# MDOT Capital Preventive Maintenance Update

MPPP National Meeting

September 2023

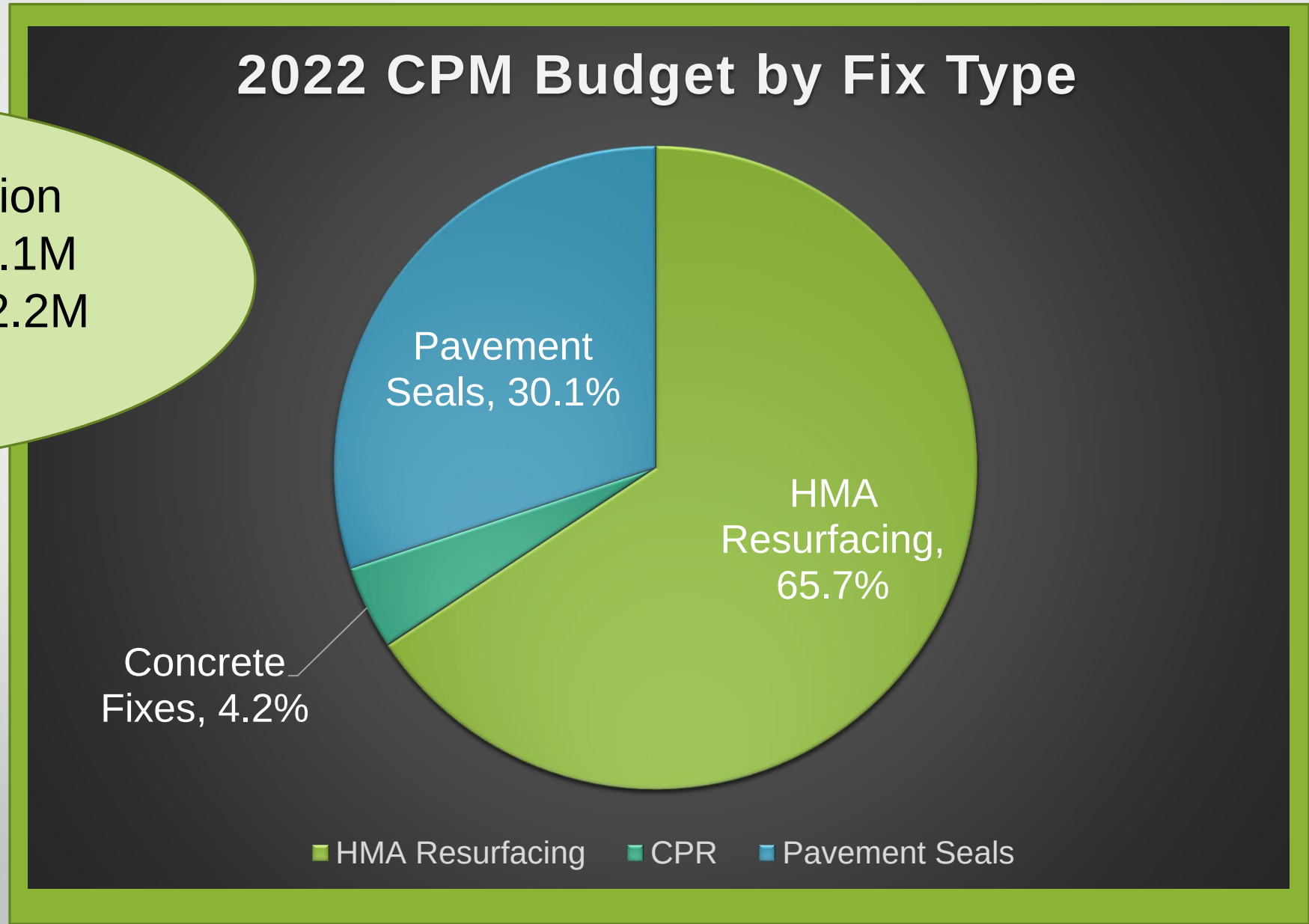
Tyler Hunt PE, CPM Program Engineer

# Overview

- 2023 CPM Program Overview
- CPM Emerging Technologies
  - Scrub Seal
  - Soft Binder Fiber Microsurface
  - Void Reducing Asphalt Membrane
  - Polyurethane Joint Sealing
- Preservation Challenges at MDOT
- Questions

# 2023 CPM Program

2023 CPM - $110 million
Pavement Seals - $33.1M
HMA Resurfacing - $72.2M
CPR - $4.7M



# 2023 CPM Program

| Pavement Seal | # Projects | | Functional Enhancement | # Projects |
|---|---|---|---|---|
| Single/Multi Course Chip Seals | 9 (244 lane miles) | | Cold Milling and 1-1/2" Overlay and HMA Overlays | 26 |
| Soft Binder Fiber Microsurface | 4 | | Full Depth CPR | 2 |
| Paver Placed Surface Seal (UTBWC) | 3 | | | |
| Cape Seal | 1 | | | |
| Ultra-Thin | 1 | | | |
| HMA/PCP Crack/Joint Sealing | 13 | | | |
| PCP Spall repair | 1 | | | |

60 Projects Programed
32 Pavement Seal
28 Functional Enhancements

# Emerging Technologies

# Scrub Seal

- Address fine cracking
- Similar process to chip seal except scrub broom
- Use when overband is impractical

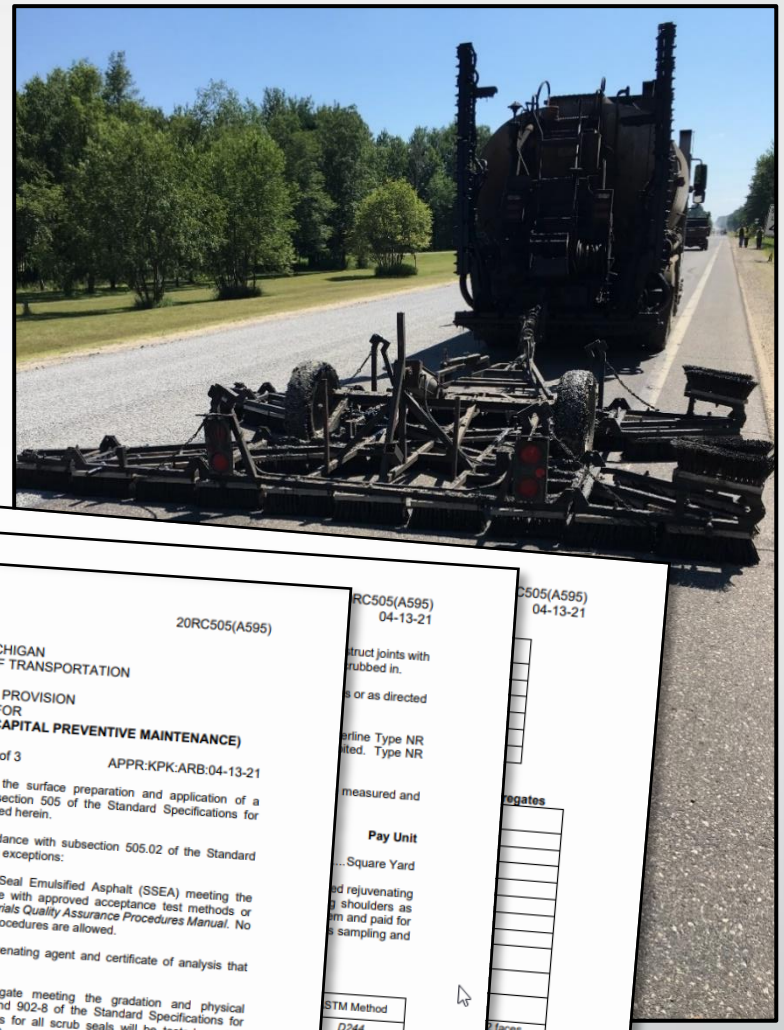
- Emulsion SSEA (lower visc than CS emulsion)
- Rejuvenating Agent
- Aggregate 34CS (same as MDOT chip seal agg)

# Scrub Seals

- Projects Completed
  - M-20 Hesperia (2017)
  - US-141 north of M-35 (2021)
- M-553 from M-35 to CR 480 - scheduled for 2024

**Table 2: Rejuvenating Agent**

| Test | Specification | Test Method |
|---|---|---|
| **Viscosity, 140F, CST** | 50-300 | **ASTM D4402/D4402M** |
| **Flash Point, F, COC** | 380 Minimum | **ASTM D92** |
| **Saturate, % by wt.** | 30 Maximum | **ASTM D2007** |
| **Test on RTFO Residue** | | |
| **Weight Change, %** | 6.5 Maximum | **AASHTO T240 or T179** |
| **Viscosity Ratio** | **3 Maximum** | **AASHTO T179** |





20RC505(A595)

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**REJUVENATING SCRUB SEAL (CAPITAL PREVENTIVE MAINTENANCE)**

CFS:RAG 1 of 3 APPR:KPK:ARB:04-13-21

**a. Description.** This work consists of the surface preparation and application of a rejuvenating scrub seal in accordance with section 505 of the Standard Specifications for Construction, the standard plans, and as specified herein.

**b. Materials.** Provide materials in accordance with subsection 505.02 of the Standard Specifications for Construction with the following exceptions:

1. Asphalt Emulsion. Provide Scrub Seal Emulsified Asphalt (SSEA) meeting the requirements of Table 1 and in accordance with approved acceptance test methods or certification procedures described in the *Materials Quality Assurance Procedures Manual*. No deviations to acceptance test methods and procedures are allowed.

2. Rejuvenating Agent. Provide a rejuvenating agent and certificate of analysis that meets the requirements of Table 2.

3. Coarse Aggregate. Provide aggregate meeting the gradation and physical requirements of 34 CS from Table 902-7 and 902-8 of the Standard Specifications for Construction or Table 3. Coarse aggregates for all scrub seals will be tested per the *Procedures of Aggregate Inspection Manual*. Copper smelter slag is not permitted for use as a scrub seal aggregate.

**c. Construction.** Ensure all construction is in accordance with subsection 505.03 of the Standard Specifications for Construction with the following additions.

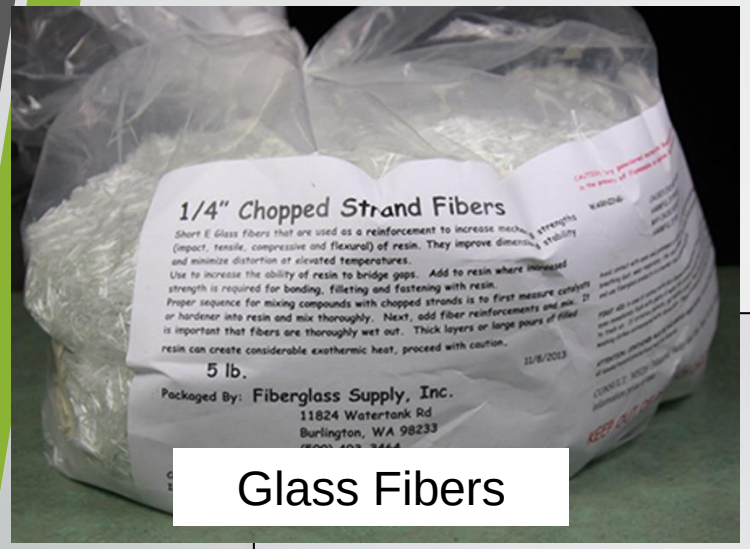
1. Equipment. Provide a scrub broom with a rigid frame that is attached to and pulled by the distributer truck. Equip the scrub broom with a means to be mechanically raised and lowered off and onto the road surface and be towable in the elevated position. Equip the scrub broom with a hinged wing assembly that is adjustable to maintain a consistent scrubbing process for various pavement widths. Provide a scrub broom with appropriate weight that will not squeegee emulsion off the road surface.

2. Test Section. Determine the application rate of emulsion and aggregate based on the existing pavement condition. Provide the Engineer with proposed application rates prior to start of work. Construct a 500 foot test section a minimum of one lane width at the beginning of work.

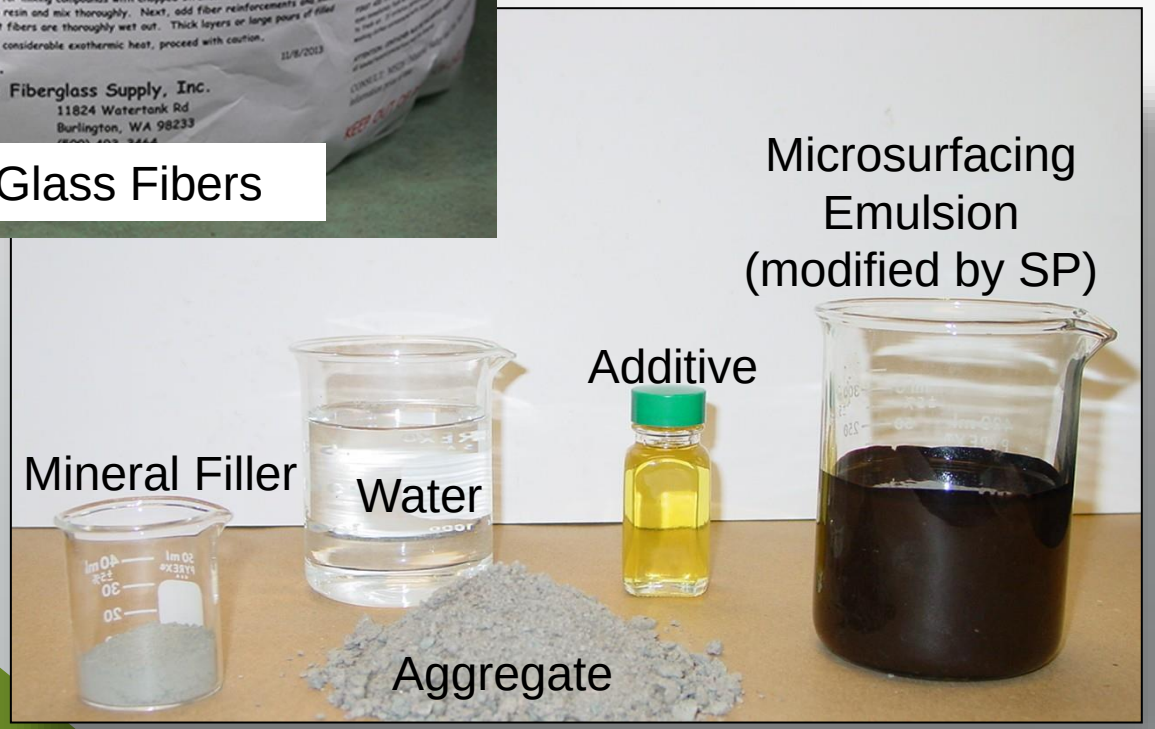
Immediately upon completion of the test section the Engineer will evaluate the test area to determine if the application rates are acceptable. If the test section is not approved, the Contractor must construct additional test sections until the Engineer approves. The unapproved test sections will not be paid for. Full production work can only begin after the Engineer accepts the test section.

# Scrub Seals – M-20 near Hesperia


# Soft Binder Fiber Microsurface

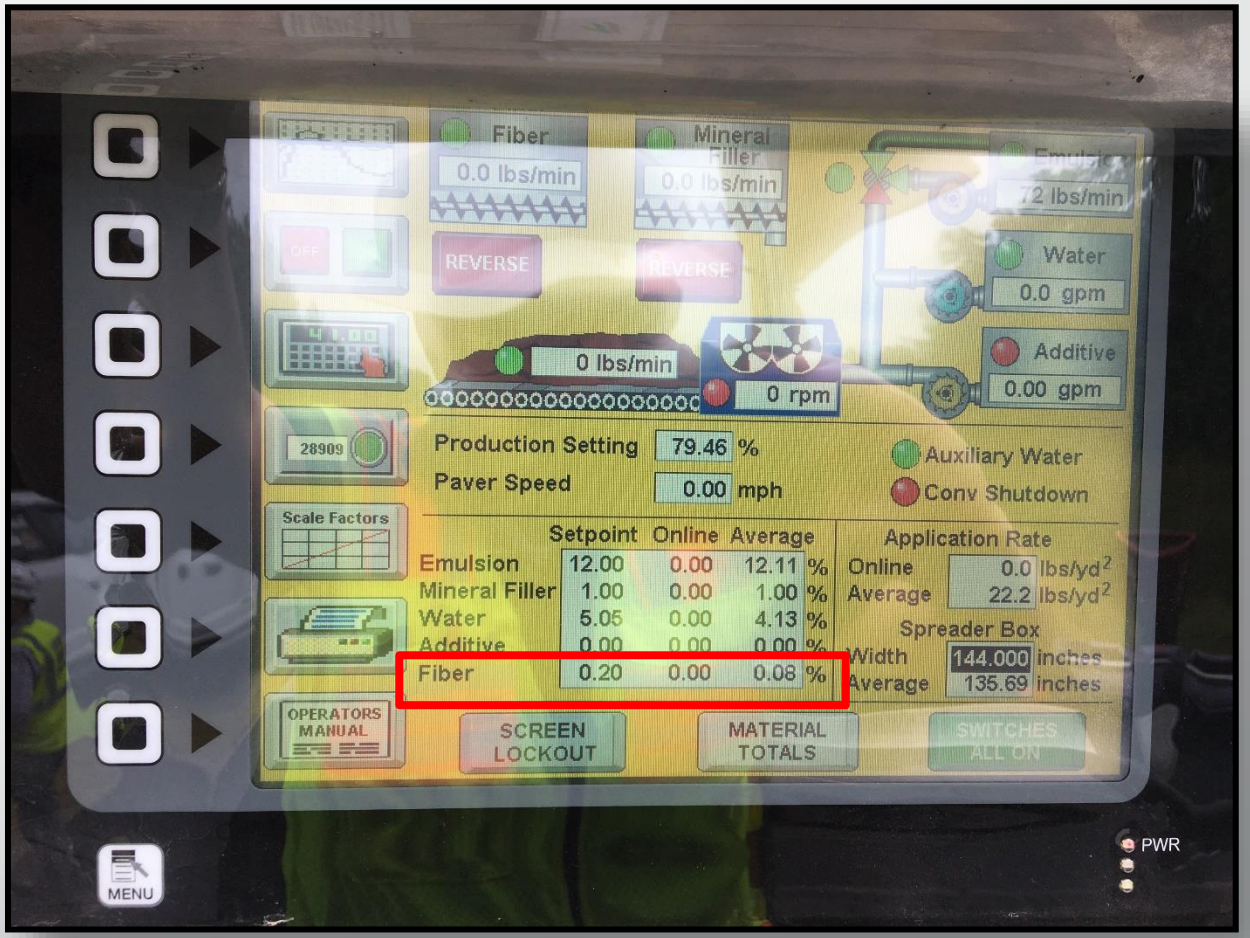



Glass Fibers



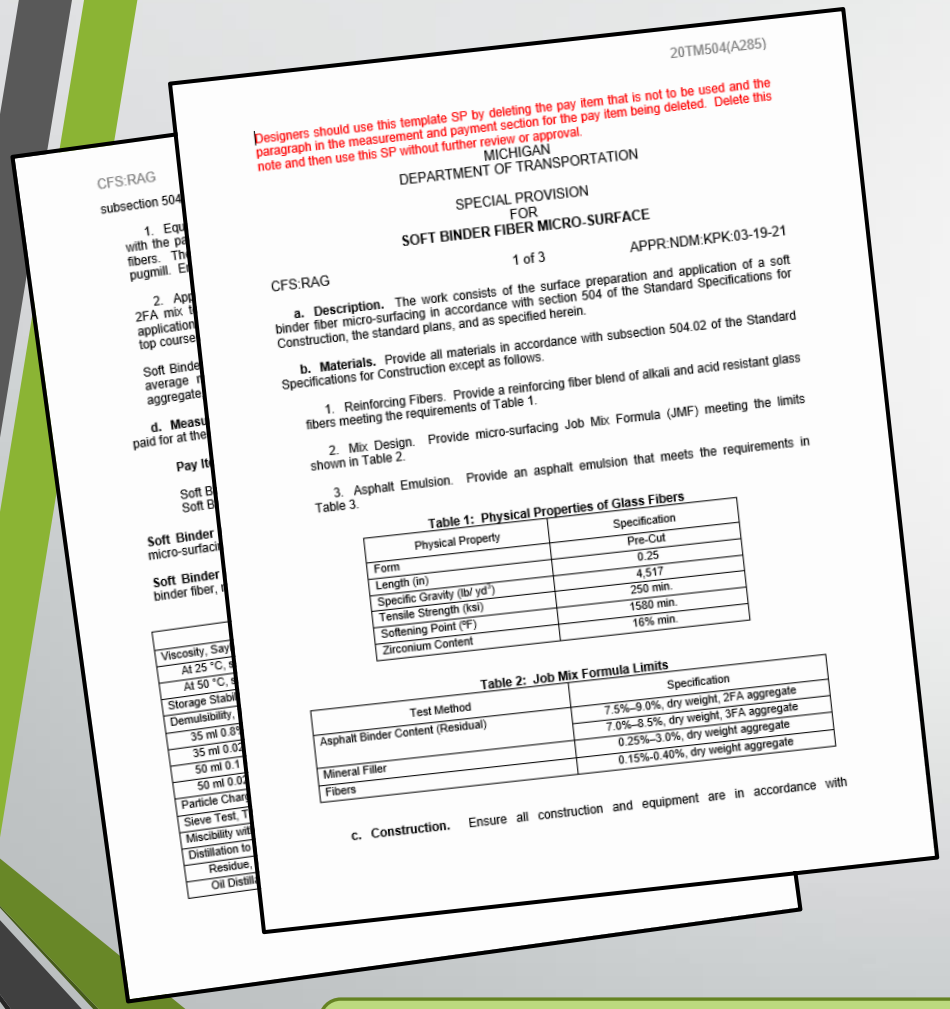

- 2FA Aggregate
- Alkali & Acid Resistant Glass Fibers @ 0.25” length
- Softer binder than CSS-1hM, CSS-1mM
  - Pen. 90 -140 per T49/D5
  - (Vs 70 – 90 for CSS-1mM and 40 – 90 for CSS-1hM)

# Soft Binder Fiber Microsurface




Fiber Dispenser with integrated rate indicator

# Soft Binder Fiber Microsurface



20TM504(A285)

Designers should use this template SP by deleting the pay item that is not to be used and the paragraph in the measurement and payment section for the pay item being deleted. Delete this note and then use this SP without further review or approval.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**SOFT BINDER FIBER MICRO-SURFACE**

1 of 3 APPR:NDM:KPK:03-19-21

CFS:RAG

**a. Description.** The work consists of the surface preparation and application of a soft binder fiber micro-surfacing in accordance with section 504 of the Standard Specifications for Construction, the standard plans, and as specified herein.

**b. Materials.** Provide all materials in accordance with subsection 504.02 of the Standard Specifications for Construction except as follows.

1. Reinforcing Fibers. Provide a reinforcing fiber blend of alkali and acid resistant glass fibers meeting the requirements of Table 1.

2. Mix Design. Provide micro-surfacing Job Mix Formula (JMF) meeting the limits shown in Table 2.

3. Asphalt Emulsion. Provide an asphalt emulsion that meets the requirements in Table 3.

**Table 1: Physical Properties of Glass Fibers**

| Physical Property | Specification |
|---|---|
| Form | Pre-Cut |
| Length (in) | 0.25 |
| Specific Gravity (lb/ yd³) | 4,517 |
| Tensile Strength (ksi) | 250 min. |
| Softening Point (°F) | 1580 min. |
| Zirconium Content | 16% min. |

**Table 2: Job Mix Formula Limits**

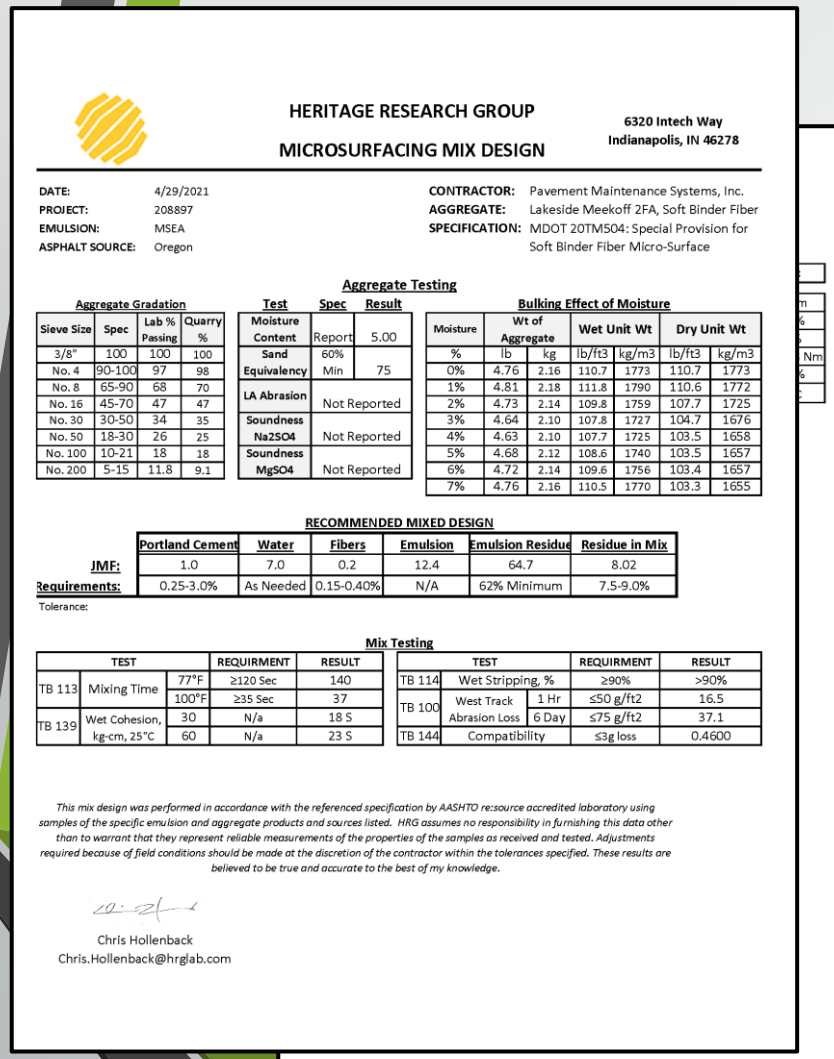
| Test Method | Specification |
|---|---|
| Asphalt Binder Content (Residual) | 7.5%–9.0%, dry weight, 2FA aggregate<br>7.0%–8.5%, dry weight, 3FA aggregate |
| Mineral Filler | 0.25%–3.0%, dry weight aggregate |
| Fibers | 0.15%-0.40%, dry weight aggregate |

**c. Construction.** Ensure all construction and equipment are in accordance with

- 2023 Projects
  - M-40 from M-60 to Marcellus
  - M-152 from the Berrien/Van Buren County line to M-51
  - US-24 (Telegraph) from 8-mile to I-696
  - US-24 BR (Square Lake) from US-24 to M-1
- 2024 Projects
  - Belle Isle
  - M-106

Template SP 20TM504(A285)

# Soft Binder Fiber Microsurface



HERITAGE RESEARCH GROUP

MICROSURFACING MIX DESIGN

6320 Intech Way
Indianapolis, IN 46278

DATE: 4/29/2021
PROJECT: 208897
EMULSION: MSEA
ASPHALT SOURCE: Oregon

CONTRACTOR: Pavement Maintenance Systems, Inc.
AGGREGATE: Lakeside Meekoff 2FA, Soft Binder Fiber
SPECIFICATION: MDOT 20TM504: Special Provision for Soft Binder Fiber Micro-Surface

**Aggregate Testing**

**Aggregate Gradation**

| Sieve Size | Spec | Lab % Passing | Quarry % |
|---|---|---|---|
| 3/8" | 100 | 100 | 100 |
| No. 4 | 90-100 | 97 | 98 |
| No. 8 | 65-90 | 68 | 70 |
| No. 16 | 45-70 | 47 | 47 |
| No. 30 | 30-50 | 34 | 35 |
| No. 50 | 18-30 | 26 | 25 |
| No. 100 | 10-21 | 18 | 18 |
| No. 200 | 5-15 | 11.8 | 9.1 |

| Test | Spec | Result |
|---|---|---|
| Moisture Content | Report | 5.00 |
| Sand Equivalency | 60% Min | 75 |
| LA Abrasion | | Not Reported |
| Soundness Na2SO4 | | Not Reported |
| Soundness MgSO4 | | Not Reported |

**Bulking Effect of Moisture**

| Moisture | Wt of Aggregate | | Wet Unit Wt | | Dry Unit Wt | |
|---|---|---|---|---|---|---|
| % | lb | kg | lb/ft3 | kg/m3 | lb/ft3 | kg/m3 |
| 0% | 4.76 | 2.16 | 110.7 | 1773 | 110.7 | 1773 |
| 1% | 4.81 | 2.18 | 111.8 | 1790 | 110.6 | 1772 |
| 2% | 4.73 | 2.14 | 109.8 | 1759 | 107.7 | 1725 |
| 3% | 4.64 | 2.10 | 107.8 | 1727 | 104.7 | 1676 |
| 4% | 4.63 | 2.10 | 107.7 | 1725 | 103.5 | 1658 |
| 5% | 4.68 | 2.12 | 108.6 | 1740 | 103.5 | 1657 |
| 6% | 4.72 | 2.14 | 109.6 | 1756 | 103.4 | 1657 |
| 7% | 4.76 | 2.16 | 110.5 | 1770 | 103.3 | 1655 |

**RECOMMENDED MIXED DESIGN**

| | Portland Cement | Water | Fibers | Emulsion | Emulsion Residue | Residue in Mix |
|---|---|---|---|---|---|---|
| JMF: | 1.0 | 7.0 | 0.2 | 12.4 | 64.7 | 8.02 |
| Requirements: | 0.25-3.0% | As Needed | 0.15-0.40% | N/A | 62% Minimum | 7.5-9.0% |

Tolerance:

**Mix Testing**

| TEST | | | REQUIRMENT | RESULT |
|---|---|---|---|---|
| TB 113 | Mixing Time | 77°F | ≥120 Sec | 140 |
| | | 100°F | ≥35 Sec | 37 |
| TB 139 | Wet Cohesion, kg-cm, 25°C | 30 | N/a | 18 S |
| | | 60 | N/a | 23 S |

| TEST | | | REQUIRMENT | RESULT |
|---|---|---|---|---|
| TB 114 | Wet Stripping, % | | ≥90% | >90% |
| TB 100 | West Track Abrasion Loss | 1 Hr | ≤50 g/ft2 | 16.5 |
| | | 6 Day | ≤75 g/ft2 | 37.1 |
| TB 144 | Compatibility | | ≤3g loss | 0.4600 |

*This mix design was performed in accordance with the referenced specification by AASHTO re:source accredited laboratory using samples of the specific emulsion and aggregate products and sources listed. HRG assumes no responsibility in furnishing this data other than to warrant that they represent reliable measurements of the properties of the samples as received and tested. Adjustments required because of field conditions should be made at the discretion of the contractor within the tolerances specified. These results are believed to be true and accurate to the best of my knowledge.*

Chris Hollenback
Chris.Hollenback@hrglab.com

- Emulsion slower setting
- Surface stays tender for longer
- Additional time to open to traffic
- Sanding of intersections may be required

# VOID REDUCING ASPHALT MEMBRANCE

- Sprayed along HMA joint to reduce voids
- Avoiding excessive compaction effort
- 2023 Projects
  - I-94 from Freer to Race Rd
  - US-31/M-37 Traverse City

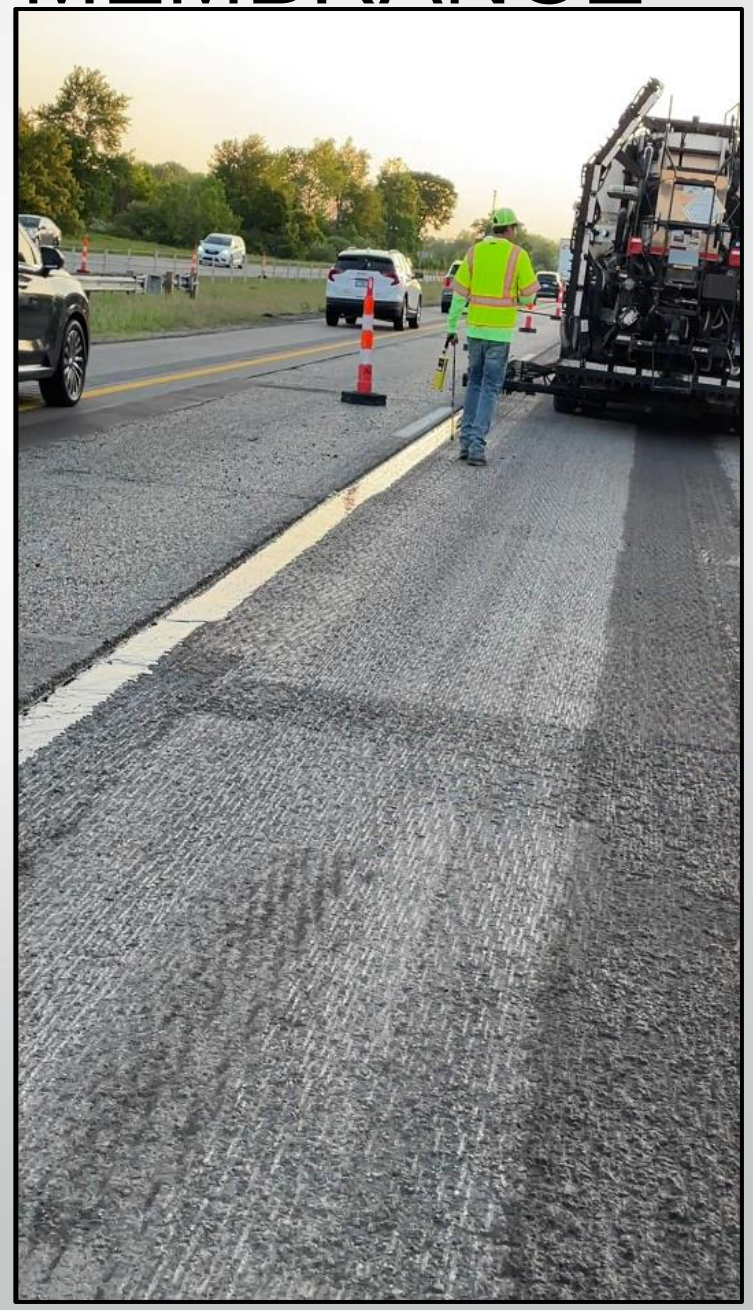


**Table 2: VRAM Application Rate**

| Non-SMA Mixtures | | |
|---|---|---|
| Overlay Thickness, inches | VRAM Width, inches | Application Rate, lb/ft |
| 1 | 18 | 0.80 |
| 1¼ | 18 | 0.88 |
| ≥ 1½ | 18 | 0.95 |
| **SMA Mixtures** | | |
| Overlay Thickness, inches | VRAM Width, inches | Application Rate, lb/ft |
| 1½ | 18 | 1.26 |
| 1¾ | 18 | 1.38 |
| ≥ 2 | 18 | 1.51 |

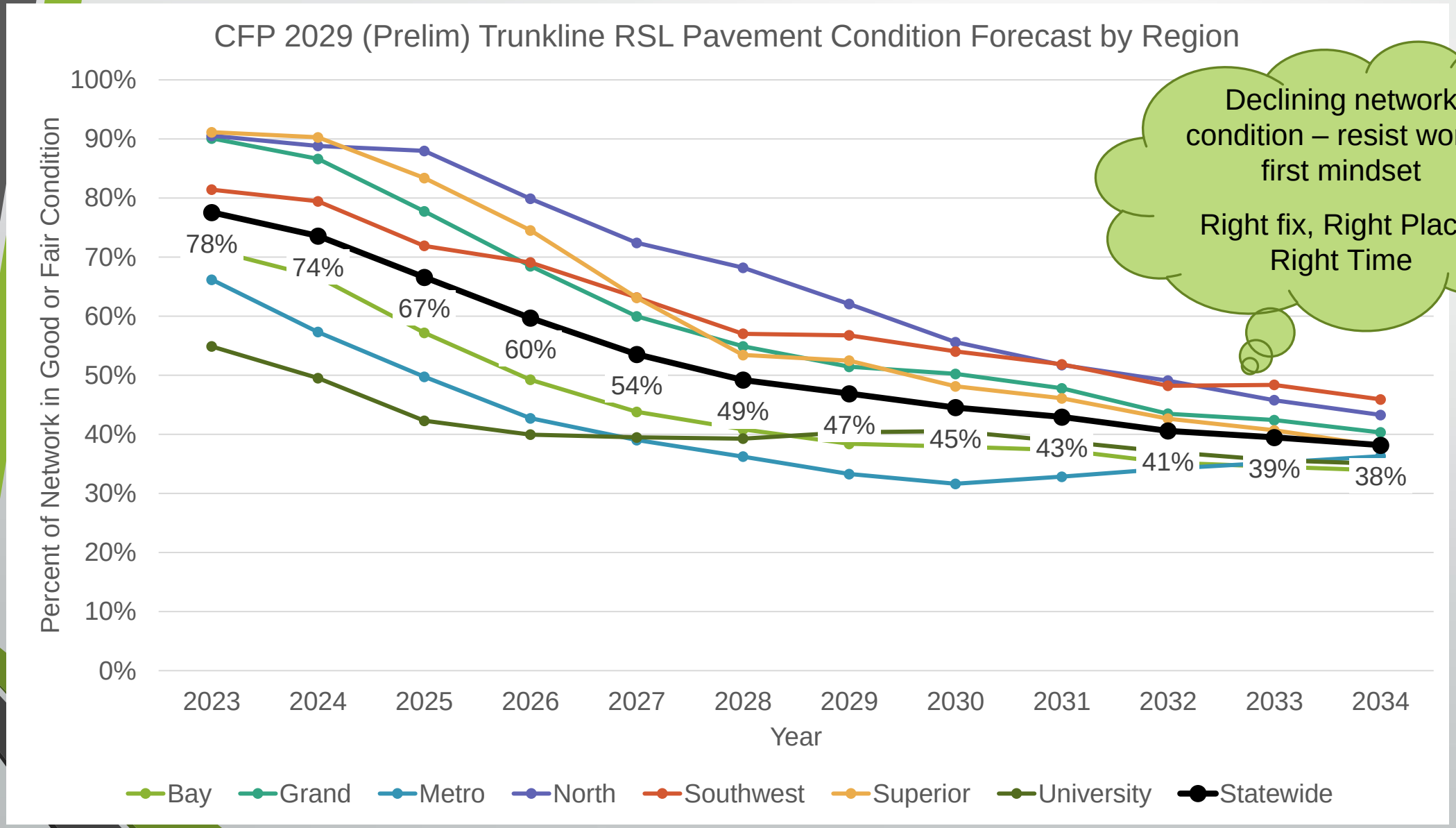
1. The thickness of the VRAM may taper from the center of the application to a lesser thickness on the edge of the application. Maintain the width and weight per foot.
2. In the event of a joint between a SMA and non-SMA mixture, the non-SMA application rate will be used.
3. When applying VRAM half-width, apply the application at one-half the prescribed width and rate.

# Polyurethane Joint Resealing

- 2021 – US-131 north of I-94
  - Eucolastie 1SL
- 2023 – US-31/M-37 Chums Corner
- 2024+ - TBD
- Contractors can use non-sag or self leveling
- Backer rod required
- Longitudinal and transverse joints paid separately

20RC603(A435)

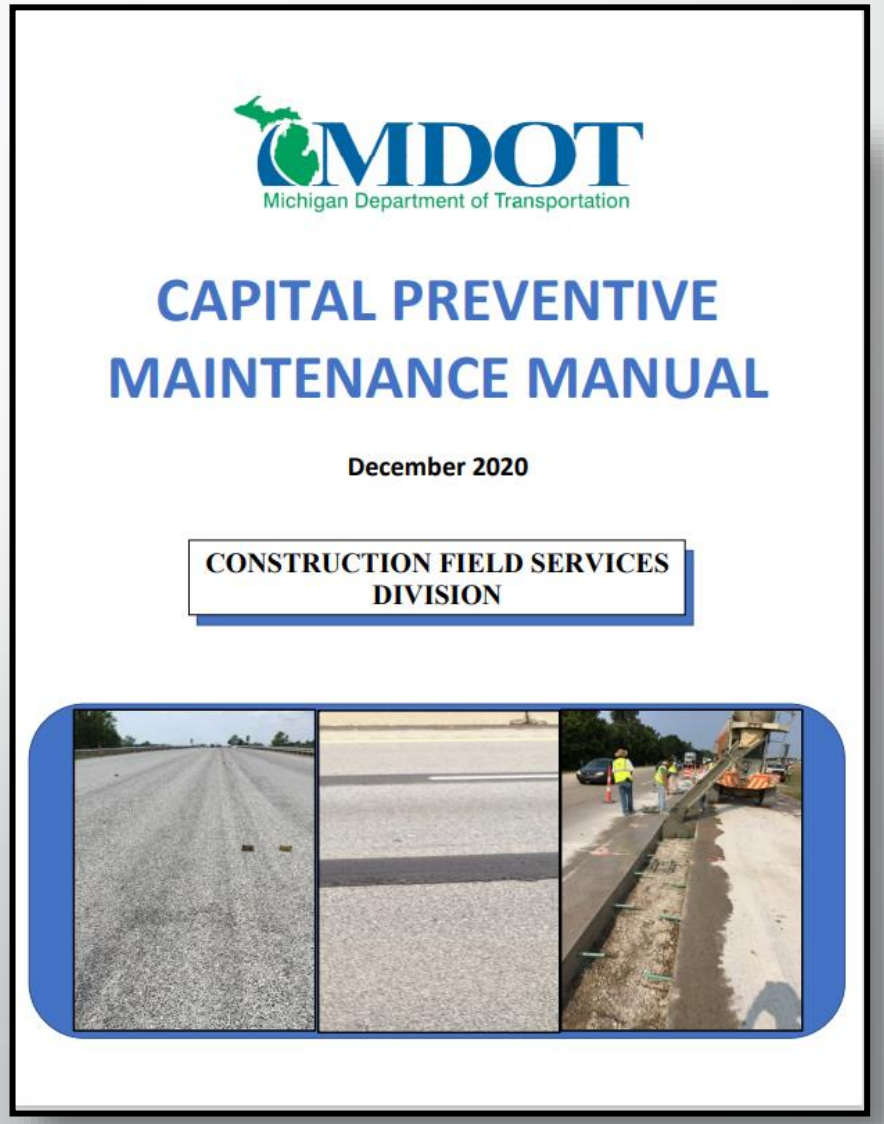
# Preventive Maintenance Challenges



# Preventive Maintenance Challenges

- Longevity from Joint/Crack Sealing
- Chip Seal Delamination over Long. Markings
- Conc Joint Sealing Timeframe and Methods

- With declining network condition – resist worst-first mindset
- Right fix, Right Place, Right Time



# Contacts

- Tyler Hunt
  - Phone:  517-256-9592
- Andy Bennett
  - Phone:  517-243-0870

# QUESTIONS

THE END