

WisDOT Update

Barry Paye, PE

Chief Materials & Pavements Engineer

Wisconsin DOT

WAPA Conference
Pewaukee, WI

December 4, 2019



Topics

- Asphalt Binder Testing
- Updates to Specifications for 2020
- Cold Weather Paving
- Cold In-Place Recycling
- Longitudinal Joint Construction
- Longitudinal Joint Density
- PWL Summary
- Wisconsin Research.

Asphalt Binder Testing



Asphalt Binder Content Testing

- Required starting with the December 2018 Letting
- Pay Credits based on QV testing:
 - 0.4 to 0.5% below mix design target
 - 75% pay
 - More than 0.5% below mix design target
 - remove and replace or 50% pay if allowed to remain in place

Asphalt Binder Content Testing

- QV testing results for 2019
 - 877 QV tests in 2019
 - 27 Noncompliant QV tests (AV, VMA and/or AC)
 - 7 of 27 had low binder content - 0.8%
 - 4 of the 27 were AC only
 - 2 were confirmed by BTS to be -0.4% below JMF
 - 3 of the 27 were AC and VMA or AV
 - 1 was confirmed by BTS to be -0.4% below JMF

2020 Specification Updates

- Tack Coats
- 4.75mm Mixes
- Interlayer Mixes
- Nuclear Density Testing
- Cold Weather Paving
- QMP Updates

Tack Coat

- Nonconforming tack defined
 - Tack coat tracked offsite or to other areas of the construction site
 - Excess tack coat accumulation in puddles
 - Areas with insufficient residual asphalt content.
- Only allow h-type emulsions
 - SS-1h, CSS-1h, QS-1h, CQS-1h
- Allow up to 72 hours between tacking and paving on closed lanes



No. 6 (4.75-mm) HMA via ASP-6

- Gradation and agg quality added to SS 460
 - VMA is a range (16.0 – 17.5)
- Min-max thickness: 0.75 – 1.25 inches
- Density
 - Upper layers: 450.3.2.6.2 *NEW* roller pattern by growth curve
 - Lower layers: 450.3.2.6.3 ordinary compaction
- Uses
 - Upper layer at design speeds of 45 mph or lower
 - Lower layer or wedging/leveling layer

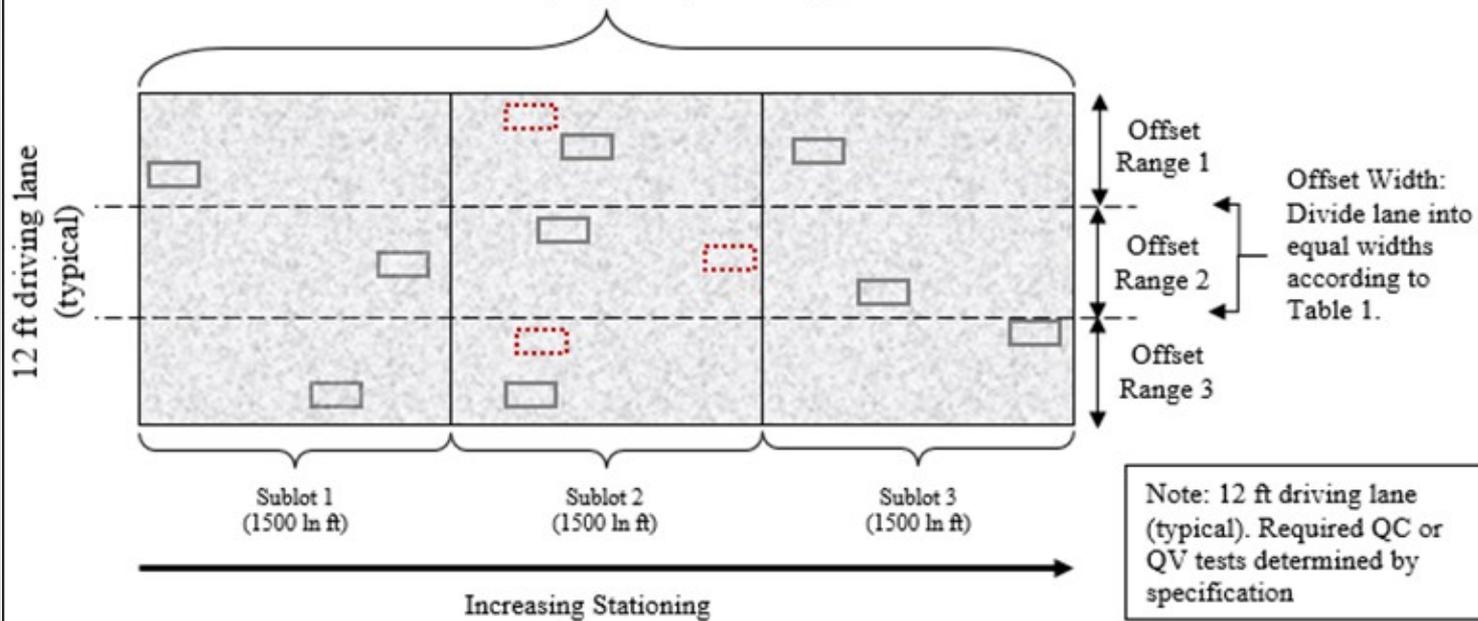
Interlayer STSP

- 1.0 inch thick, low void, highly elastic mix
 - Mitigate amount and severity of reflective cracking for HMA overlays on PCC
- Performance Testing
 - Flexural Beam Fatigue for mix design acceptance
 - HWT and IDEAL-CT for information
- Density
 - Roller pattern by growth curve with additional cores for information
- Base Patching using plunge milling at spalled joints & transverse cracks

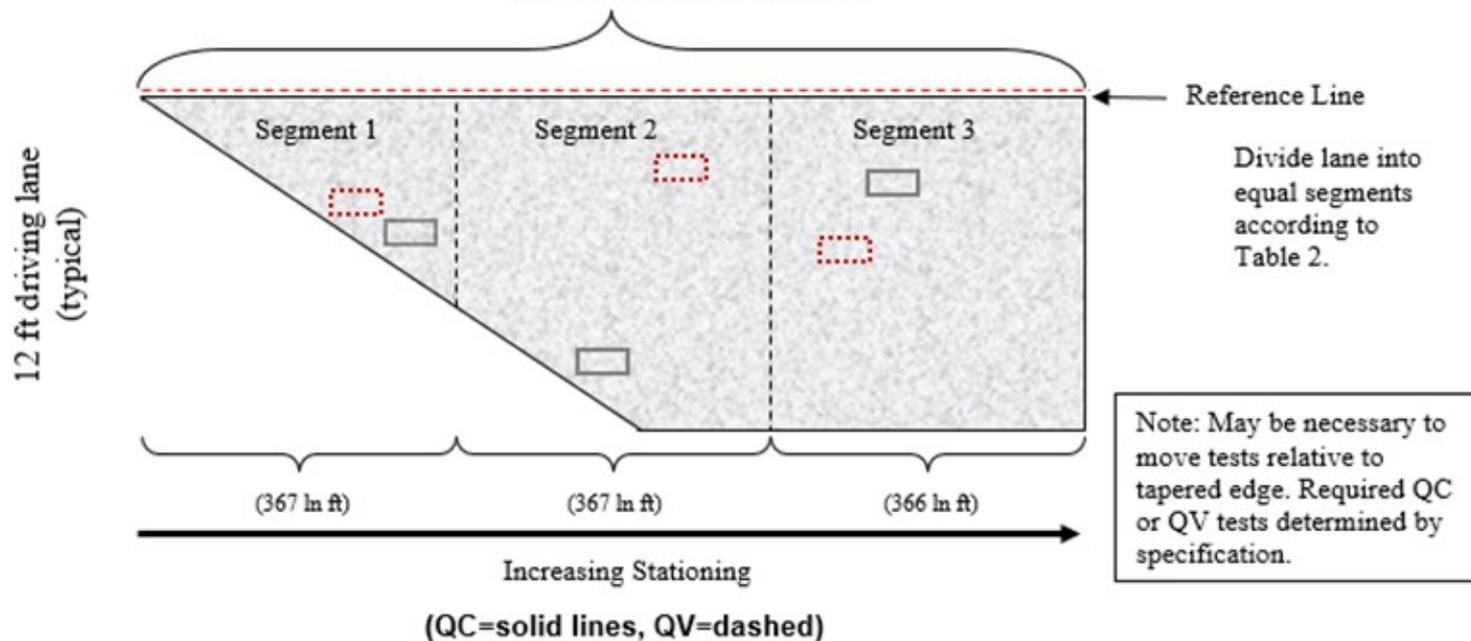
CMM 8-15 Nuclear Density Testing

- Random locations for BOTH longitudinal and transverse offset
- Specify linear subplot system for all projects
 - Nominal tonnage system eliminated
 - Sublot layout and testing frequency based on:
 - Single paved lane length
 - Multiple lanes within a contiguous area
 - Example layouts for mainline, roundabouts, and intersections
- Round pcf, and % density to nearest 0.1
- Testing times:
 - Project testing (All HMA, soils, and base): 1-min
 - Ref site and gauge comparison (CMM 8-15.7 & 8-15.8): 4-min

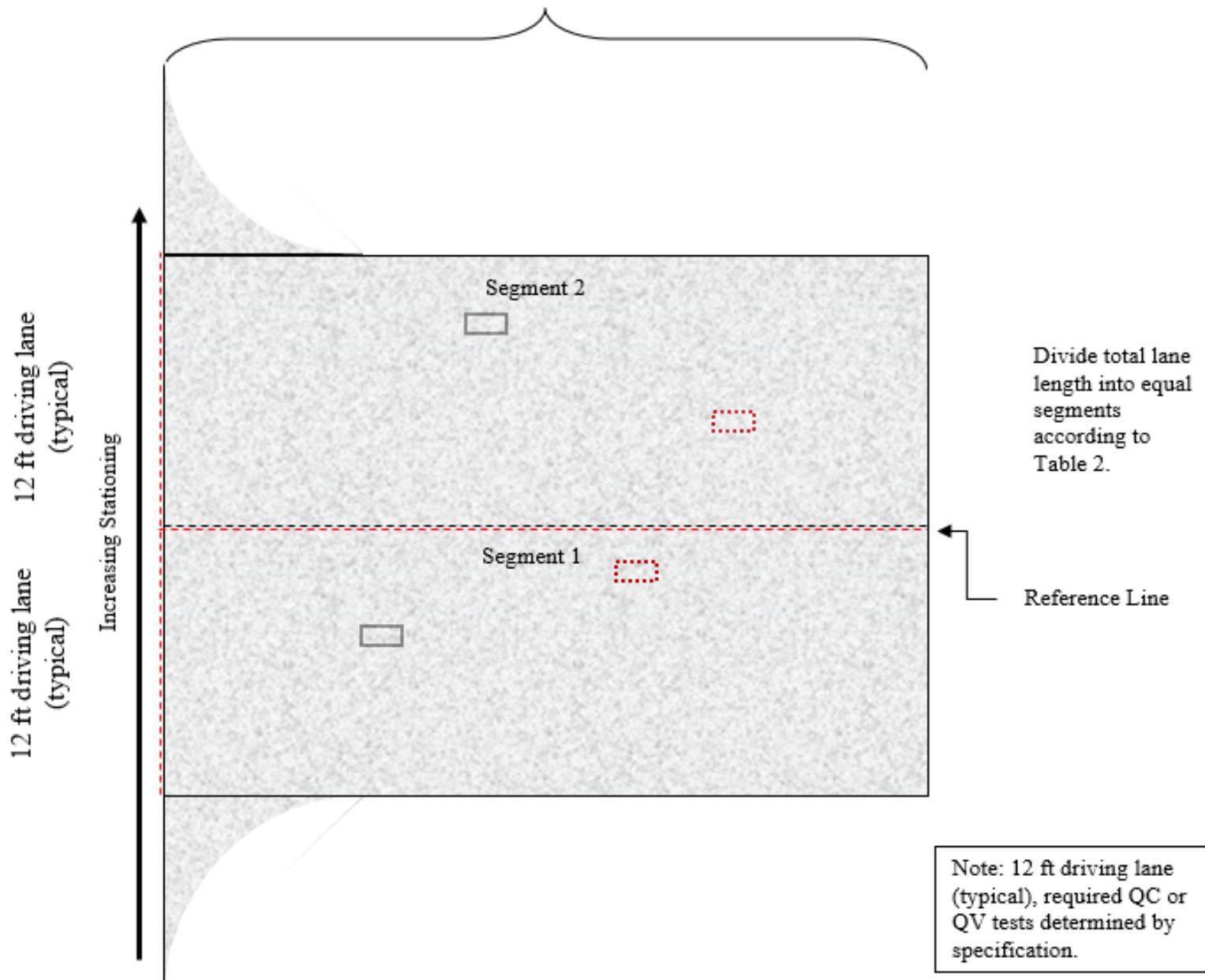
1 Lot (Single Day's Paving)



1 Sublot (1100 Lane Feet)



1 Sublot (420 Centerline Feet)

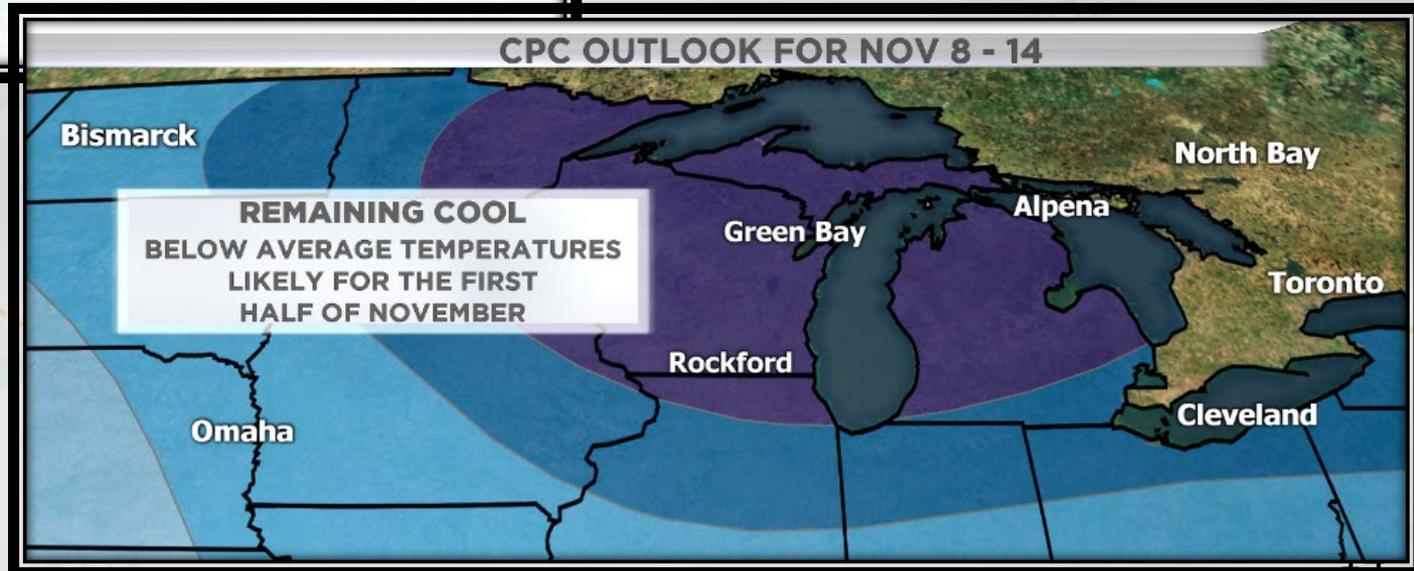
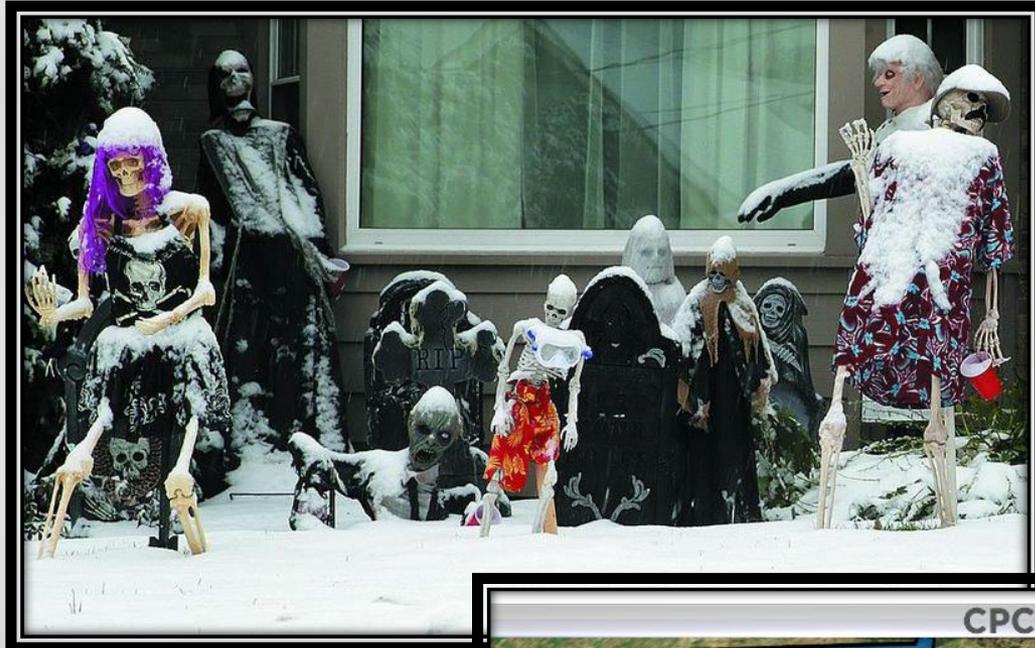


(QC=solid lines, QV=dashed)

CMM 8-36 QMP - HMA

- G_{mm} , G_{mb} , and Compaction testing procedures updated to WisDOT-Modified AASHTO
- Ignition Oven:
 - WisDOT will use Ignition Oven for AC% testing unless otherwise stated
 - Individually-packaged samples required for all ignition oven correction factors
 - New requirement for correction factor sample labeling
 - Now includes reason for submittal (new design, annual reverification, other)

Cold Weather Paving



Cold Weather Paving

- Communication, Communication, Communication
- Short term, daily
 - Identify normal, cold weather or no paving
- Long term
 - Identify possible paving days on long range forecast
 - Identify critical paving needing completion
 - Identify paving that could be pushed to next season
 - Prioritize all paving
 - Stage work accordingly!

CIR - Cold In-place Recycling



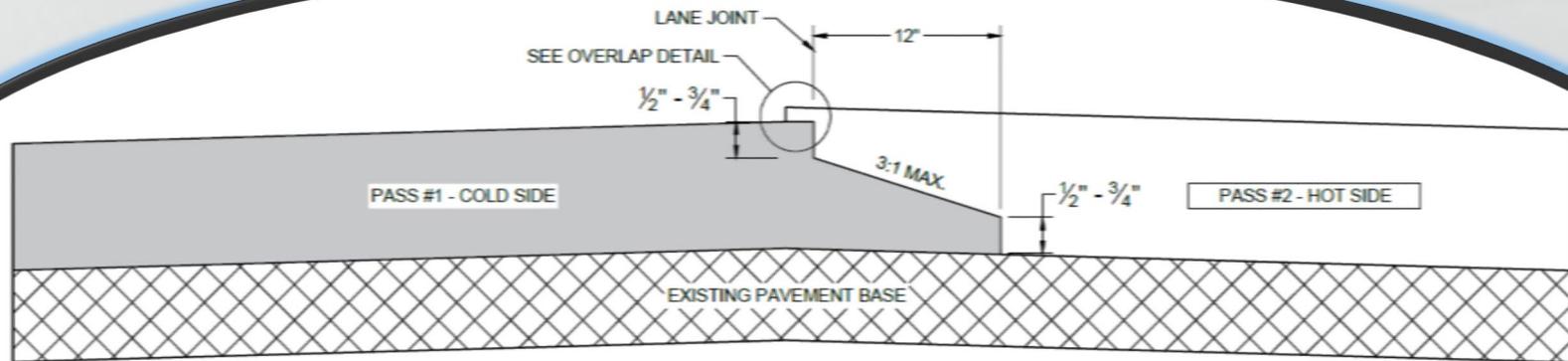
CIR - Cold In-place Recycling

- STSP Updates for May 2020 Lets
 - Targets 2.0% +/- 0.30% foamed asphalt
 - Targets 2.0% +/- 0.30% mix water
 - Mix design still required
 - Informational purposes
 - Region may request test strip @ mix design targets
 - Supporting SPV's aligned to make bidding easier

CIR- Cold In-place Recycling



Longitudinal Joint Construction



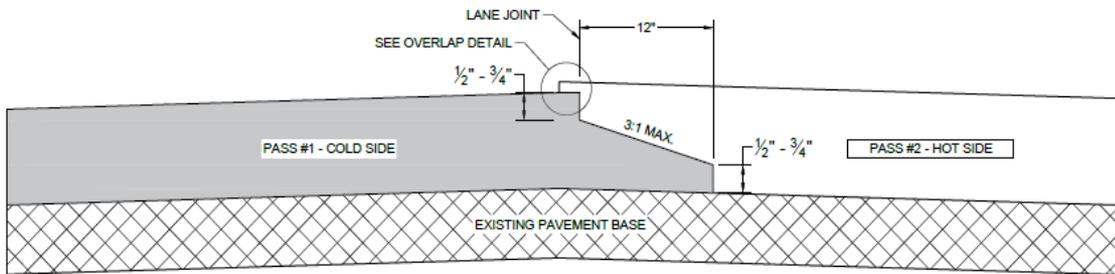
**TYPICAL PAVEMENT CROSS SECTION
OF NOTCHED WEDGE LONGITUDINAL JOINT**

Longitudinal Joint Construction

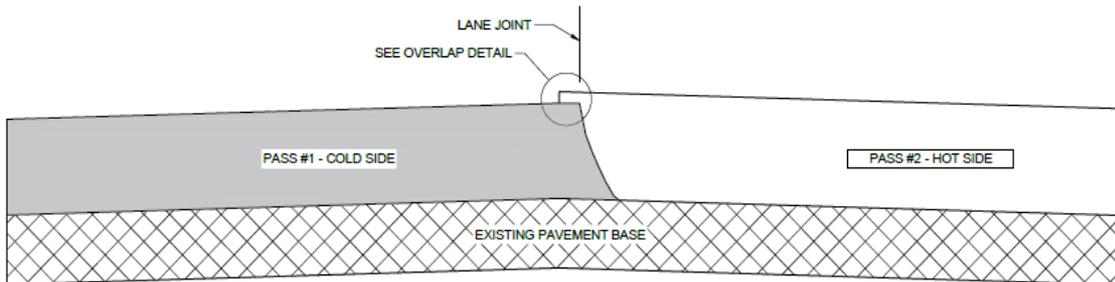
- SDD 13C19 updated to include all joint types
- Notched wedge joint required for all HMA layers ≥ 1.75 inches
 - Only milled out for SMA or as directed by the engineer to address specific lengths of damaged joint
 - State-wide special provision available for wedge removal
- Discontinue specifying joint heaters
- Include Longitudinal Joint Density SPV on all PWL projects
 - Non-PWL projects will require joint density measurements for information in 2021 spec

Implementation of New Longitudinal Joint Construction

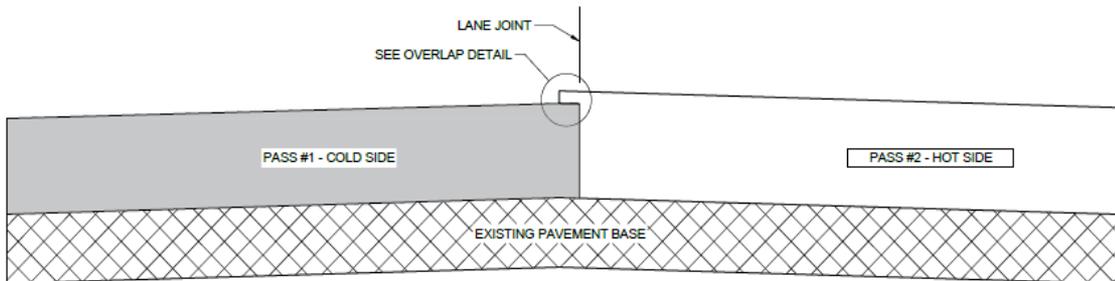
- Feb 2020 PSE (starting with May 2020 Letting)
 - Notched wedge joint used on all mainline HMA layers ≥ 1.75 "
 - Wedge only milled out for SMA and when joint is damaged by traffic as directed by the engineer
 - Statewide STSP 204-045 used for wedge removal (rarely)
 - LJD STSP included on all PWL projects
 - Discontinue use of joint heater STSP
- Aug 2020 PSE (starting with Dec 2020 Letting)
 - Begin collecting joint density for information on Dec 1 letting
 - 2021 Standard Spec will be edited to require collection of joint density data on all projects that don't include the LJD SPV



TYPICAL PAVEMENT CROSS SECTION OF NOTCHED WEDGE LONGITUDINAL JOINT



TYPICAL PAVEMENT CROSS SECTION VERTICAL LONGITUDINAL JOINT



TYPICAL PAVEMENT CROSS SECTION OF MILLED LONGITUDINAL JOINT

GENERAL NOTES

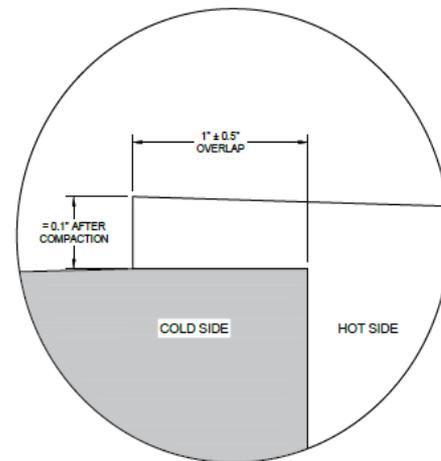
IN ADDITION TO THE DETAILS PROVIDED IN THIS DRAWING, CONFORM TO STANDARD SPECIFICATION 450.3.2.8 FOR WHEN A NOTCHED WEDGE JOINT IS REQUIRED AND GENERAL JOINT CONSTRUCTION REQUIREMENTS.

FOR ALL LONGITUDINAL JOINTS, ENSURE THE PAVER SCREED OVERLAPS THE PREVIOUSLY PLACED PAVEMENT BY 1 ± 0.5" AND THE HOT SIDE OF THE JOINT REMAINS HIGHER THAN THE COLD SIDE BY APPROXIMATELY 0.1" AFTER FINAL COMPACTION.

ONLY REMOVE THE LONGITUDINAL NOTCHED WEDGE JOINT FOR SMA PAVEMENT OR AS DIRECTED BY THE ENGINEER TO ADDRESS SPECIFIC LENGTHS OF JOINT DAMAGED BY TRAFFIC.

WHEN MILLING BACK OR REMOVING ANY LONGITUDINAL JOINT, LIMIT THE MATERIAL REMOVED TO 2" FROM THE TOP NOTCH OR FROM THE VERTICAL JOINT EDGE ON THE COLD SIDE OF THE JOINT.

USE LONGITUDINAL MILLED JOINT AS PLANS SHOW OR THE AS THE ENGINEER DIRECTS.



OVERLAP DETAIL (TYPICAL)

DRAFT

HMA LONGITUDINAL JOINTS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED	ISJ
DATE	HMA PAVEMENT ENGINEER

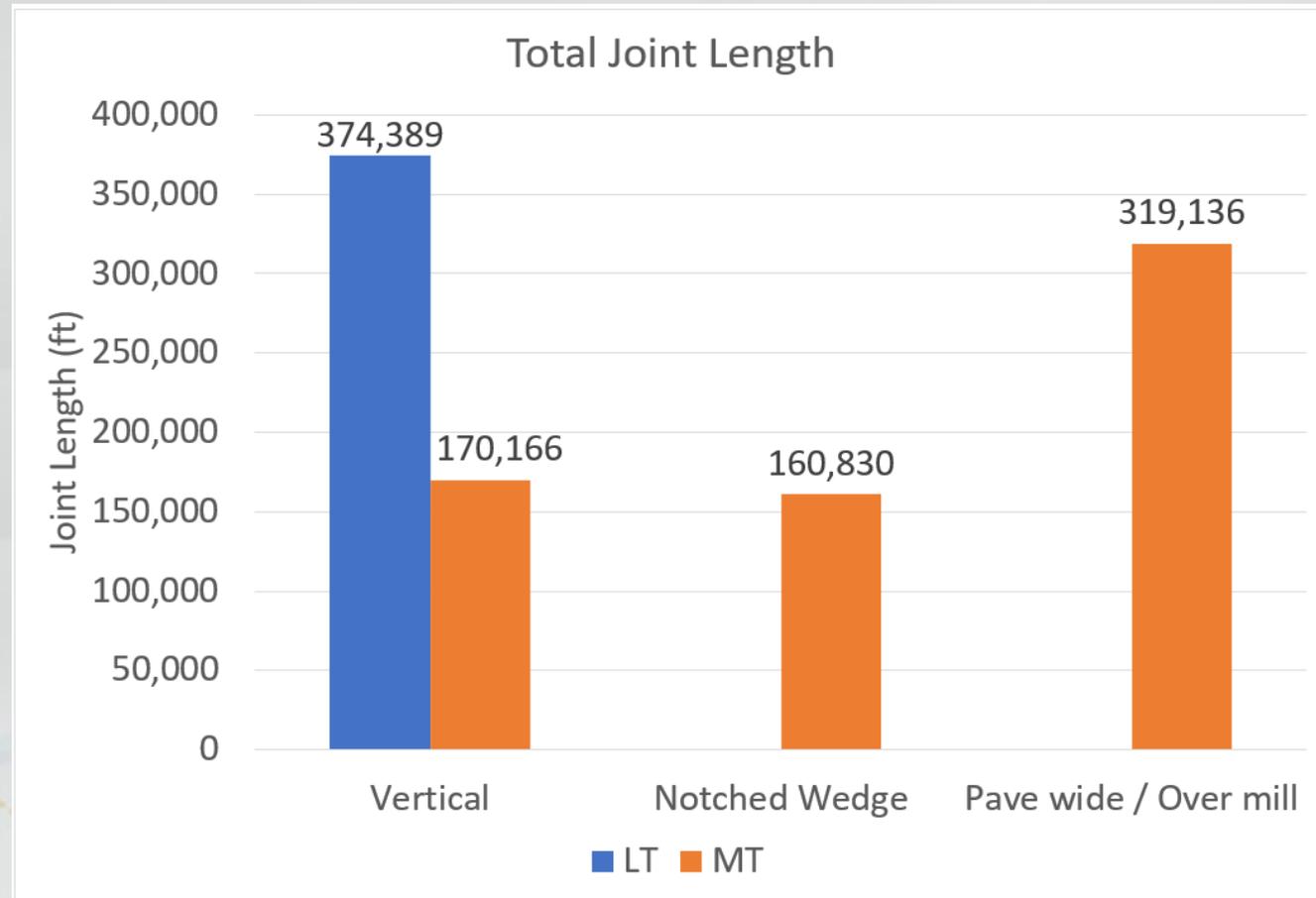
SDD 13C19 - 02

Longitudinal Joint Density



2018 Longitudinal Joint Density SPV Project Results

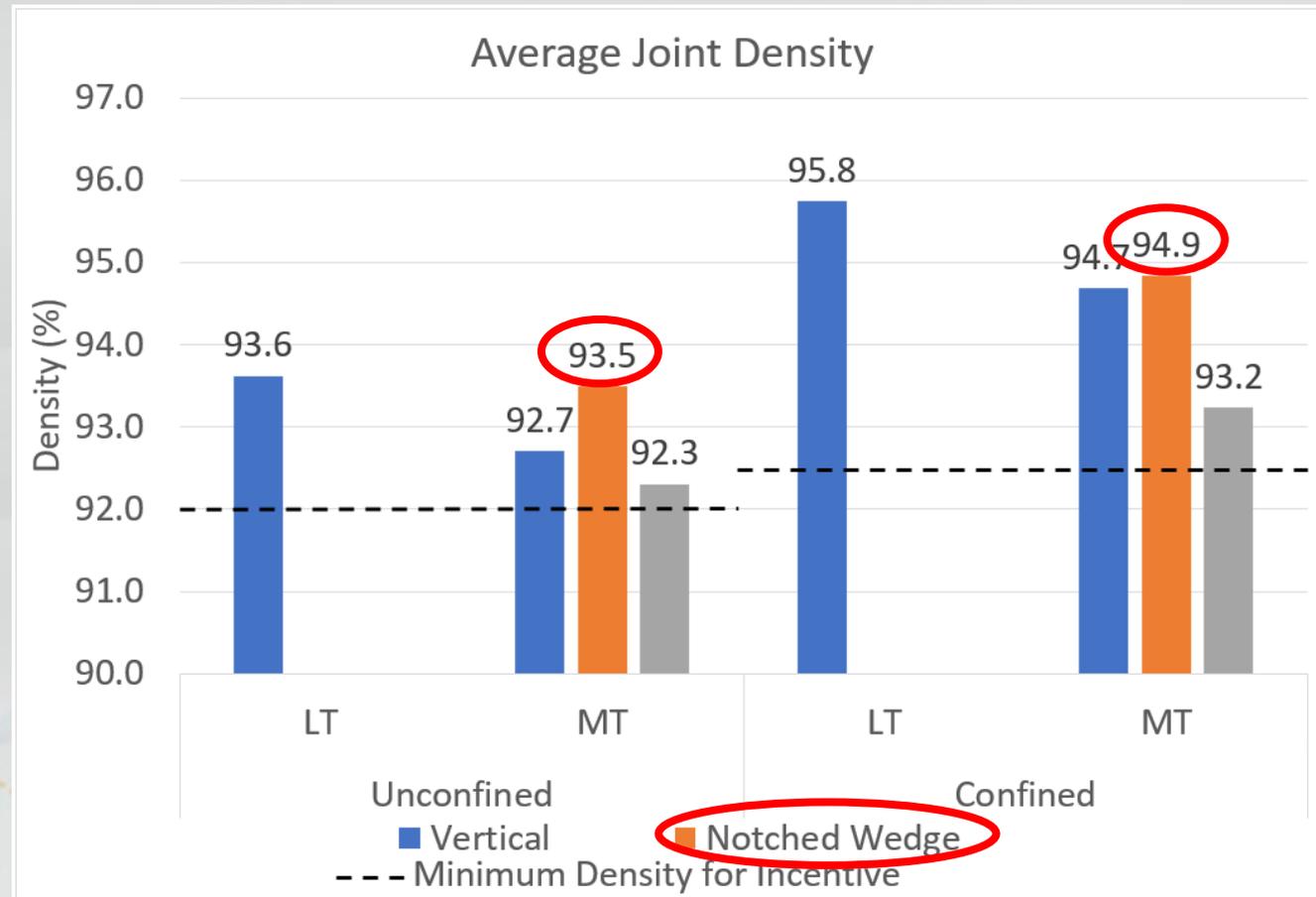
- 7 projects
 - 2 LT projects
 - 5 MT projects
 - Over 1.1 million feet (211 miles) of longitudinal joint tested



2018 Longitudinal Joint Density SPV Project Results (con't)

- Notched Wedge

- Improved confined and unconfined densities
- Increased safety for traveling public



2019 Longitudinal Joint Density SPV Projects

- 11 projects
 - 2 LT projects
 - 6 MT projects
 - 3 HT projects

SW	SE	NE	NC	NW
USH 018	IH 41	STH 042	STH 153	USH 063
USH 012		USH 010		
STH 082		USH 151		
IH 90		STH 021		

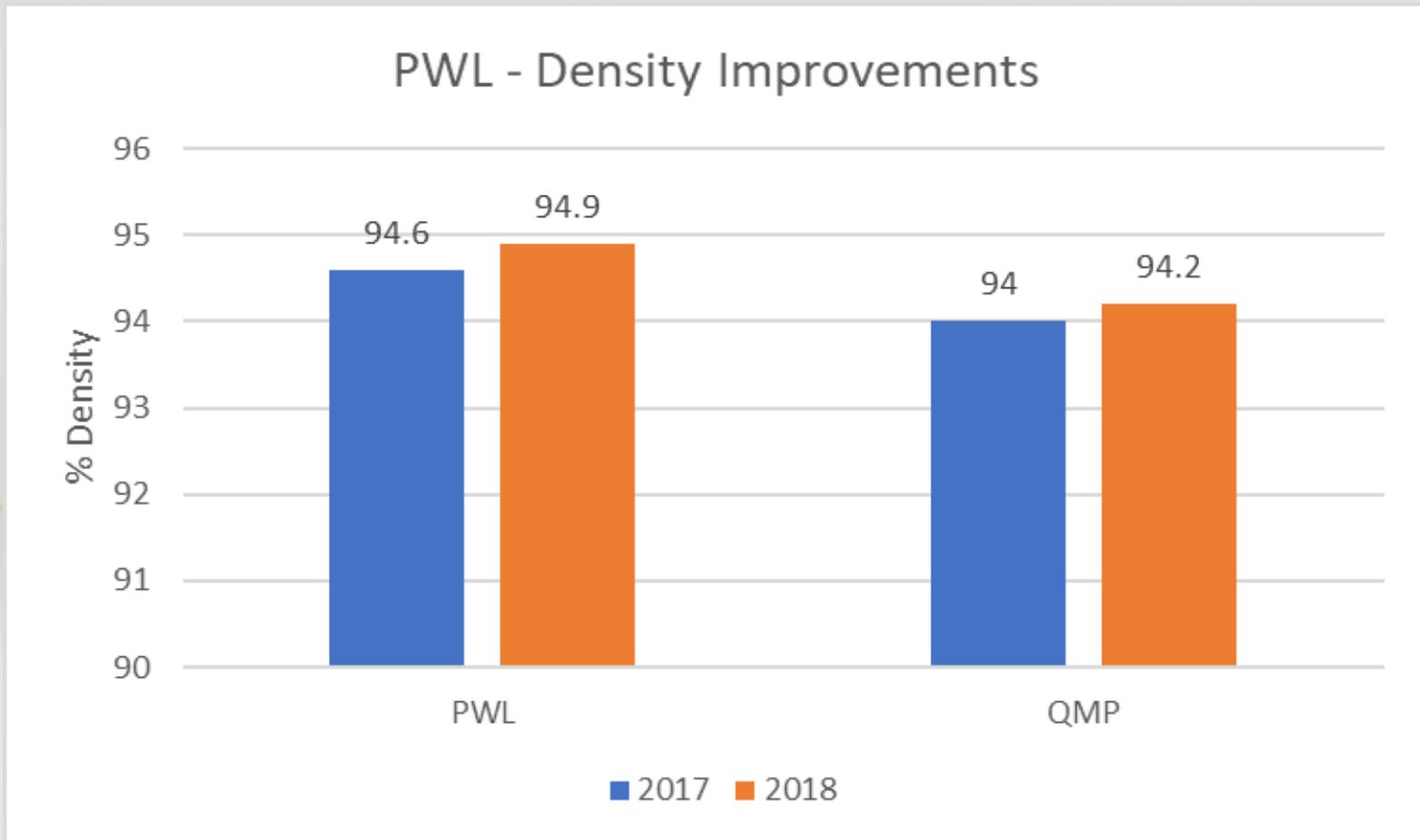
PWL - Percent Within Limits

	2016	2017	2018	2019
Number of PWL Contracts	3	19	25	35
Tons	91,000	811,000	701,000	1,422,500 <i>~55% of program</i>

PWL – Program Improvements

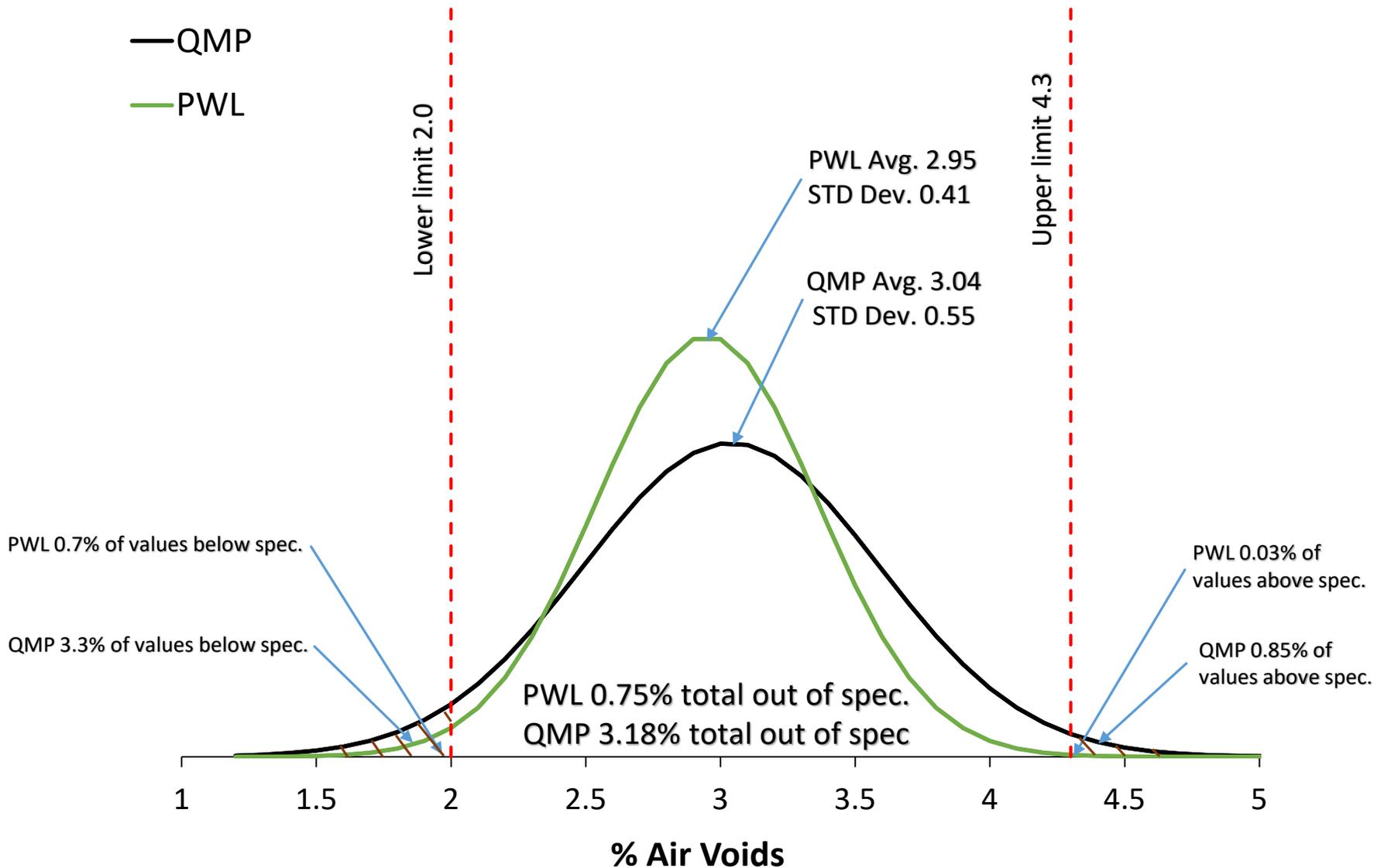
		Density		Air Voids	
		2017	2018	2017	2018
PWL	Mean	94.6	94.9	3.0	3.0
	SD	1.1	1.1	0.5	0.4
QMP	Mean	94.0	94.2	3.1	3.0
	SD	1.5	1.2	0.5	0.6

PWL – Density Improvements



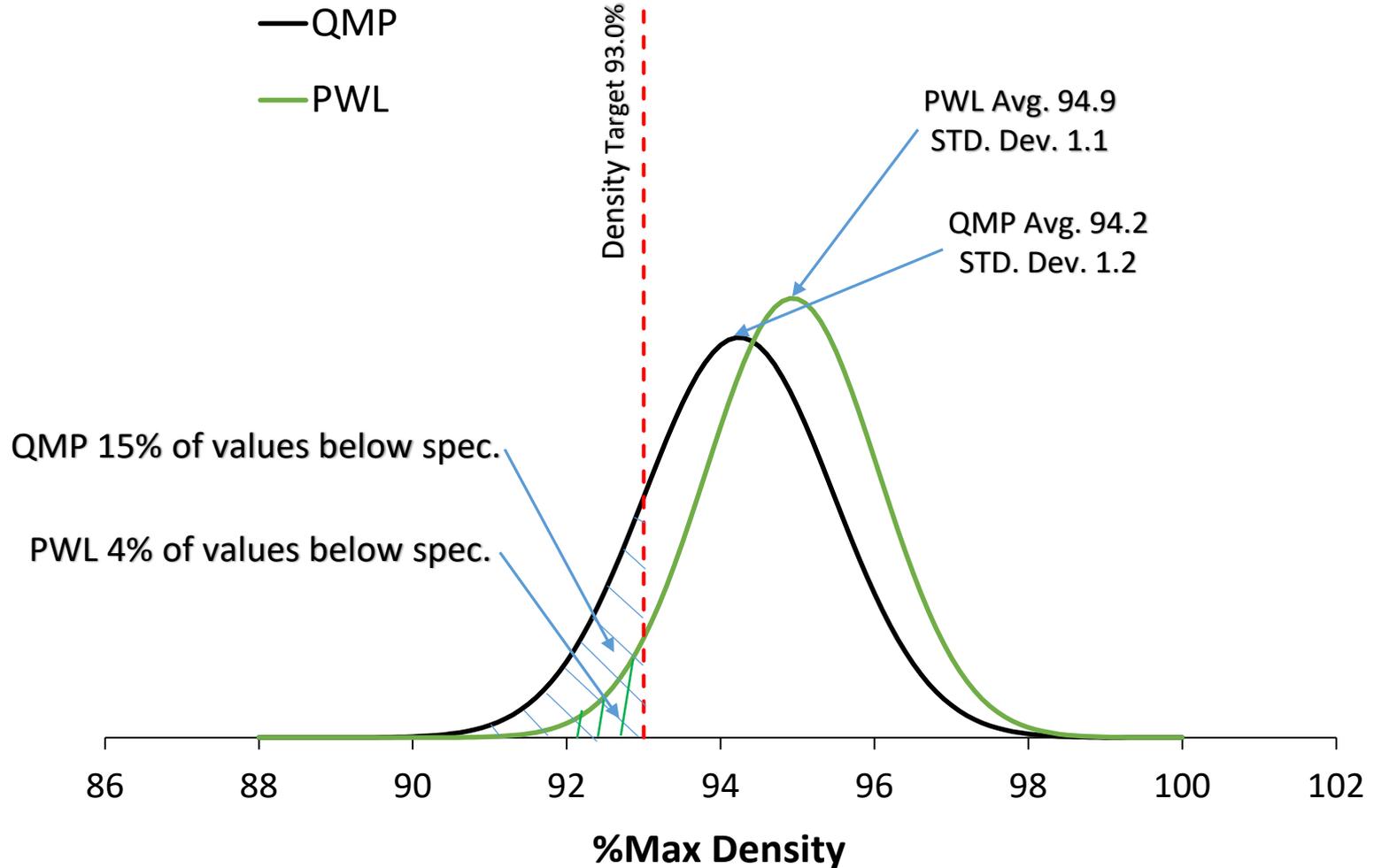
PWL vs QMP

2018 Air Void Data

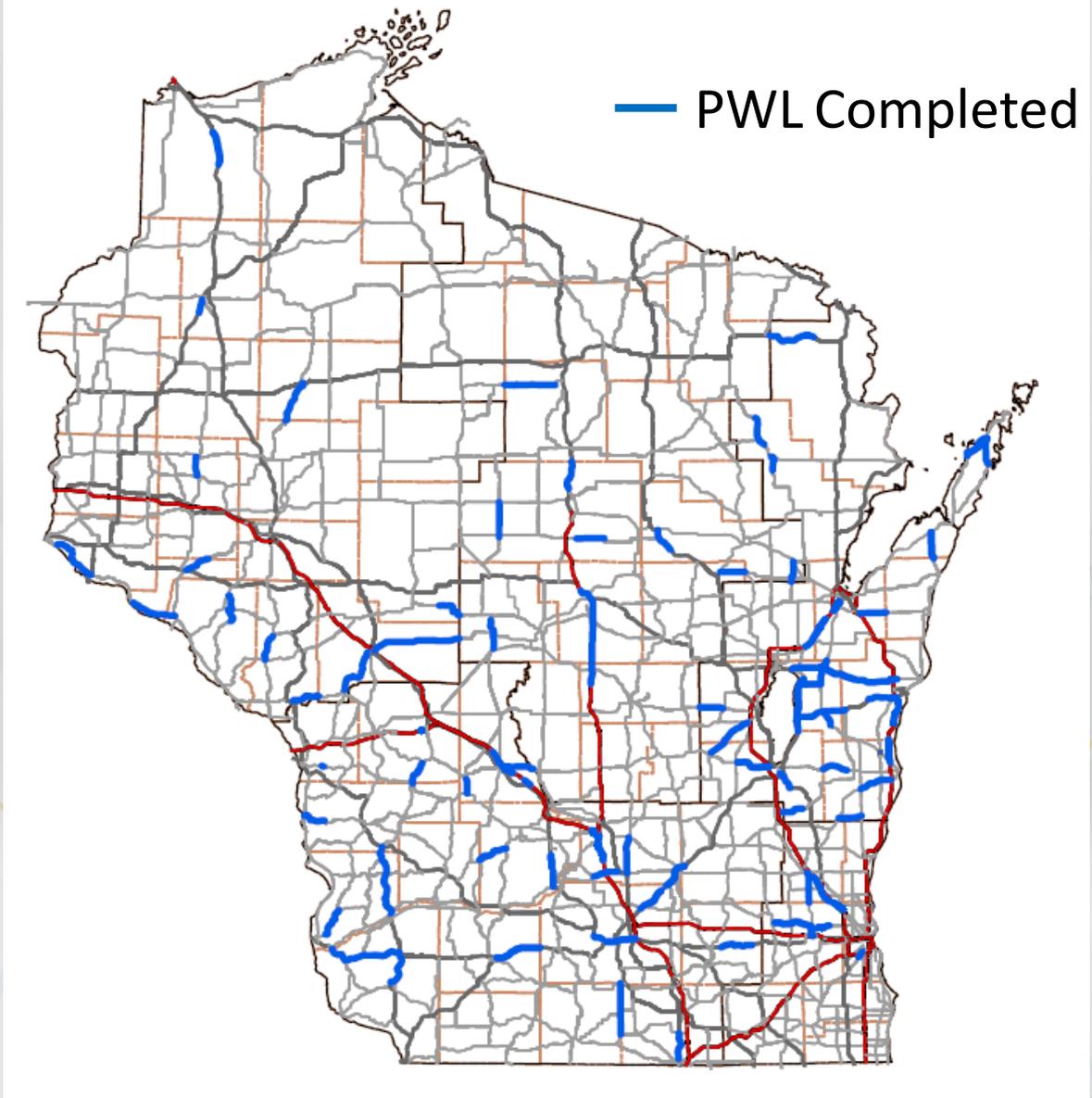


PWL vs QMP

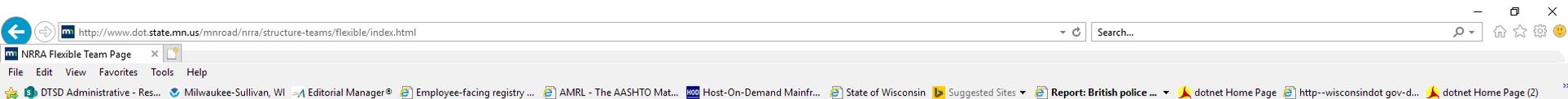
2018 Density Data



2016 – 2019 PWL Projects Completed



NRRA – Flex Team – dot.state.mn.us/mnroad/nrra/



Road Research

- MnROAD Home
- NRRA
- NCAT Partnership
- Research Topics
- Search Reports
- Contacts

Flexible Team

The flexible team is comprised of technical experts in the area of new and rehabilitation of asphalt roadways. Activities include prioritization of short and long term research, development of long term research test sections at MnROAD and providing input to the technology transfer team on what should be marketed.

Team Meetings

Team meetings happen the **first Wednesday of every month, 10-11 a.m.** (unless the chair reschedules). The link below will work for all the meetings, even if they are rescheduled.

[Join online meeting](#)

There is no conference call bridge for these meetings. Please use the audio and microphone through your computer. If that doesn't work, please access the meeting through the smartphone app.

Quick Links

- [Our Partners](#)
- [Structure and Teams](#)
- [Meetings](#)
- [Newsletter](#)
- [Research Pays Off](#)
- [Join NRRA](#)
- [NRRA Pavement Workshop](#)

NRRA Flexible Team Efforts

2017 Synthesis

- [Longitudinal Joint Construction Performance](#) - Complete
- [Tack Coats](#) - Complete

2017 Projects

- [Developing Best Practices for Rehabilitation of Concrete with Hot Mix Asphalt \(HMA\) Overlays related to Density and Reflective Cracking](#)
- [Cold Central Plant Recycling \(CCPR\)](#)

2019 Synthesis

- [Mix Rejuvenator Synthesis \(Phase I\)](#)

2019 Projects

- [Mix Rejuvenator Test Sections \(Phase II\)](#)
- [An Innovative Practical Approach to Assessing Bitumen Compatibility as a Means of Material Specification](#)

HMA Performance Testing (doc)

Members

- [Member List](#)
- [Email the team](#)

General Questions

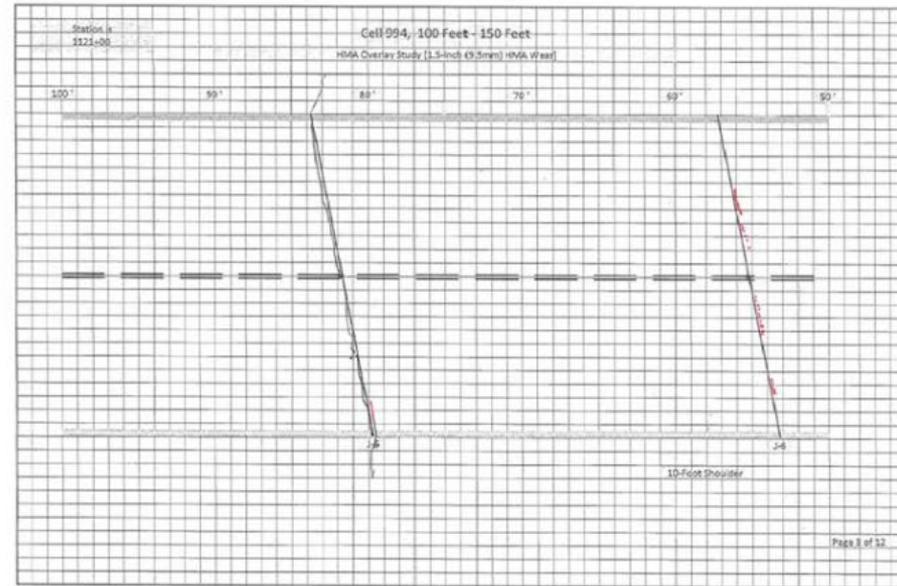
Daniel Oesch - Chair
Missouri DOT
daniel.oesch@modot.mo.gov

Team Pages

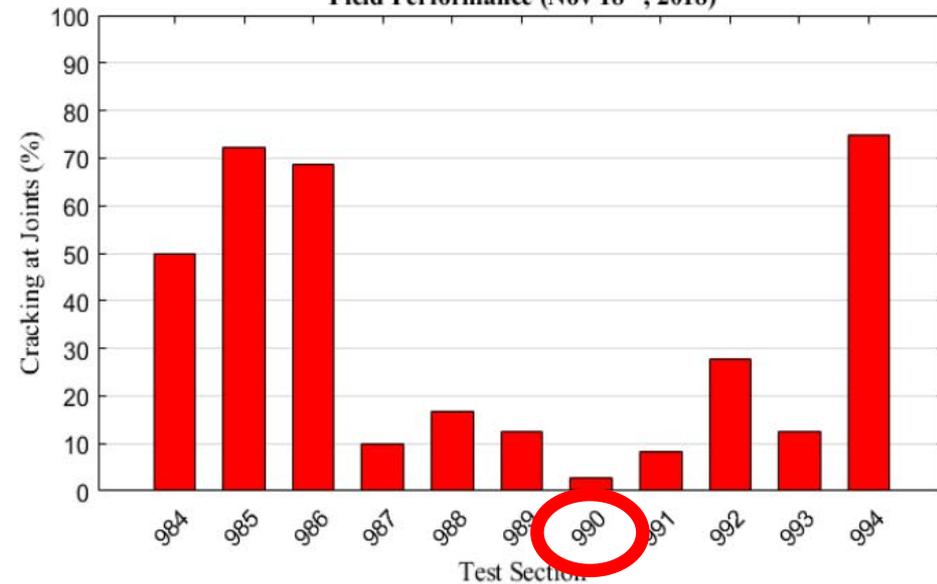
- [Executive Committee](#)
- [Flexible](#)
- [Rigid](#)

Field Performance – Distress Survey Data

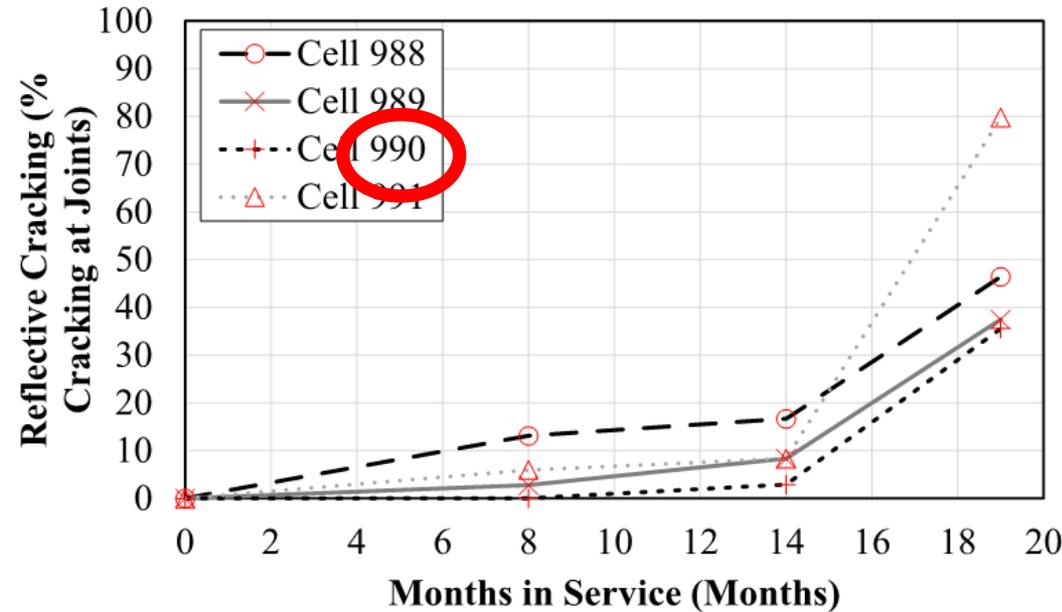
- Convert distress survey maps to digitized reflective cracking data (**percent cracking at joints**)
- After 1 year of placement, cells with **less than 10% cracking at joints** include:
 - **Cell 990** (1.5", 9.5 mm (3% AV) and 2.25" HMA, 19mm)
 - **Cell 991** (1.75", 9.5 mm (AASHTO M323 #8) and 2.25" HMA, 19mm)
 - **Cell 987** (1.5" HMA, 9.5 mm and 2.5" HMA, 19mm)



Field Performance (Nov 18th, 2018)



Field Performance



Cell 988: 12.5 mm (SPWEB440E)

Cell 989: Superpave5 (SPWEB450E)

Cell 990: 3% Air Void (SPWEB430E)

Cell 991: 9.5 mm (SPWEA440E)

Cell (#)	May-18		Nov-18		Apr-19	
	Reflective Cracking (%)	Rank (#)	Reflective Cracking (%)	Rank (#)	Reflective Cracking (%)	Rank (#)
988	13.10	4	16.67	4	46.43	3
989	2.78	2	8.33	2	37.50	2
990	0.00	1	2.88	1	35.58	1
991	5.95	3	8.33	2	79.76	4

Important to continuously monitor field sections to evaluate short and long term performance.



WHRP

Topic	ID	Status
Tack Coat	0092-17-06	Complete
Moisture Sensitivity	0092-18-06	Final review
In-service Performance	0092-18-05	Final review
Rubber Asphalt	0092-19-05	Ongoing
Recycled Binder	0092-19-04	Ongoing
Balanced Mixture Design	00092-20-04	Recently started
AASHTOWare ME Inputs	0092-20-03	Recently started

Questions?