior to diamond grinding. This will depend on several factors, including the joint efficiency of the pavement and the amount and quality of concurrent concrete pavement treatment work. The improved skid resistance due to diamond grinding depends on the final micro texture and macrotexture and the hardness and polishing characteristics of the aggregates. The improved skid values will decline until they reach the skid levels of the original surface at which point the values will generally remain steady.

Life Extension

Pavement	Years
Rigid	3 to 5

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Diamond grinding should generally not be used on concrete pavements where the faulting is greater than 3/8 inch. Greater fault depths will greatly increase the unit cost of diamond grinding. As mentioned above, diamond grinding should not be used as a one-step solution to treat the deficiencies of the concrete pavement.

Caution should be used with JRCP that is showing surface delamination from corroding steel reinforcement that may be exacerbated by diamond grinding. Diamond grinding can accelerate distress in pavement experiencing joint deterioration from freeze/thaw deicer scaling.

Longitudinal grooving should be added to all projects with concrete coarse aggregate with an average wear index (AWI) less than 260.

FULL DEPTH CONCRETE PAVEMENT REPAIRS*

Description: The work consists of complete removal and replacement of the concrete pavement at the deteriorated joint or open crack. The new concrete repair should include load transfer (dowel bars) and contraction and /or expansion joints with joint seals.

Specification: *Standard Specifications for Construction Section 603*

Warranty: No

Pavement Type: Rigid Pavement

Category: Functional Enhancement

ADA Considerations: No compliance is required.

Purpose: A full depth concrete repair will restore the pavement's structural integrity and should at least maintain its existing ride quality. Secondary benefits include a reduced amount of water entering the pavement structure and a slower rate of future distress formation.

Existing pavement condition: Overall, the concrete pavement should be in good condition and deteriorating at a slow rate. Transverse joints and cracks to be repaired should show at least 3 feet of moderate to severe spalling over its length within the lane. Other transverse cracks exhibiting a crack width greater than 1/4 inch or faulting more than 1/8 inch are appropriate for full depth repairs.

Pavement	Minimum RSL (years)	D.I.	I.R.I**
Rigid	**7**	**<20**	**<107**

*The full depth concrete pavement repair is limited to 30 patches per lane mile.
**Higher I.R.I. numbers should consider Concrete Pavement Restoration.

Performance: The time from casting to intended opening to traffic should be a minimum of 3 days. Contact Lansing CFS for concrete mix designs that will meet shorter opening to traffic requirements.

Life Extension

Pavement	Years
Rigid	3 to 10

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Concrete repairs will usually induce a variation in tire noise from a difference in surface texture between the repair and the existing pavement. If a non-chloride accelerator is used for faster strength gain, then the anticipated longevity of the repair will be reduced by approximately 50%. Contact Lansing CFS for concrete mix designs that will meet open to traffic requirements and improve repair durability.

PARTIAL DEPTH CONCRETE PAVEMENT REPAIRS

Description: The work consists of repairing shallow spalls, open cracks, and / or joint distress in concrete pavement using non-cementitious materials. Depending upon the repair material used, the pavement may require more extensive prep work to ensure bonding to sound concrete.

Specification: *Special Provisions*
Asphalt Repair Mastic
Cold Pour Rubber – Contact Lansing CFS
Partial Depth Pavement Repair Using Non-Cementitious Patching Material
Rapid Setting Polymer Concrete Patching Material (MMA or T17) – Contact Lansing CFS

Warranty: No

Pavement Type: Rigid Pavement

Category: Functional Enhancement

ADA Considerations: No compliance is required.

Purpose: A partial depth concrete repair is ideal when the distress is in the top 1/3 of the pavement and is minor with no extensive secondary distress around the repair area. Partial depth repairs will repair and seal shallow spalls, open cracks, and joints.

Existing pavement condition: Overall, the concrete pavement should be in good condition and deteriorating at a slow rate. When repairing transverse joints, a Silane application is recommended to help further prevent any future freeze-thaw damage.

Pavement	Minimum RSL (years)	D.I.	I.R.I**
Rigid	**7**	**<20**	**<107**

**Higher I.R.I. numbers should consider Concrete Pavement Restoration.

Performance: Manufacturer's recommendations should be followed regarding cure time for the material prior to opening to traffic.

Life Extension

Pavement	Years
Rigid	3 to 10**
*** We acknowledge that a Partial Depth Concrete Repair will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: The condition of the concrete pavement along with which partial depth concrete repair material used will determine the performance of the fix.

DOWEL BAR RETROFIT

Description: Dowel bar retrofit is an operation in which slots are cut into the concrete pavement across faulted joints and cracks, and dowel bars are placed in the slots to restore the load transfer. The work consists of five operations: cutting the slots, preparing the slots, placing the dowel bars, backfilling the slots and opening the pavement to traffic.

Specification: None

Warranty: No

Pavement Type: Rigid Pavement

Category: Functional Enhancement

ADA Considerations: No compliance is required.

Purpose: A dowel bar retrofit treatment restores the effective load transfer at faulted joints and cracks, significantly reduces the recurrence of faulting and increases the structural capacity of the pavement.

Existing pavement condition: This treatment should be used to rehabilitate existing jointed concrete pavements in good to fair condition before serious deterioration is present. There should be very little to no spalling along the joint or crack. Crack widths should be less than 1/4 inch and faulting less than 1/8 inch.

Pavement	Minimum RSL (years)	D.I.	I.R.I
Rigid	**10**	**<15**	**<107**

Performance: This treatment should generally be used with other rigid pavement treatments such as diamond grinding, to extend the service life of existing jointed concrete pavements. Joint resealing or concrete crack sealing may also be necessary on pavements with poorly draining bases.

Life Extension

Pavement	Years
Rigid	2 to 3

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: If serious faulting at the existing cracks and joints in the concrete pavement is present, this should not be used as a stand-alone treatment. Base problems must be addressed.

CONCRETE PAVEMENT RESTORATION

Description: This work shall include full depth concrete pavement repairs, diamond grinding, and underdrain outlet cleanout. A combination of additional treatments, including spall repair, dowel bar retrofit, crack sealing and joint resealing, and underdrain outlet cleanout can provide substantial benefit to the pavement.

Specification: *Standard Specifications for Construction Section 603*

Warranty: No

Pavement Type: Rigid Pavement

Category: Functional Enhancement

ADA Considerations: No compliance is required.

Purpose: Most projects will require several treatments used in combination to correct existing distresses. The treatments not only repair distress, but also prevent or slow the recurrence of distress.

Existing Pavement Conditions: The concrete pavement will likely display deterioration that requires a combination of various treatments. The key is to select a repair strategy that considers costs, longevity and future maintenance and reconstruction options. Generally, roadways considered for concrete pavement restoration have 3 to 7 years of Remaining Service Life (RSL).

Pavement	Minimum RSL (years)	D.I.	I.R.I
Rigid	**3**	**<40**	**<212**

Performance: A proper application of treatments to correct deficiencies will result in longer lasting concrete pavements. Additionally, the work will result in greater public consciousness of the improvements. If the pavement condition requires more than 30 full depth concrete repairs per lane mile, a rehabilitation or reconstruction alternative approach may be more cost effective.

Life Extension

Pavement	Years
Rigid	5-10

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: If a non-chloride accelerator is used for faster strength gain, then the anticipated longevity of the repair will be reduced by approximately 50%. In general, the longevity of the repair will be reduced when strength gain is accelerated from normal rates using Grade 3500 concrete.

UNDERDRAIN OUTLET CLEANOUT AND REPAIR

Description: This work includes the clean out and repair of the rigid PVC, corrugated plastic or steel open-graded underdrain outlets from outlet ending to the connection with the mainline open-graded underdrain.

Specification: Recommended Special Provision *Underdrain Outlet Cleanout*

Warranty: No

Pavement Type: Rigid Pavement and Flexible

Category: Functional Enhancement

ADA Considerations: No compliance is required.

Purpose: The installation of an open-graded drainage system improves the long-term load carrying and load distribution properties of the base, subbase and subgrade materials by removing the free water which can decrease the stiffness of these load carrying layers. The clean out and repair of the underdrain outlets will help re-establish the effectiveness of the underdrain drainage system.

Existing pavement condition: The clean out and repair of open-graded underdrain outlets should begin on a rigid pavement or ASCRL that is approximately ten years old. Subsequent Preventive Maintenance clean out and repair projects should follow every ten years or until the condition of the pavement requires extensive work that is beyond the scope of the Capital Preventive Maintenance Program.

Performance: The clean out and repair of the open-graded underdrain outlets will help re-establish the effectiveness of the open-graded underdrain drainage system thus maintaining the load carrying capacities of the base, subbase and subgrade.

Performance Limitations: Since this work will be done by contract, it is necessary to define the work to be done in the contract and provide a relatively accurate plan quantity. A Special Provision has been developed to provide contractors with the guidance that is needed to perform the work. The underdrain outlet repair work will be limited to work perpendicular to the roadway.

3.4 OTHER TREATMENTS

HMA SHOULDER RIBBONS

Description: This work includes the construction of a new HMA shoulder ribbon where gravel shoulders exist or the removal and replacement of a deteriorated HMA shoulder ribbon.

Specification: *Standard Specifications for Construction Section 501*

Warranty: No

Pavement Type: Flexible, Composite, and Rigid Pavement

Category: Functional Enhancement

ADA Considerations: No compliance is required.

Purpose: The purpose of an HMA shoulder ribbon is:

- Accommodate an increasing encroachment of traffic
- Expedite runoff water from the traveled lane pavement
- Provide other usage such as bicycle paths
- Reduce edge stresses and edge and corner deflections by increased lateral support
- Reduce the development of pavement edge drop-offs.

Existing pavement condition: In order for this treatment to be used in the Capital Preventive Maintenance Program, the condition of the adjacent pavement structure must meet the Capital Preventive Maintenance Program's pavement condition criteria.

REQUIREMENT

The design life of the shoulder ribbons should be equal to or less than the Remaining Service Life (RSL) of the main line pavement.

Performance: Most shoulder deterioration is attributable to truck encroachment, water intrusion in the longitudinal joint, use of lower quality materials, and inadequate structural thickness. Field observations have shown that shoulder distress is primarily concentrated within 2 feet from the traveled lane. The extension of pavement life will be up to 3 years.

Performance Limitations: The total thickness of the HMA shoulder is limited to 330 lbs/syd. The width of the HMA shoulder ribbon is usually 3 feet. This width of the HMA shoulder ribbon can be increased where it is justified.

3.5 EMERGING TECHNOLOGY TREATMENTS

3.5.1 EMERGING TECHNOLOGY TREATMENTS

A statewide fund is available for projects utilizing emerging technology treatments. Emerging technologies are treatments that are promising, but their performance and cost effectiveness is unproven. Emerging technology treatments are listed in the Table below. Emerging Technologies not listed in the table will be considered on a case by case basis with input from the CPM subcommittee.

With the use of emerging technology funds, the region must complete the workplan that is detailed below. The CPM Engineer and CFS staff will assist.

Emerging Technology Treatments
•Polymer Injection Slab Stabilization
•Ultra-Thin HMA Overlay - High Volume (<1" Thick)
•Engineered Paving Mat (Geosynthetic Interlayer)
•Longitudinal Joint Stabilizer (Possible use for rumble strips
•Protective Treatment for Transverse and Longitudinal Concrete Pavement Joints (Saline Treatment)
•Non-Cementitious Concrete Repairs
•Scrub Seal

3.5.2 REGION DEVELOPMENT GUIDELINES FOR WORK PLANS

At their January 2000 meeting the Engineering Operations Committee approved a general process to track and document the effectiveness of new "emerging technologies" for pavement preservation. The basis for the process was the *Research Protocols for Pavement Preservation,* dated September 1999, which was developed by AASHTO. The following guidelines further explain how a workplan should be developed for department preservation projects, whenever a new technology is utilized.

A workplan is required for any project that uses a new technology that is not considered standard department practice. The purpose of the workplan is to fully describe the technology and its particular use on a project(s). It answers questions such as; How will the technology be used? What are its benefits? In addition to a general description of the project and how the work will be performed.

Department Oversight
The Regions/TSCs have primary responsibility for the initiation, construction, monitoring, and reporting of projects utilizing new technologies. The Pavement Committee maintains statewide oversight of the process and review/approval responsibility for project acceptance. The Region/TSC will draft a workplan, which is then submitted to the Pavement Committee for review and acceptance.

WORKPLAN COMPONENTS

Summary Page
Provides a brief (snapshot) summary of the project. Includes the project location and description, identification (CS & JN), technology name, proposed construction date, and whether the project is R&R or CPM.

Background Statement
Describes the project details and the purpose of the technology. Includes some background on the technology, as to its' primary benefits and development/usage to date. Why was this project selected to demonstrate the technology's effectiveness?

Description of the Treatment (Fix)
Provide a detailed description of the project. Include any additional information not included in the background statement, as to how the technology is expected to extend the pavement's service life, if R&R, or extend service life, if CPM.

Objective
Provide a concise statement regarding the intend accomplishments from this project with emphasis on the technical merits involved. What about the technology needs to be understood and demonstrated?

Study Tasks
Provide a listing of the work tasks involved to accomplish the project objective. These could involve pre-testing of materials, specific construction oversight, collection of samples, field documentation, data analysis, and documentation/reporting. Does the vendor or material supplier have a role in the project outcome and/or is their presence required on site? The AASHTO research protocol provides additional insight for this item.

Anticipated Results

Describe what benefits are likely to occur and how they are applicable to current department practices.

Documentation and Reporting

Describe what project documentation is required. How long will project monitoring need to take place? As a minimum, after construction is completed a series of reports are required. They are:

Construction Report - Documents how the work was performed with emphasis on any deviation from the intended course of action. Includes all pertinent information about the technology itself; including actual usage, limits, material reports, IDRs, and deviations from plan details. Initial conclusions about the technology and recommendations on additional trial projects are desired.

Progress Reports - Depending on the duration of the monitoring cycle, one or more progress reports may be required. Their primary purpose is to report on current field performance, including trends over time, and recommendations on further use. An annual update is usually required, unless unusual circumstances justify a more lengthy reporting schedule.

Final Report - A detailed accounting of the project's findings. Summarizes previous information from past reports. Includes all data analysis and outcomes from study tasks with conclusions/recommendations regarding the technology's use and implementation into department practice. Was the objective accomplished? Documents project costs and benefits derived.

Project Oversight

Identifies a regional contact person(s) who will take the lead on the project. If more than one Region is involved, than identify a "lead" Region. If multiple persons are involved, identify individual roles and responsibilities. Include a description of assistance required from others, including the central office or contracted (non-department) personnel.

Budget

Account for any special needs that require extra project funds or personnel. Are special materials, testing equipment, or facilities required? If so, how will they be acquired?

Appendix A

Project Field Review Report

CAPITAL PREVENTIVE MAINTENANCE (CPM)
PROJECT FIELD REVIEW REPORT

Region:		Year of Construction:		Job Number:	

Field Review Date and By:

Route:	Physical Reference #:	PRBMP:	PREMP:	PR Length: (Route-Mi)	Total Length: (Route-Mi)	# of Lanes:	Total Lane Miles:

Location Description:

Pavement Type:	Pavement Width:	Shoulder Type:	Shoulder Width:

Prev Fix Yr. & Prev Fix Type:		ADT Range: / Comm ADT Range:	

Recommended Treatment:

Pavement Condition Requirements for Recommended Treatment

Min. RSL (yrs):	Max. DI:	Max. IRI:	Max. Avg. RUT:

Pavement Management Data

RSL / Yr.		DI / Yr.		IRI / Yr.		RUT / Yr.	

Field Review Comments or Justification:

Construction Cost:	PE Cost (8%):	CE Cost (12%):	Total Project Cost:
	ROW Cost:		$0.00

For CPM Subcommittee Use Only

CPM Subcommittee Recommendation for Approval ☐ Yes ☐ No (See Attached) Date:

Appendix B

MEMO: ONE COURSE HMA OVERLAYS ON ROADS WITH CRACK TREATMENT

MDOT Michigan Department of Transportation

OFFICE MEMORANDUM

DATE: July 28, 2004

TO: TSC Managers
Resident/Project Engineers
Region/TSC Delivery Engineers
Region/TSC Development Engineers

FROM: Kevin Kennedy
Capital Preventive Maintenance Engineer
Construction and Technology Support Area

SUBJECT: One Course HMA Overlays on Roads with Crack Treatment

One course HMA overlays have been an effective tool in the Capital Preventive Maintenance program. However, there are two potential issues that can arise during construction.

The first issue deals with bumps forming in the asphalt overlay above areas where crack sealant is present. During the compaction process, rollers tend to push the HMA forward. If the underlying surface has uniform restraining characteristics, a smooth finished surface can be constructed. However, if the underlying surface varies significantly, a wave formation can form in the HMA which results in unwanted bumps during construction. Low melt temperature sealants may soften when heated by the overlay, which may prevent restraint of the HMA if it displaces during construction. Potential solutions for this problem include:

1. Use of rollers with power driven front drums.
2. Use of two course paving with the first course being a thin leveling coat (1/2″ scratch course)
3. Modifying rolling patterns and temperatures based on operator experience to reduce mix shoving.
4. Slowing roller speed during compaction, especially on intermediate and final rolling
5. Rolling to achieve compaction with the minimum number of passes. Do not “over roll”.
6. Milling the existing surface prior to the overlay.

For any of the above potential solutions, HMA density requirements should not be waived.

The second issue deals with the tires on construction equipment pulling out sealing material during construction. This occurs when tack coat sticks to the tires of construction equipment and then the tires pull out the sealing material as they pass over the material. Potential solutions for this problem include:

1. Diluting the tack coat. Care should be taken to not over dilute the tack coat to the point that bonding is prevented.

2. Apply a non-stick material (lime, sand, etc.) over the sealant to prevent adherence. Care should be taken to limit the non-stick material to the area over the sealant.
3. Remove excess sealant and/or avoid excessive sealant applications.
4. If overband crack treatment is applied prior to the HMA overlay, remove all dirt, debris, and moisture from cracks prior to applying overband material (as per specification).

Due to the potential complications listed above, projects with excessive amounts of previous crack treatments may not be ideal for one course overlays. On projects that are selected, the above listed actions should assist in overlay construction.

If you have any questions or comments, please contact me at 517-322-6043.

_____

cc: B. O'Brien
C. Bleech