Improving HMA Committee, MS Teams – April 28, 2022
Meeting Minutes

Present	Name	Company	Present	Name	Company	Present	Name	Company
	Anderson, Taj	Poe	X	Dempsey, Bill	Lakeside	X	Pederson, Chris	CTL
X	Anderson, Cooper	Am. Rock	X	Fishel, Greg	Miles		Phillips, Scott	WSDOT
X	Beier, Spencer	WSDOT	X	Gent, Dave	WAPA		Terrill, Keith	Road Science
	Bell, Dave	Lakeside		Griffith, Brad	Miles	X	Kull, Spencer	CalPortland
	Benson, Ed	Interstate C&A	X	Hill, Kentin	Granite	X	Raynes, Bob	Cadman
X	Cantrell, Logan	Granite	X	Huang, Shin-Che	FHWA	X	Schofield, Kim	WSDOT
X	Carlie, Karen	WSDOT	X	Joy, Justin	Idaho Asphalt		Schultz, Brett	Miles
X	Chapman, Josh	Granite	X	Johnson, Torrey	Tucci & Sons	X	Waligorski, Kevin	WSDOT
	Clayton, E. J.	Granite		Keeth, Jon	WSDOT		Webster, Garrett	WSDOT
X	Crouse, Jeff	Lakeside		Malley, Stuart	CRH	X	Williams, Kurt	WSDOT
X	Davis, Steve	WSDOT		Mathis, Gerome	Inland Asphalt	X	Winger, Leon	WSDOT
						X	Zemke, Erik	Shamrock

OLD BUSINESS Roll call/Introductions: Spencer Beier is replacing Chris Damitio on the team.

17-02 How can we cost-effectively increase the service life of HMA Pavements?

HMA Changes From WAPA and WSDOT, Updated June 8, 2020
Relating to Mix Design Approval, Field Acceptance of Mixture, and Field Acceptance of Compaction

Mix Design Approval

SPEC	REGARDING	CURRENT	2018	2019-2020	2021	2022
9-03.8(2)	⅜ VMA Lower Spec Limit	15.0%	no change	no change	15.0%	15.0%
	½ VMA Lower Spec Limit	14.0%	no change	no change	14.0%	14.0%
	¾ VMA Lower Spec Limit	13.0%	no change	no change	13.0%	13.0%
	1 VMA Lower Spec Limit	12.0%	no change	no change	12.0%	12.0%
9-03.8(7)	VMA Tolerance (⅜, ½, ¾, 1	-1.5%	-1.0%	-1.0%	-0.5%	-0.5%

Field Acceptance

SPEC	REGARDING	CURRENT	2018	2019-2020	2021	2022
9-03.8(2)	⅜ VMA Lower Spec Limit	15.0%	no change	no change	15.0%	15.0%
	½ VMA Lower Spec Limit	14.0%	no change	no change	14.0%	14.0%
	¾ VMA Lower Spec Limit	13.0%	no change	no change	13.0%	13.0%
	1 VMA Lower Spec Limit	12.0%	no change	no change	12.0%	12.0%
9-03.8(7)	VMA Tolerance	N/A	-1.5%	-1.0%	-0.5%	-0.5%
9-03.8(7)	No. 8 Tolerance			±4% *	±4%	* See Key Points
9-03.8(7)	No. 200 Tolerance			±2.0% *	±2.0%	* See Key Points
Revision to FOP for T166	Gmb wait time		15 hours	15 hours	Follow AASHTO	Follow AASHTO

HMA Changes From WAPA and WSDOT, Updated May 19, 2020

SPEC	REGARDING	CURRENT	2018	2019-2020	2021	2022
5-04.3(9)B5	Factor "f" for statistical evaluation (of VMA)	N/A	2	2	10	10
9-03.8(7)	JMF Binder Tolerance	-0.5% to +0.5%	-0.4% to +0.5%	-0.4% to +0.5%	-0.4% to +0.5%	-0.4% to +0.5%
5-04.3(10)C3	HMA compaction Lower Spec Limit - disincentive	91.0	91.0	91.5	92.0	92.0
5-04.3(10)C3	HMA compaction Lower Spec Limit - incentive	91.0	91.5	92.0	92.0	92.0
5-04.3(10)C3	Factor in Compaction Price Adjustment equation - disincentive	0.40	0.40	0.60	0.40	0.40
5-04.3(10)C3	Price Adjustment Equation - incentive	0.40	0.80	1.00	1.00	1.00
Key Points:						
Agree to keep 4% tolerance on #8 but allow to go beyond control point during production - * Evaluate for 2022						
Agree to keep 2% tolerance on #200 but allow Upper Spec limit to go from 7% to 8% during production.* Evaluate for 2022						
No. 8 and No. 200 production tolerances will be implemented via GSP for 2021 and evaluated to determine next steps						
Develop an optional system to obtain WSDOT Gsb prior to mix design submittal (added fee), will compare results to mix design test results for precision and bias (d2s) for T 84 and T 85.						

- November 5, 2020: *Note the items under the Key Points have been incorporated by a GSP for 2021. Dave Gent - How do we finalize the optional system to obtain WSDOT Gsb prior to mix design submittal so it is broadcast and operational as soon as possible?
- April 29, 2021: Working on a process to incorporate into QC8 to add preliminary Gsb testing. Joe DeVol update. The pre-Gsb for use in mix designs is not going to be feasible as originally anticipated. Looking at options to address concerns other ways. Possibilities include: Informational Pre-Gsb, Running Averages, Submit and store aggregates during development of Mix Design, accepting contractor testing if by certified testers. A sub-group will discuss this issue and recommend how to proceed. QC8 revision will be released without the Pre-Gsb process incorporated for now.
- October 28, 2021: For 2022 we are matching the 2021 spec's including the expanded tolerances for the #8 and #200 as allowed by GSP. We will not be able to implement the Pre-Gsb testing during mix design submittal.
- April 28, 2022: No significant changes anticipated for 2023 book. Analyzing data from '21 season now. Continuing to see significant improvements in compaction (see attachments). Mixture data still under review in the Materials office.

14-16 Concerns with SAM

- October 31, 2019 – Dave Gent,
  - October Construction Manual update: Dyer
    - Prepave meeting – discuss process of notifying mixture and compaction results
    - Prepave meeting – timely results needed to keep track of CPF

        - Inspector roles and responsibilities – OK to provide unofficial results at time of testing
    - Data on timeliness of data entry: Kurt Williams
- June 9, 2020 - The lab has pulled data from SAM regarding the time to post test data in SAM and has shared the data with the regions. In general the turnaround times are good for compaction and mix. Mineral Aggregate tests tend to lag behind. Contractors should contact the Project Office if this issue continues.
- November 5, 2020: We did have instances of untimely SAM data entry this season primarily tracked to one area. While this doesn't appear to be a systemic issue it does warrant continued effort. WSDOT is proposing pull SAM data entry reports annually and submit to region management.
    - Granite pointed out some project hey had issues with Timely SAM Data entry, Timely Challenges, Timely Min Agg data entry, and accuracy of Challenges.
        - Requesting time limit for Min Agg, and Min Agg samples run per mix design and not combined together (is this a new topic?).
    - Dave Schofield noted need to check accuracy of data entry and calculations and communication.
- April 29, 2021 – Kurt Williams pulled the SAM entry data and is being reported to the region construction engineers. Continues to be a focus and was discussed at the WAPA Joint training and Construction Engineer meetings. COVID telework certainly didn't help the issue, will continue to monitor. Contractors brought up question about testers double checking data prior to entering into the system. Always a best practice to double check not only data entry, but also that SAM is using the correct spec version.
- October 28, 2021 – This is an ongoing issue and will continue to be with staffing shortages and turnover. WSDOT will continue to pull SAM data entry data annually and provide to the regions and timely and accurate data entry will continue to be reinforced during trainings. Inconsistencies with compaction sublot sizes was pointed out. Should we consider adding language allowing irregular areas (intersections, turn lanes, etc.) not completed during the main paving operation to be broken out into a separate lot with varying sublot sizes?
- April 28, 2022 – SAM data discussed at WAPA/WSDOT Joint Training held 3/3/2022. Team brought up looking at adding a maximum timeframe for SAM Data? (example - can't get below 1.0 if not entered into SAM within 7 days?) including min. agg. Also mentioned to CN manual language emphasizing timely and accurate data entry. (This is already covered in the CM chapter 5-04.1, 5-04.2, 5-04.3(9)B3, and 5-04.3(10)C, reference note from 10/31/19). Original test data on retests? The original test data is accessible if the contractor requests. Test data entry is being added to WAQTC tester certification training.

17-03 Trackless tack/HP Tack

- October 31, 2019 – Dave Gent mentioned that there is a national "best practices" effort underway at the National Asphalt Pavement Association that may inform the group on possible spec. updates once it is published. There are no specification changes proposed at this time noting that in May 9, 2019 meeting NanoTac (a trackless tack additive) would be considered for use on WSDOT projects if proposed by the Contractor.
- June 9, 2020 - Steve Davis noted WSDOT is interested in pursuing trackless tack as an experimental feature should there be interest.
  Dave Gent clarified that WAPA is interested in using trackless tack as a tool but is not on the top of WAPA's priority list. National efforts for best tack practices are underway.
- November 5, 2020 - WSDOT is open to experiment if a contractor submits a proposal. It was noted that FHWA has removed their proprietary item requirements, this still requires approval but proprietary item justification now lies in Region approval, thus could be possible to set up a proprietary tack for trial.

Suggestion to assemble a sub-group between WAPA/WSDOT and Suppliers. Dave Gent to reach out to suppliers to gauge interest.

- April 29, 2021: Any interest in a tack trial? Any movement on a tack subgroup? Presentation given at WSDOT/ WAPA Joint Training by Andy Clayton of Blue Line Transportation – Oregon allows High Performance Tack Coat (HPTC) when requested. Andy said WSDOT has a "non-QPL" form that allows HPTC – WSDOT to clarify(?). This may be an item WSDOT has to drive by adding it to a job. Open to trial project.
- October 28, 2021 – Nothing new to report: Kim would like to do a trial project.
  April 28, 2022 – Update – Any interest in a trial from industry?

19-01 Challenge Testing Uncompacted Void Test Results

- October 31, 2019 –We reviewed the data for almost 5 years of test data on Uncompacted Voids and Sand Equivalent. The failure rate is very low, less than 2% for uncompacted voids, and less than 0.5% for SE and Fracture; however, the impacts of the penalty for failing tests can be high. Another issue noted that Min Agg testing is done later than mix testing as well as the delay in posting data in SAM. Kurt to review data and possibility of allowing challenges/retests as well as review the time to post the information into SAM.
- June 9, 2020 - Round robin testing among WSDOT testers planned. COVID-19 setback this effort. Hope to move forward either this fall 2020 or spring 2021. Known samples will be sent to qualified testers across WSDOT Regions.
- November 5, 2020 – Planning to perform the round robin testing this winter/spring. WAPA has suggested eliminating this test. WSDOT remains solid in its stance that it is a required test following the AASHTO guidelines although has reduced the AASHTO recommended tolerance. Following up on the repeatability question with the round robin testing. Cadman pointed out that under 3-04 there is no opportunity to challenge or retest a failing sample and requested looking into adding this ability to address potential errors. WAPA would like to see a fair, fast test where the potential penalties reflect the potential mix issues.
- April 29, 2021: Update on round robin testing. Joe DeVol Kurt Williams is reviewing all of the aggregate testing statistical acceptance.
- October 28, 2021: Were we able to get the round robin testing completed? See attached 19-01b for Round Robin Testing Data and 19-01a for Min Agg Sam Data Analysis. Question remains regarding Retests/Challenges. Kurt noted in meeting with FHWA they do not support the retest option. Question was raised about graduating the penalty – UV is currently part of the Min Agg testing along with SE and Fracture equally, and is already statistically accepted. Thus acceptance down to 0.75 pay factor. Question was raised about relevancy of the test and ability to use Hamburg instead. Kurt noted Hamburg not set up as an acceptance test. Question raised about other agencies, see Attach 19-01c for comparison.
- April 28, 2022 – Kurt noted that a challenge or retest option is not supported per the notes above. Dave Gent requested this remain an agenda item for now. Keep as a line item but hide notes for future, reference 4/28/22 minutes for lates notes.

19-09 Is WSDOT cooling the pavement adequately before taking cores?

- October 31, 2019 - Dave Gent – Is a change to the coring test procedure needed to address this? A couple of ideas that came up included modifying SOP 734 to require the use of ice if coring the same day, or maybe require the contractor to acquire the cores. Bob and Kurt will review with regions.

- June 9, 2020 - Procedure discussed with Region IAI's. Appears to be more related to education than a problem with the test procedure. This has been addressed and WAPA has been asked to bring problems forward if they occur.
- November 5, 2020 – This issue was brought up on at least one occasion this year. Should the responsibility for taking cores be transferred to the Contractor? Dave Gent to review the idea of contractor coring with other WAPA members, Joe DeVol/Kurt Williams to review idea with Region Materials Engineers.
- April 29, 2021: Update on cores. Joe DeVol - There's a push for contractor provided coring but some resistance in areas of WSDOT. Leon brought up a scenario were the contractor releases the mat for coring, and the contractor takes care of the icing if they feel it's needed.
- October 28, 2021 – WSDOT is resistant to modifying coring test procedures. There are standard items for contractor coring of bridges and roadway in the specifications that can be included in contracts or change ordered in if requested and accepted.
- April 28, 2022 – Coring multiple lift paving too early. Issue potential on fish passage work particularly. (Possibility - Require waiting 24 hours minimum to core multi-lift paving?) Random sampling concern – coring multiple lifts at same time. What challenges are we having out in the field?

19-16 Recycled Materials Toxicity Testing – RAP/RAS – New Spec Joe/Steve

- October 31, 2019 – Kurt Williams and Joe DeVol – Discussion on FHWA Audit of Standard Spec 9-03.21 and changes in state law regarding asbestos (as it relates to RAS). Discussion, will be updating Std Spec Section 9-03.21(1) to require toxicity testing data for Asbestos as well as providing documentation on the source of the RAP used on the project.
- June 9, 2020 - Goes back to Section 1-06, 9-03.21. Toxicity testing for RAP/RAS requirements needs more certification for non-DOT sources. Recent WSDOT audit has triggered increased requirements for mix design and production of HMA. While the current specifications allow WSDOT to request certifications, the updated Standard Specifications effective 2021 will further clarify the need to provide a certification on materials source. The certification will be needed up front for mix designs coming through the door and no later than 90 days before HMA placement. WAPA asked WSDOT to discuss production concerns as discussions move forward.
- November 5, 2020 – Initial spec updates have been made. Continuing to review requirements with environmental to ensure WAC requirements are being met. WAPA has concerns with the need for this particularly for RAP, also noting the 90 day requirement could impact paving schedules. Joe noted he is still working with the Environmental group to nail down the requirements and that changes may be coming.
- April 29, 2021: Update on toxicity testing certification. Joe or Kurt. The initial issues have been handled however the topic is still evolving. This item will be collapsed and left on the agenda as a check in to see if anything new comes up.
- October 28, 2021 – Nothing new on this item. Monitoring – Dave Gent observation: It would be great to start a simple data base list the documents that there is no toxicity documented in this process (or, if there is a toxic of some ilk found, what is it for info. to the group). A recent development since our meeting, a RAS mix sample was tested and found to have asbestos in it. Use of RAS mixes have been put on hold.
- April 28, 2022 – Update on the new GSP & QC 8 RAS requirements associated with Asbestos.

21-03 RAP Reset Update

- April 29, 2021 - Joe DeVol: Data will be sent out as soon as it's finalized. This may lead to new spec changes…Stay tuned.

- October 28, 2021 – Steve Davis to provide update. Steve Davis to set up a presentation with Adam Hand to go over RAP Reset study. Discuss potential changes resulting from this study at the next meeting.
- April 28, 2022 – Adam Hand presented findings at meeting on 4/7/2022 ( ), how will this information be used moving forward? Look into getting a new RAP Reset subcommittee together. (Higher RAP, RAP Reset modifications, Green HMA)

21-04 Tack Lab Test Failure Uptick

- October 28, 2021 – Steve Davis to provide update on an increasing number of Tack samples failing. Failed tests went from 3% in 2020 to over 18% in 2021 (7 of 38 failed). These are contractor provided samples out of the spray bars that appear to be contaminated samples rather than issues with the emulsion. How do we reign this issue in?
- April 28, 2022 – Failed Tack discussed at WAPA/WSDOT Joint Training held 3/3/2022. Review for 2022.

21-05 Alternative Compaction Testing Methods

- October 28, 2021 – A question has been raised concerning different density testing methods such as electro-magnetic, Rolling Density Meter. A question also raised about using Method A in AASHTO T355. There are reliability concerns with the electro-magnetic test and the T355 Method A test so those are not going to be used. Kim would like to pilot RDM for bridge compaction as a possible alternative to bridge deck coring. Kim has applied for a State Transportation Innovation Council (STIC) grant.
- April 28, 2022 – Update on STIC grant for RDM on bridge decks. Have a list of projects, will be coordinating testing with the paving schedules. Update results in the fall meeting. Calibrating RDM with gyratory pucks and compare with cores.

21-06 Indirect Tensile Strength Requirement

- October 28, 2021 – Request by Kentin to eliminate IDT until IdealCT implemented. Has there been any failures from IDT? Steve Davis noted the IDT is a test run that is counter to the Hamburg to ensure the mix is not too stiff. Verification compared back to the design. Need to keep this test. A question was raised about increasing the spec when different binder grade mixes are tested.
- April 28, 2022 – Steve noted IDT test will remain in place while research is being performed by WSU to determine appropriate limits for IDEAL CT. Update aging process based on results, expected in about a year. For IDT Logan noted need different IDT number depending on binder grade.

New Items:

22-01 ASA & QPL Renewal Policy Suggestion

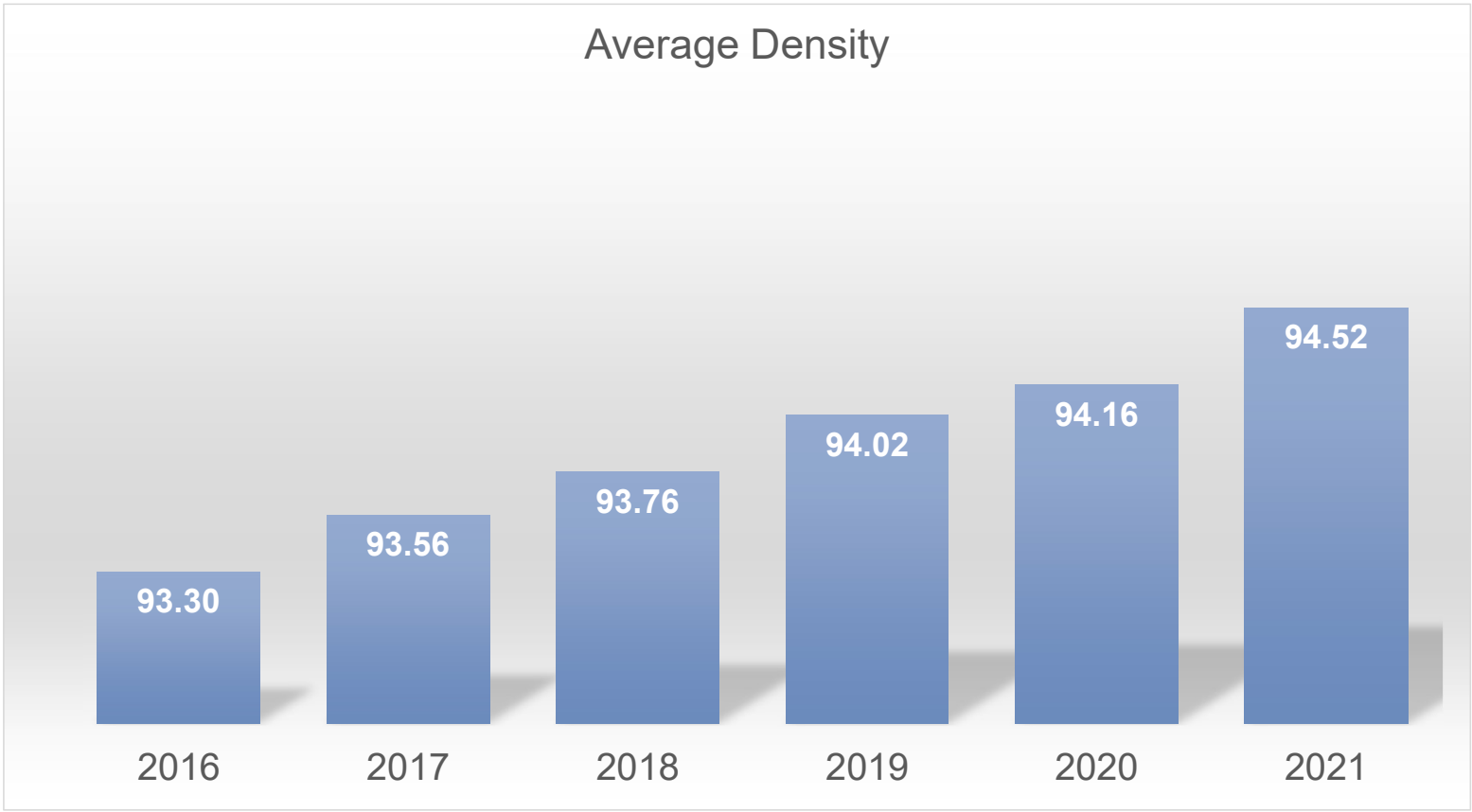
- April 28, 2022 – Discussion surrounding timelines for ASA and QPL approvals/renewals. 5-04.2(1) currently sets the timeline for inclusion on the QPL for a mix design as 24 months from date of initial approval. For renewals this tends to lead contractors to wait until expiration of the current design before pursuing renewal which can create issues. Suggestion would be to allow the contractor to begin renewal prior to expiration and setting the new period based on 24 months from the current expiration. Maybe tied to some timeline in advance of the expiration date, example would be if an approved mix design is reapproved within 60 or 90 days of expiration, the new expiration date will be 24 months from the current expiration date. This would encourage early submittal and may help with flexibility of the testing process.

SET DATE FOR NEXT MEETING –

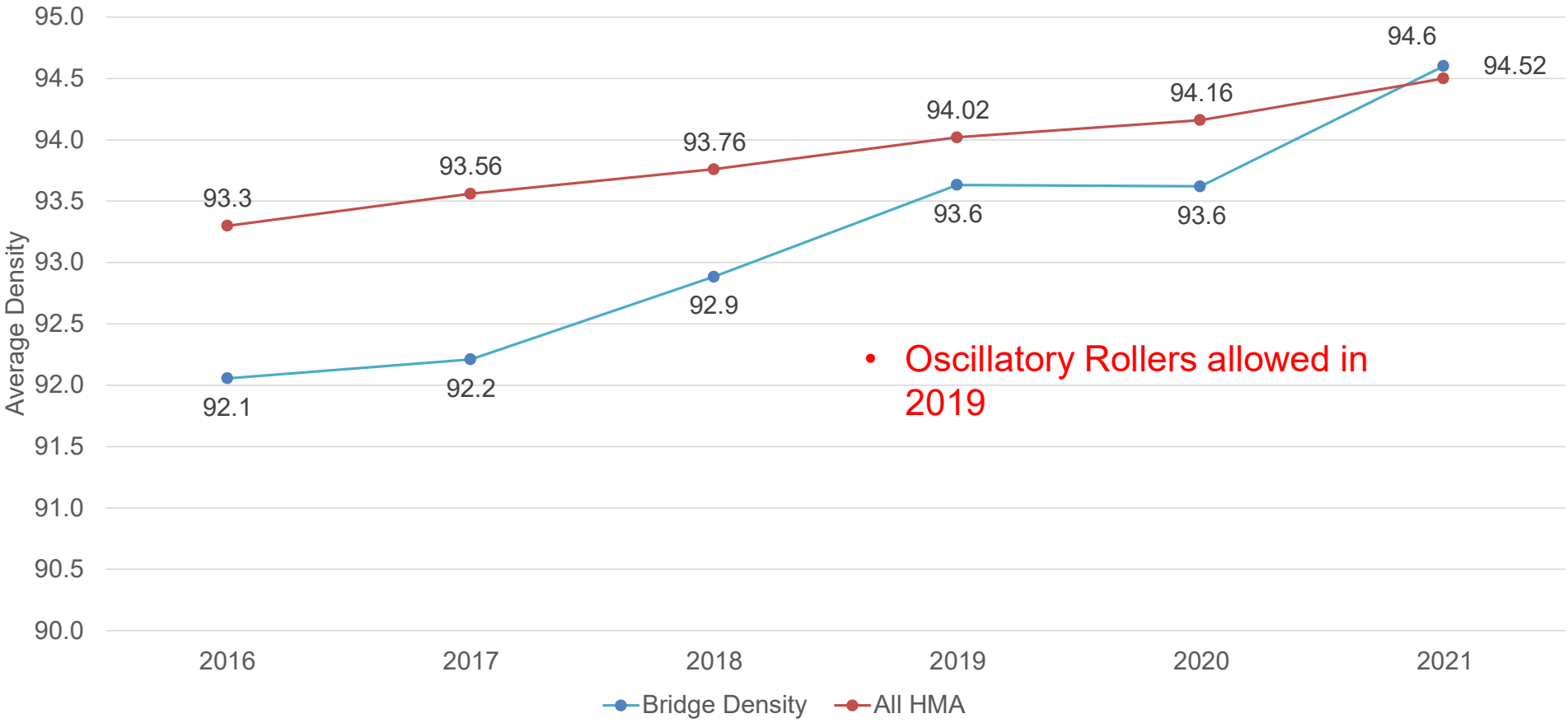
Date: November 3, 2022
Time: 9:00 – 12:00
Location: Virtual for now

HMA Compaction Improvements

Based on Paving Year with that years Compaction Specs



Bridge Compaction Improvements



RAP RESET – Responsibly Optimizing Recycled Materials Use in AC and Pavement Performance Life


Washington State Department of Transportation

Adam Hand
University of Nevada, Reno

RAP RESET – Responsibly Optimizing Recycled Materials Use in AC and Pavement Performance Life

Report Outline

1- Introduction

2- Literature Review

3- Experimental Plan

4- Material Characterization

5- Laboratory Results and Analysis

6- PMS Data Analysis

7- Statistical Analysis

8- Conclusions

9- Recommendations

Project Objective

- Review and enhance WSDOT AC materials selection, mix design, and standard specifications for optimized use of RAM, based on readily implementable technology, in collaboration with industry stakeholders for improved durability performance

1- Introduction

The use of recycled materials in asphalt mixtures has been occurring for 50 years due to its sustainable benefits.

What could Reduce AC Durability?

- Low RAP dose used without adjusting virgin binder grade?
- Use of RAS?
- High RAP dose used without appropriate virgin binder selection?
- High RAP doses used with asphalt binders susceptible to rapid aging?

Scope of Work

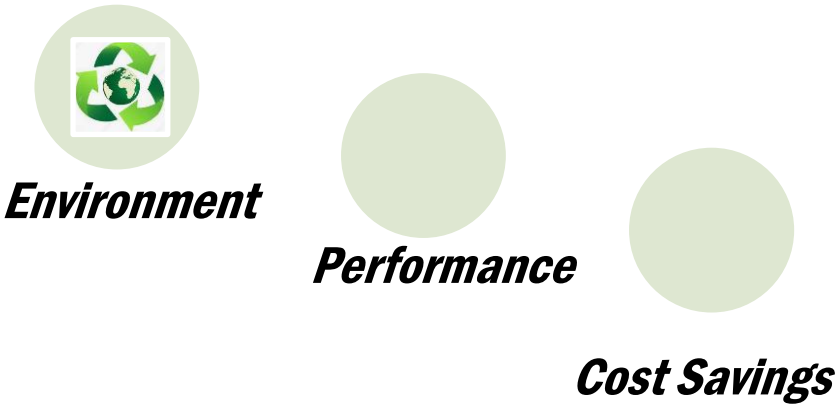
Enhance WSDOT AC materials selection, mix design, and standard specifications to responsibly **optimize the use of recycled materials**

NEVADA

WSDOT

Why Responsibly Use High RAP?

- Optimize
  - Use of Recycled Material
    - Environment: Conservation of Nature Resources, CO_{2e}
  - Cost
    - Initial and Life Cycle
  - Pavement Performance
    - Equal Pavement Performance



History of RAP Use:
2020 NAPA IS-138 Annual Survey: RAP, WMA, …

NATIONAL ASPHALT PAVEMENT ASSOCIATION

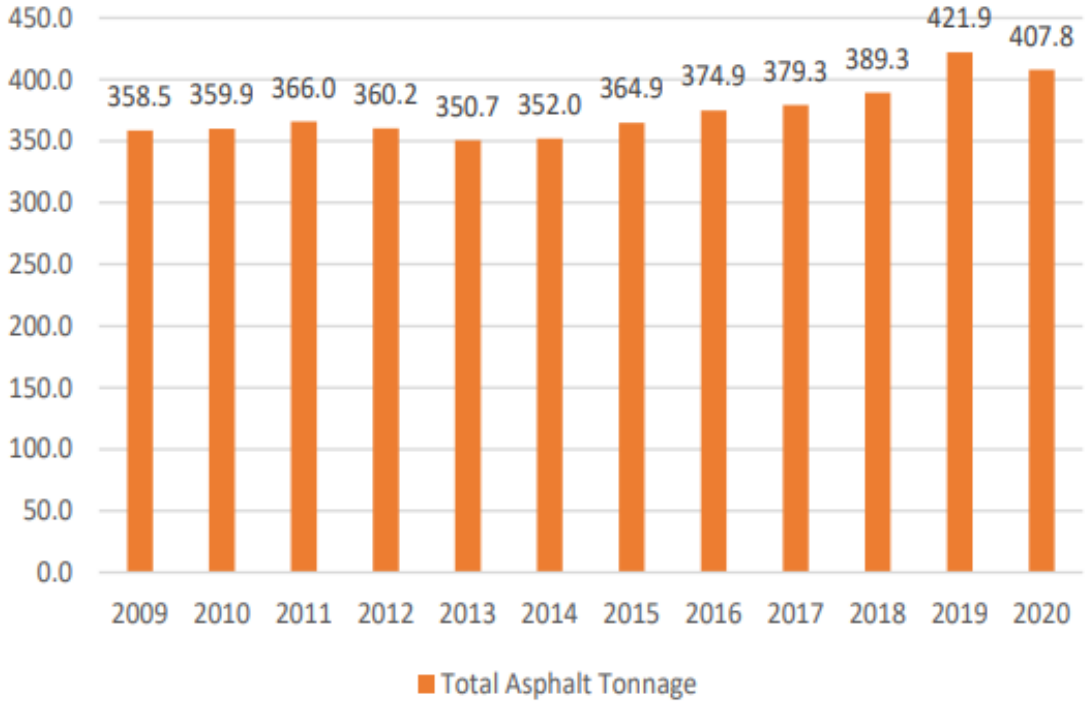
Asphalt Pavement Industry Survey on

Recycled Materials and Warm-Mix Asphalt Usage

2020

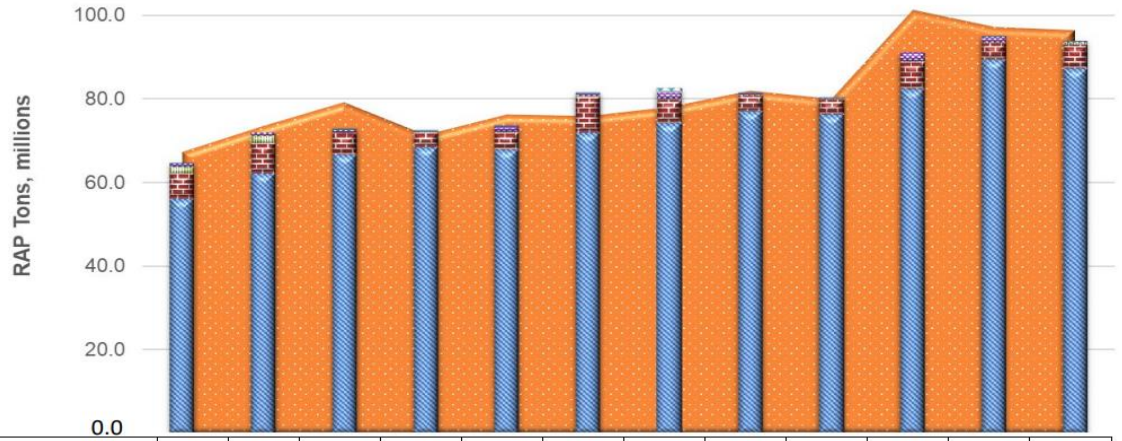
Information Series 138

https://www.asphaltpavement.org



2020 NAPA IS-138 Annual Survey - RAP

- Trends
- Most Recycled Material
- ≈93% of RAP put back in New Asphalt Mixture
- Saved (2020)
  - 4.4M tons of Asphalt (24M Barrels)
  - 82M tons of Aggregate
  - $2.9 Billion



RAP	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Accepted	67.2	73.5	79.1	71.3	76.1	75.8	78.0	81.8	79.9	101.1	97.0	96.3
Landfilled	0.1	0.0	0.3	0.2	0.1	0.2	1.0	0.1	0.0	0.0	0.1	0.2
Used in Other	0.7	0.8	0.7	0.2	1.5	0.6	1.6	0.4	0.2	2.0	1.4	0.3
Used in Cold Mix	1.5	1.6	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4
Used in Aggregate	6.2	7.3	4.9	3.6	4.0	8.5	5.5	3.7	3.4	6.4	3.8	5.8
Used in HMA/WMA	56.0	62.1	66.7	68.3	67.8	71.9	74.2	76.9	76.2	82.2	89.2	87.0

Figure 3: Comparison of Tons of RAP Accepted and Tons of RAP Used or Landfilled (Million Tons), 2009–2020

RAP by Sector & Percent

- Trends
- Predictable
- Steady @≈20%

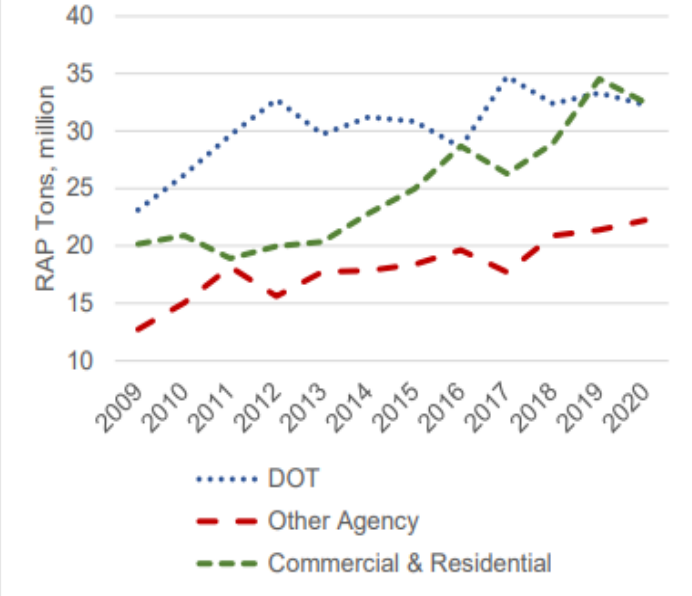


Figure 4: RAP Use by Sector (Million Tons)

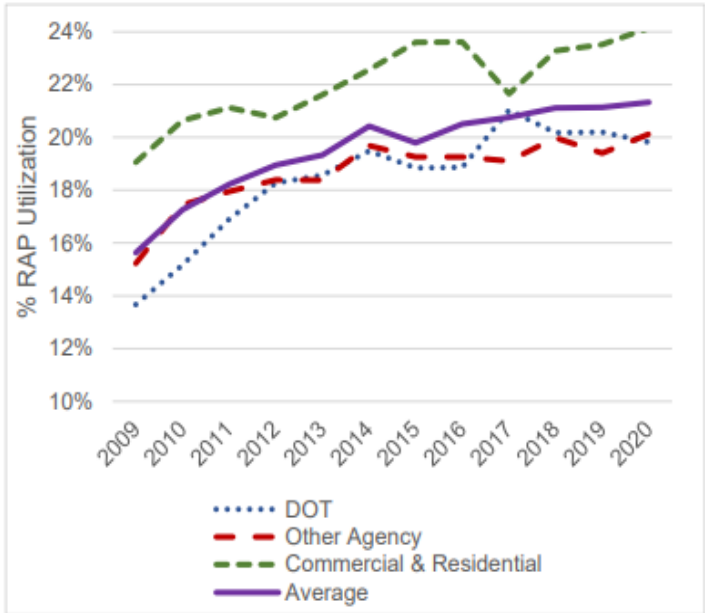


Figure 5: Average Percent RAP Used by Sector

State DOTs Average Percent RAP

- *Trends*
- 0-9% ⇩
- 10-14% ⇩
- 15-19% ⇳
- 20-29% ⇧
- ≥ 30% ⇧

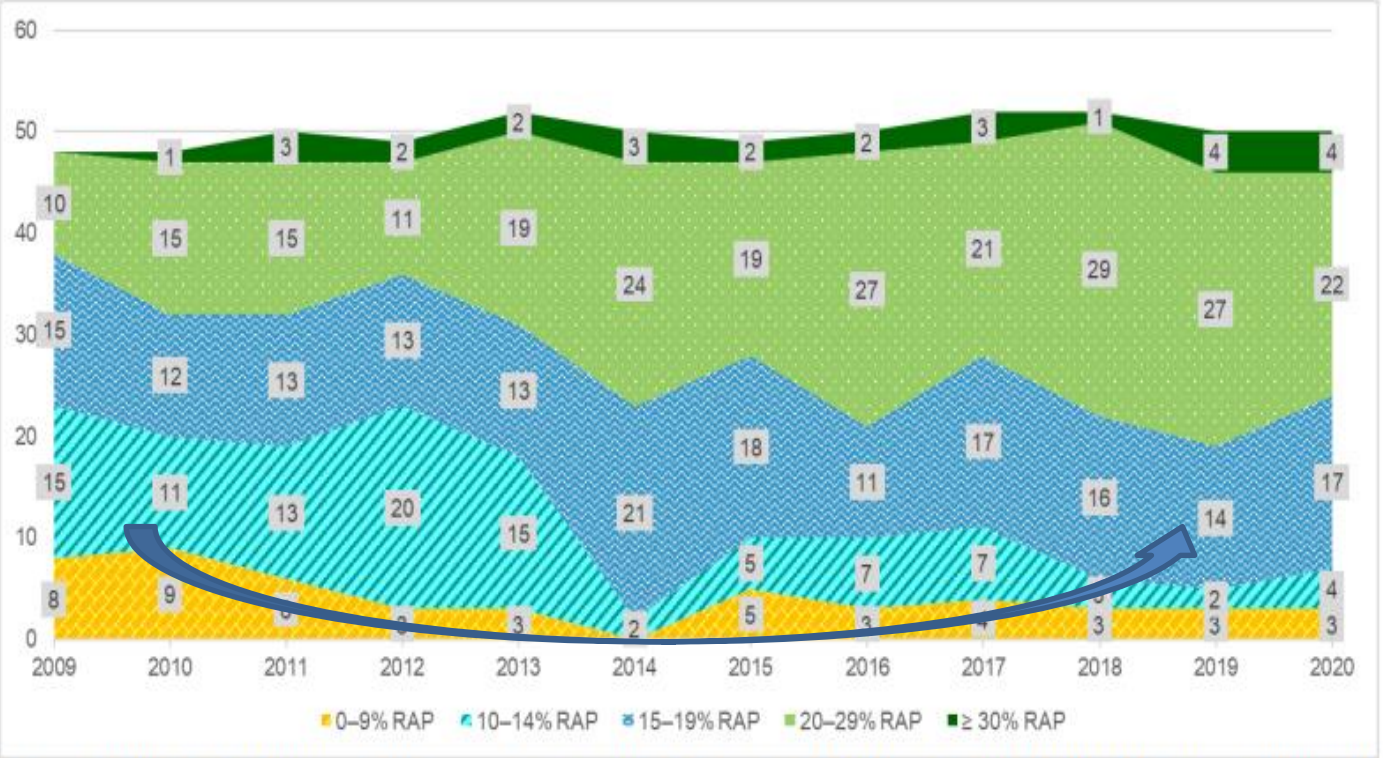
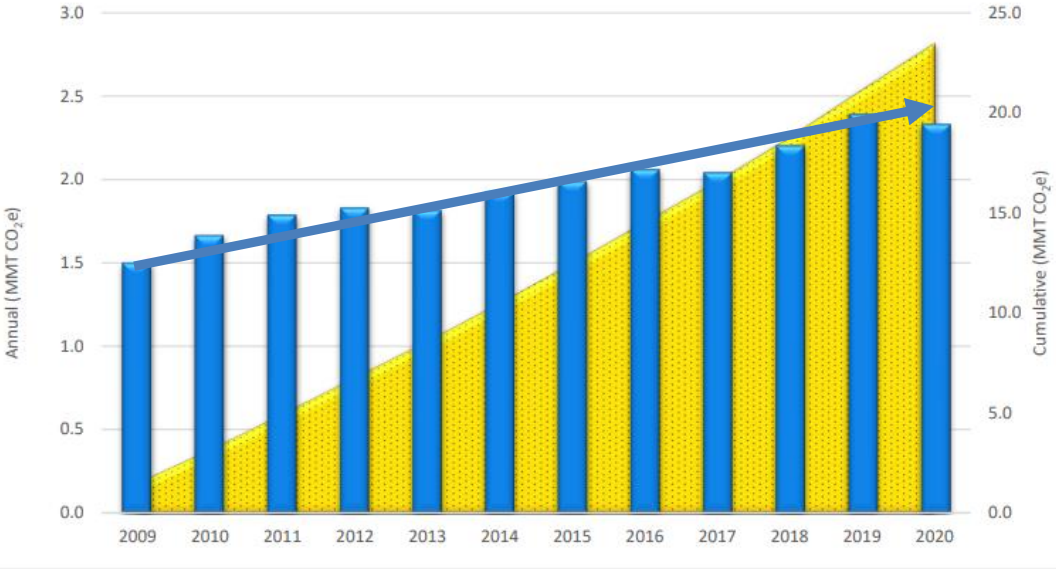


Figure 8: Number of States at Different Average Percentage of RAP Used in HMA/WMA Mixtures, 2009–2020

Cumulative GHG Emissions Reduction from use of RAP in New Asphalt Mixtures

- Steady GHG Emission Reductions
  - 2009: 1.5MM tons CO_{2e}
  - 2020: 2.3MM tons CO_{2e}
  - 23.5MM tons CO_{2e} from 2009 to 2020

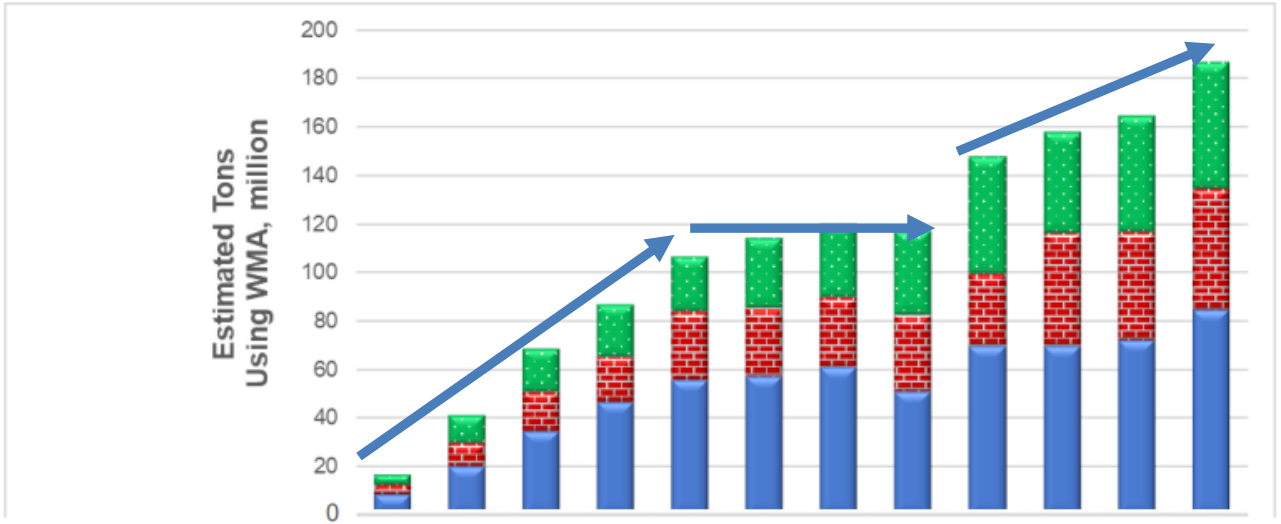


GHG Emissions	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cumulative	1.5	3.2	4.9	6.8	8.6	10.5	12.5	14.5	16.6	18.8	21.2	23.5
Annual	1.5	1.7	1.8	1.8	1.8	1.9	2.0	2.1	2.0	2.2	2.4	2.3

Figure 19: GHG Emissions Reduction from Use of RAP in New Asphalt Mixtures, 2009–2020

Warm Mix Asphalt (WMA) Production

- Trends
- 2009 - 2012 ⇧
- 2013 – 2016 ⇨
- 2017 - 2020 ⇧



Sector	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commercial & Residential	4.6	11.3	17.8	21.4	22.8	28.5	30.4	34.6	48.4	42.0	48.0	52.0
Other Agency	3.6	9.8	16.3	18.9	27.9	28.4	28.5	31.5	29.4	46.5	44.8	49.9
DOT	8.6	20	34.6	46.4	55.7	56.9	60.9	50.7	69.6	69.3	71.7	84.5

Figure 16: Estimated Tons (Millions) Produced With WMA Technologies by Sector, 2009–2020

Warm Mix Asphalt (WMA) Types

https://www.asphaltpavement.org/climate

1- Introduction Scope of Work

- **Historical RAM mixture performance**, durability of recycled mixtures, implementation of the BMD approach, and application of the ΔTc parameter.

- **WAPA-WSDOT collaboration** to increase the allowable RAP /RAS up to 40% binder replacement

- **FMFC, FMLC, and LMLC** (samples and virgin materials) were subjected to materials testing to evaluate their durability. Identify if changes to current WSDOT specifications and/or design procedures could lead to improved durability

- Evaluation of **rheological parameter ΔTc** and its acceptance criteria of ≥-5°C for multiple binder sources in Washington after 20-hour and 40-hour PAV

- **ΔTc criteria** for virgin binder/recycled material blends, regardless of RAP and/or RAS content

- Evaluating the incorporation of RAP and/or RAS in mix design, through **performance testing** (HWTT, TSR, Tensile Strength, Fracture Energy, CT-Index)

2- Literature Review

- **Good long-term performance** of RAP/ RAS mixtures can be obtained with responsible designed and constructed. High RAP/RAS increases diligence needed to obtain the desired performance

Practices used by DOTs for improving performance of AC containing recycled materials:

- **Increasing virgin binder content** (reduced $N_{design,}$ regress design AV%, increasing VMA criterion, COAC,…) Reviewing **pavement performance** to assess the impact of RAP on performance
- Using **softer binders** or recycling agents when recycled materials are used
- Including **ΔTc** when specifying virgin asphalt binders
- Use of **mixture performance tests** (rutting and cracking) for mix design
- Implementation of a **BMD methodology**
- Including **VMA and Dust to Asphalt ratio** as acceptance quality characteristics

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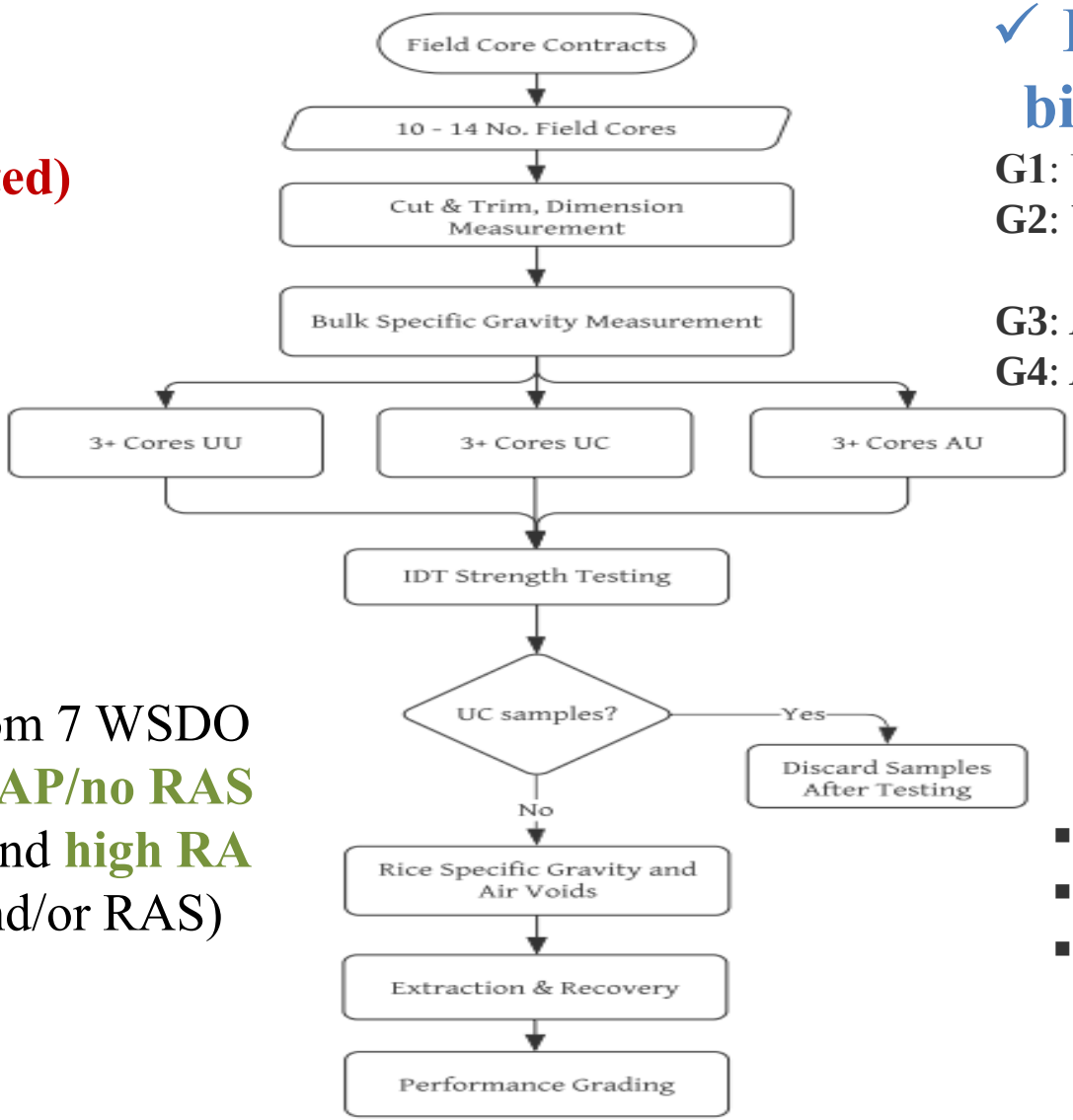
3- Experimental Plan

Specimen Types		FMFC	FMLC	LMLC
ID	Contract No.	7706, 8438, 8128, 8624, 8433, 8441, and 8465	9145, 9262/9229, and 9231	9145, 9262/9229, and 9231
	RAP %	<20 - 45%	0 - 40%	0 - 40%
Binder Properties	Extraction and Recovery	✓	✓	✓
	Superpave PG	✓	✓	✓
	Blending Charts			✓
	Superpave PG for the Blended Binder			✓
Aggregate Gradations	Verification of Virgin and RAP Aggregates with JMF			✓
Mix Design and Volumetrics	Replicate FMLC JMF			✓
	Mix Design Tweaks			✓
	Cores Dimensions Measurements	✓		
	Bulk Measurements	✓	✓	✓
Performance	IDT (Strength and CT-Index parameters at 3 conditions)	✓	✓	✓
	Prepare HWTT Specimens		✓	
	E* Testing			✓

4- Material Characterization

FMFC
(Field Mixed Field Compacted)

Field cores from 7 WSDO projects **low RAP/no RAS** (≤20% RAP) and **high RA** (>20% RAP and/or RAS)



✓ **Extraction and binder properties**:

G1: UU samples after RTFO
G2: UU samples after RTFO + 20-hour PAV aging
G3: AU samples after RTFO
G4: AU samples after RTFO + 20-hour PAV aging

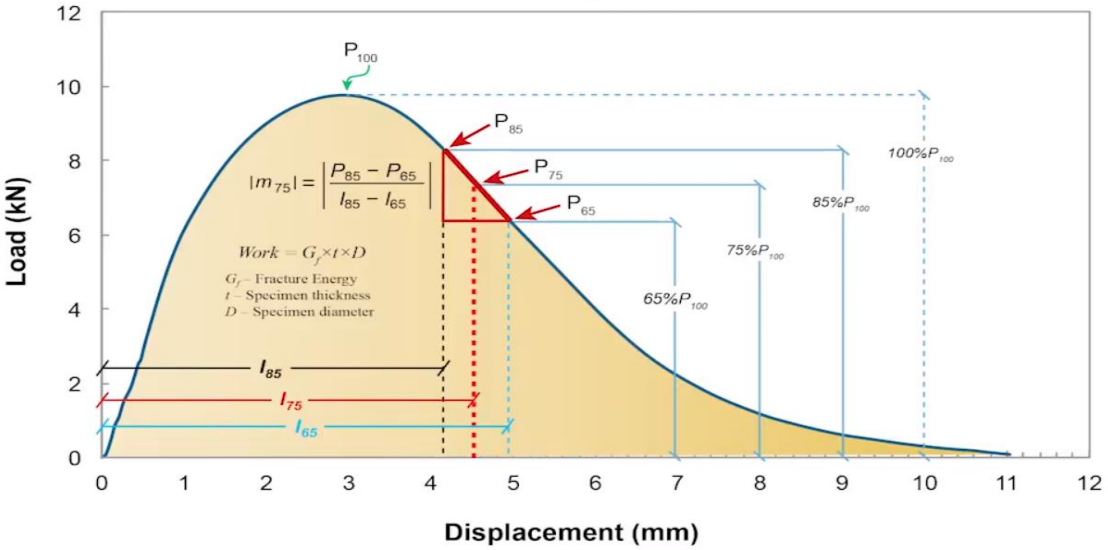
✓ **ITS, …** (UU, UC, AU)

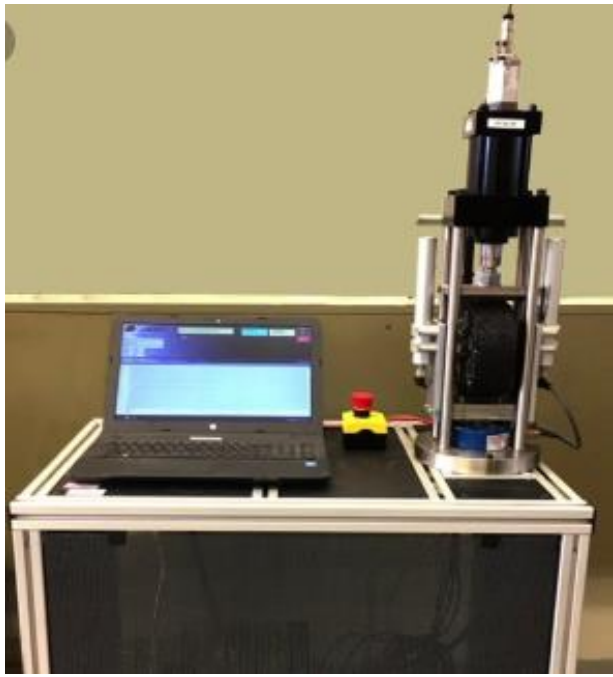
- UU = STOA
- UC = STOA + F/T
- AU = STOA + LTOA

Ideal-CT (ASTM D8225)

- Similar to ASTM D6931 / AASHTO T 283 IDT Test with Displacement Measurement
- Test temperature: 77°F
- Loading rate 2” per minute
- Outputs
  - **ITS (IDT), CT_{Index} and Fracture Energy**
- Use Load vs. Displacement curve to calculate CT_{Index}
- Quickly, easy, popular
- NO sample prep, Under $5-15k

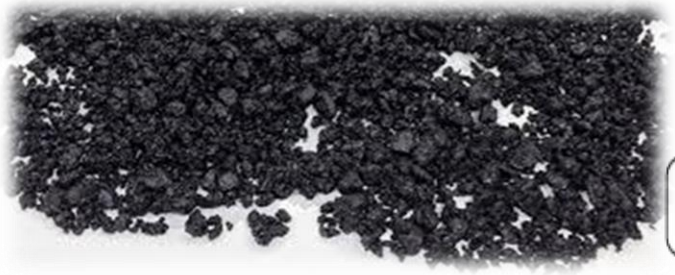
$$CT_{Index} = \frac{G_f}{|m_{75}|} \times \frac{l_{75}}{D}$$



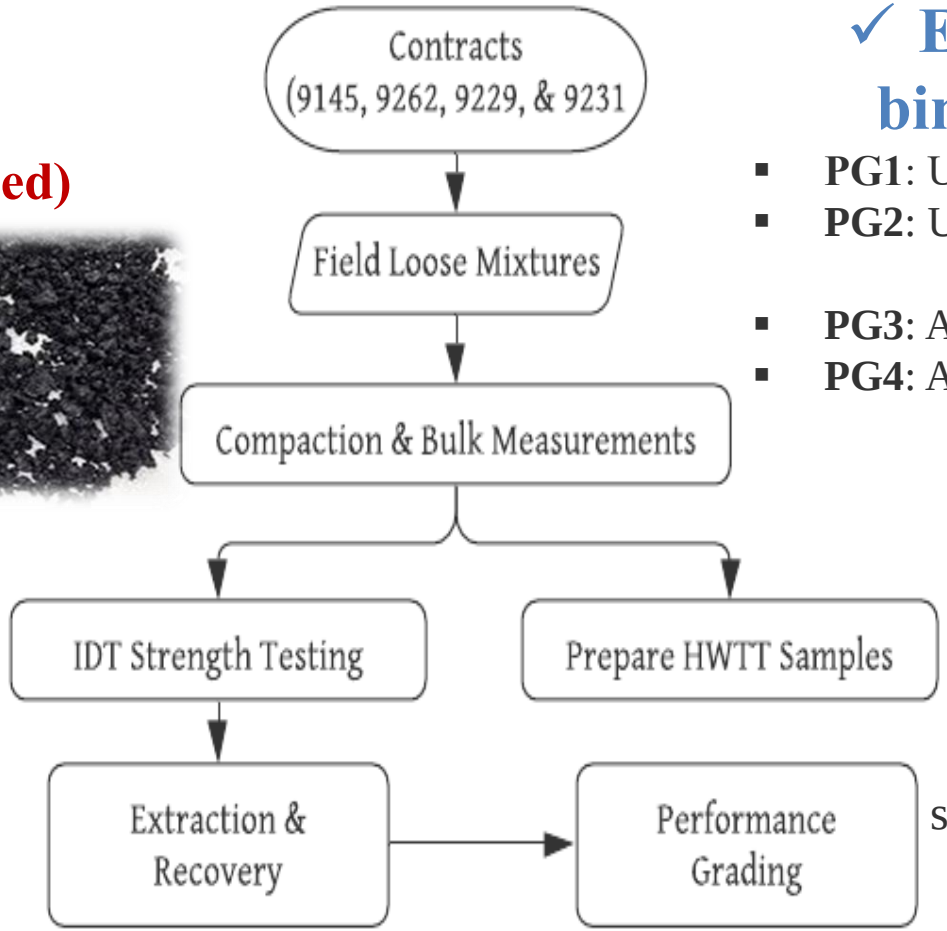


4- Material Characterization

FMLC
(Field Mixed Laboratory Compacted)



Loose field mix high RAP and **low RAP** projects during the production phase by WSDOT and the contractors.



✓ Extraction and binder properties:

- **PG1**: UU samples after RTFO
- **PG2**: UU samples after RTFO + 20-hour PAV aging
- **PG3**: AU samples after RTFO
- **PG4**: AU samples after RTFO + 20-hour PAV aging

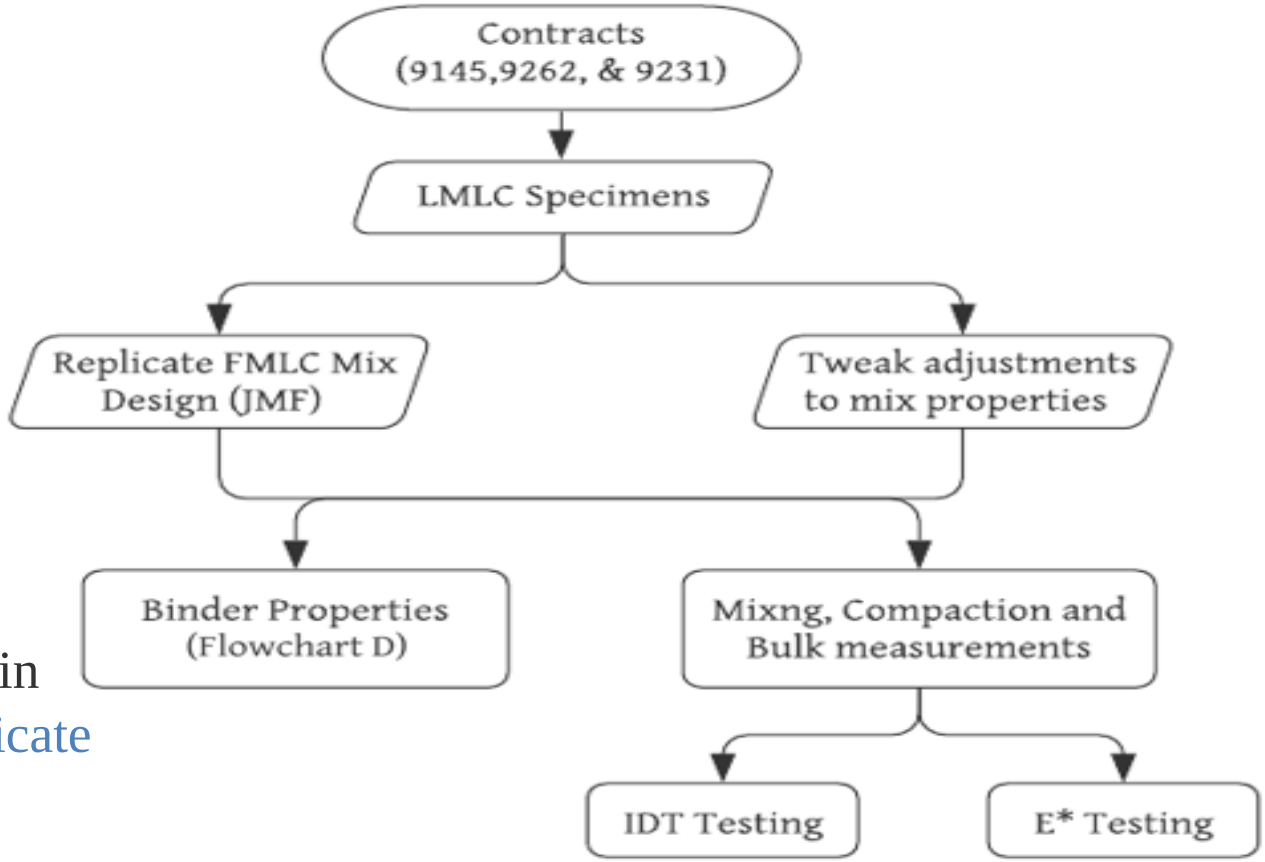
✓ IDT, …
(UU, UC, AU)

✓ HWTT
specimens prepared and shipped to WSDOT for testing

4- Material Characterization

LMLC
(Laboratory Mixed Laboratory Compacted)

Laboratory samples from virgin and recycled materials to replicate the JMF used to produce the FMLC specimens + tweaked mixtures (virgin binder source / grade, RAP %, etc.…)



✓ **IDT, …** (UU, UC, AU)

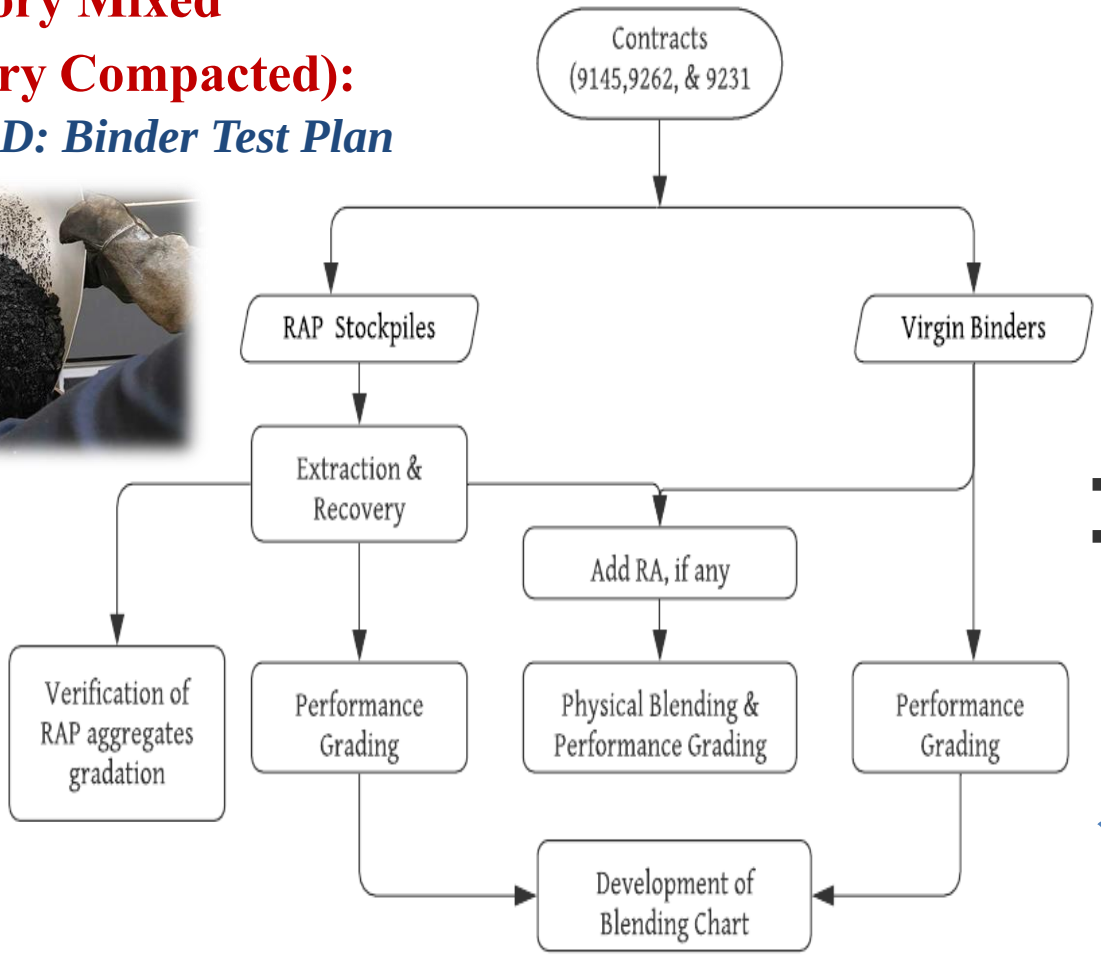
✓ **E*** short-term

4- Material Characterization

LMLC

(Laboratory Mixed Laboratory Compacted):

Flowchart D: Binder Test Plan



✓ Virgin binder :

PG1: UU samples after RTFO + 20-hour PAV aging

PG2: UU samples after RTFO + 40-hour PAV aging

✓ RAP binder :

- **PG1**: UU samples after RTFO
- **PG2**: UU samples after RTFO + 20-hour PAV aging

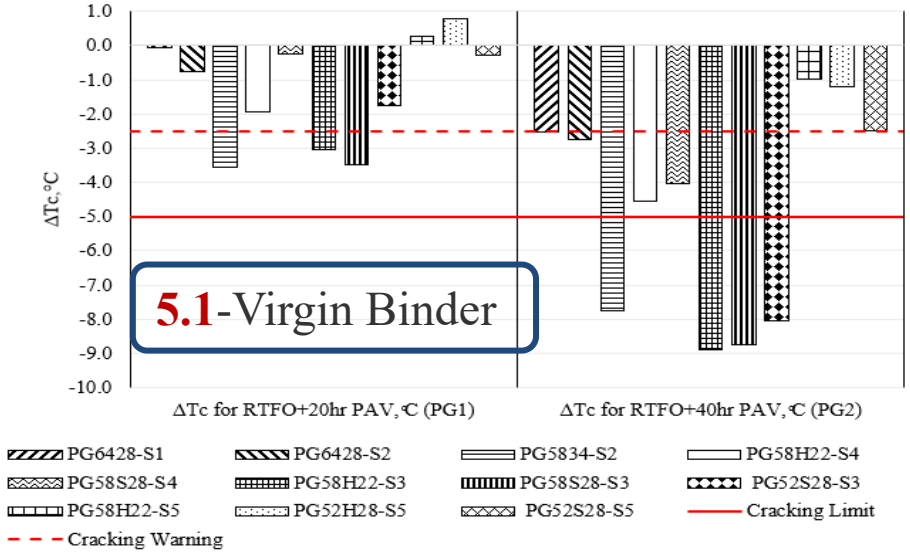
✓ Physical Blending:

Virgin binder + RAP binder + RA if any

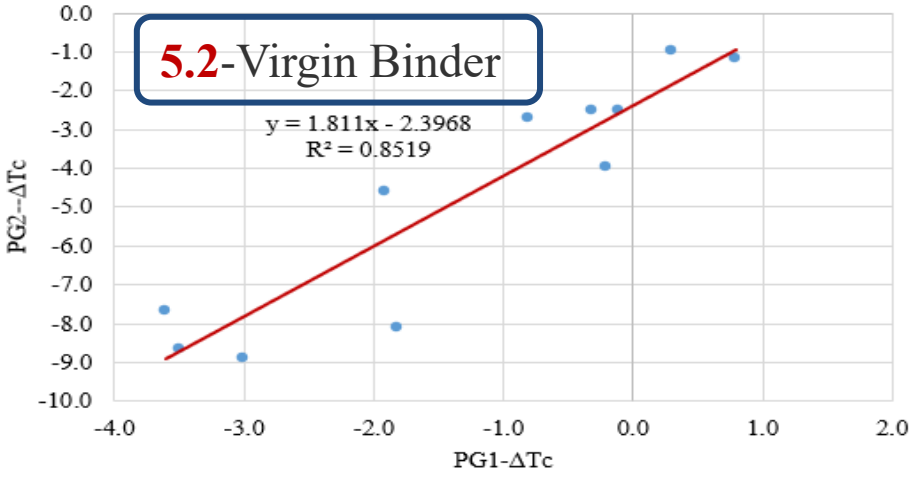
4- Material Characterization Analysis

Specimen Types		FMFC	FMLC	LMLC
Contract	RAP %	<20 - 45%	0 - 40%	0 - 40%
Analysis and Statistical Correlation	Statistical comparison between blending charts and physical blending			✓
	Impact of binder supplier			✓
	Variability between LMLC and FMLC Cracking Test Results		✓	✓
	Performance comparison with Varying RAP Amounts			✓
	Correlation between IDT… strength testing parameters			✓
	ΔTc regression with mixture performance	✓		✓
	PMS data regression with ΔTc and mixture performance	✓		

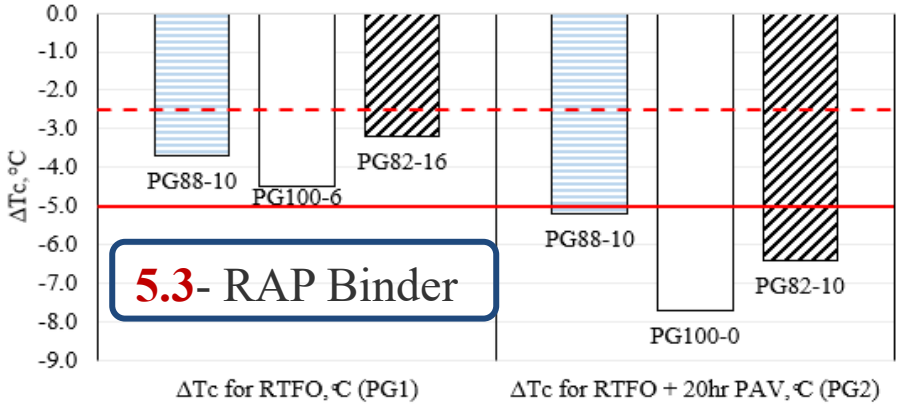
5- Lab Results & Analysis *5.A- LMLC*



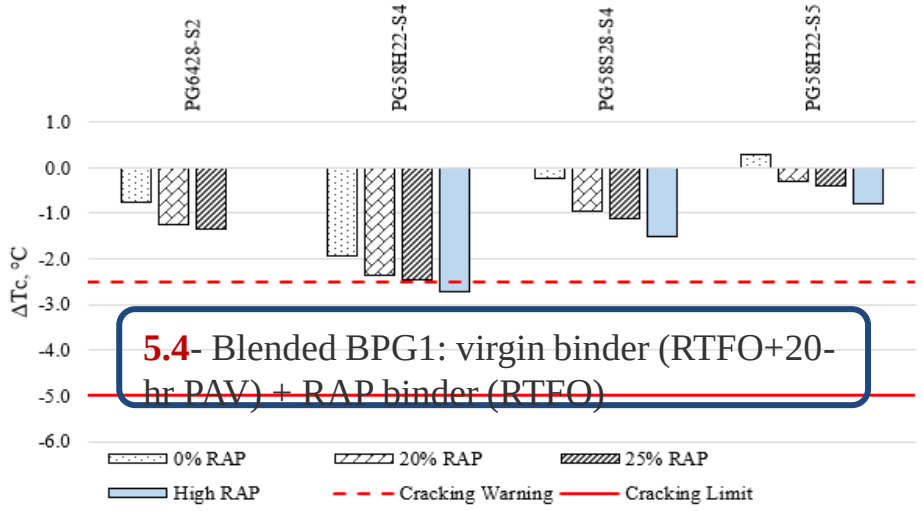
5.1-Virgin Binder



5.2-Virgin Binder

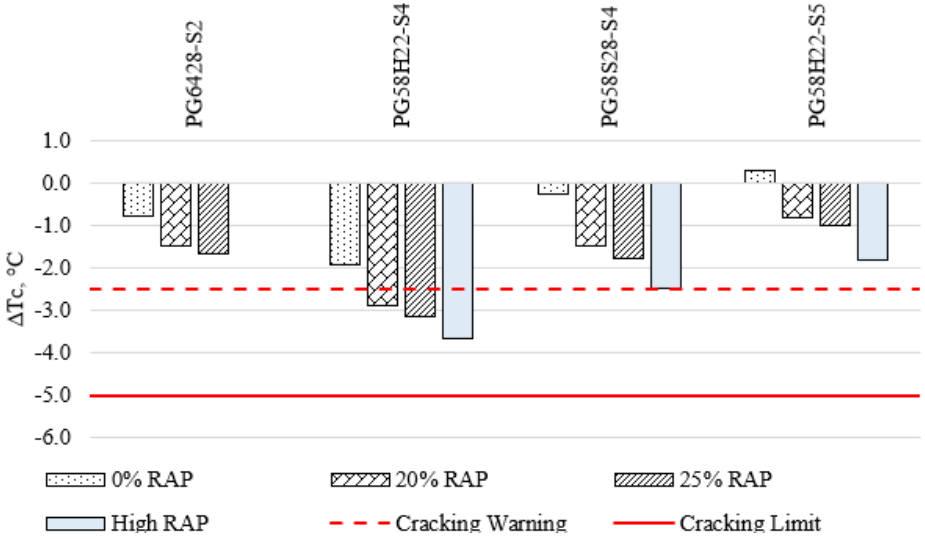


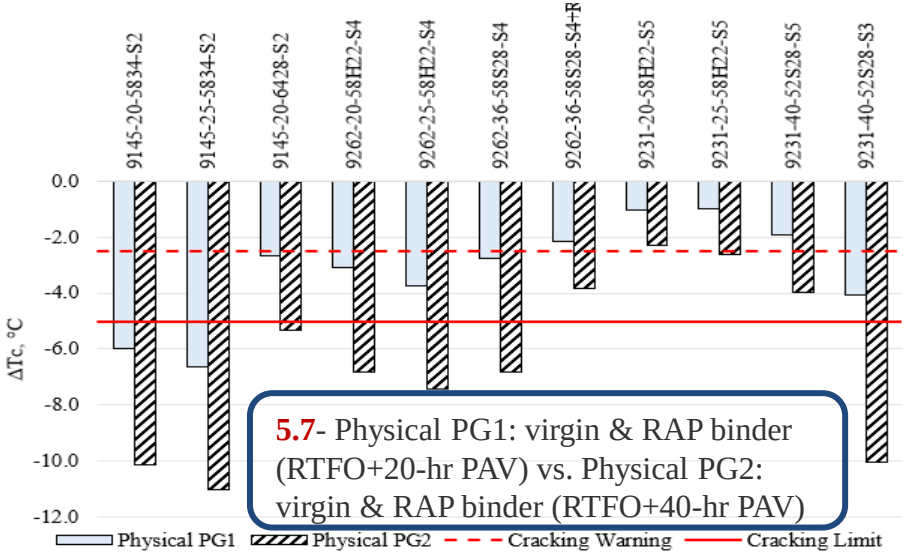
5.3- RAP Binder



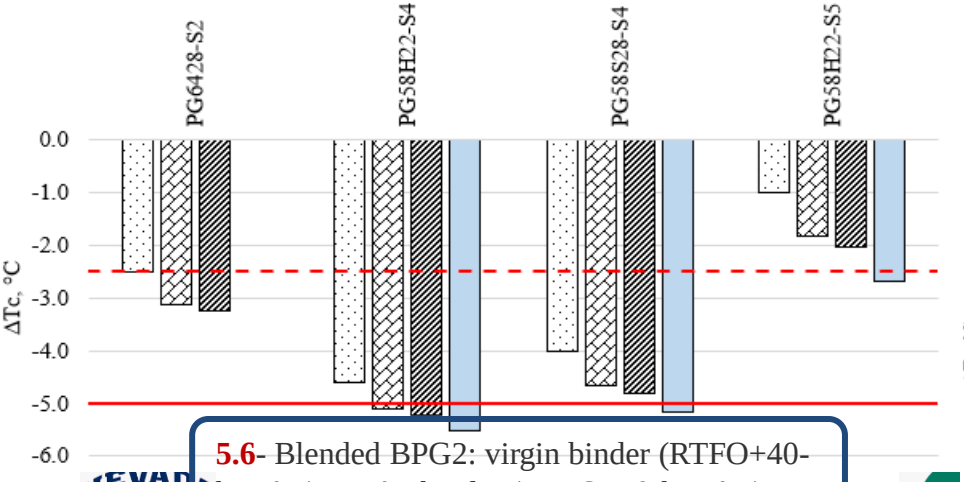
5.4- Blended BPG1: virgin binder (RTFO+20-hr PAV) + RAP binder (RTFO)

5- Lab Results & Analysis *5.A- LMLC*

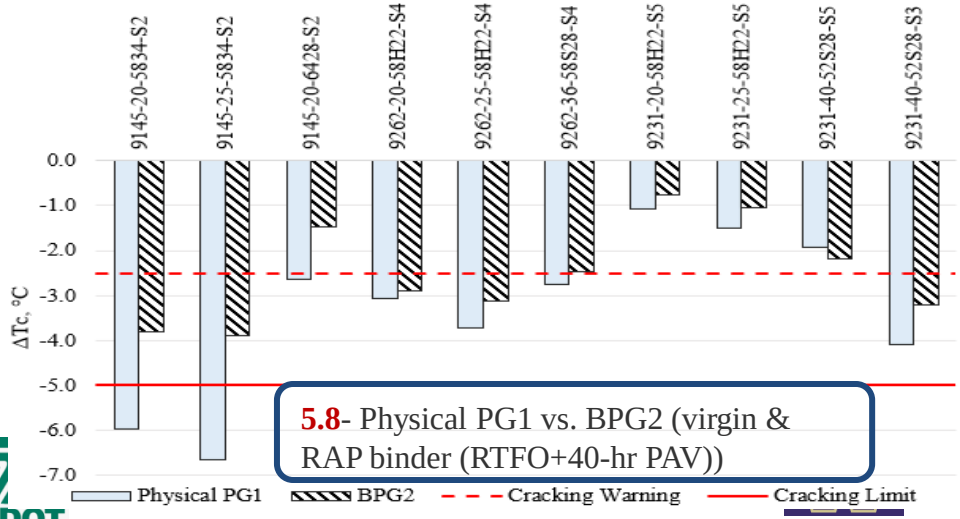




5.7- Physical PG1: virgin & RAP binder (RTFO+20-hr PAV) vs. Physical PG2: virgin & RAP binder (RTFO+40-hr PAV)



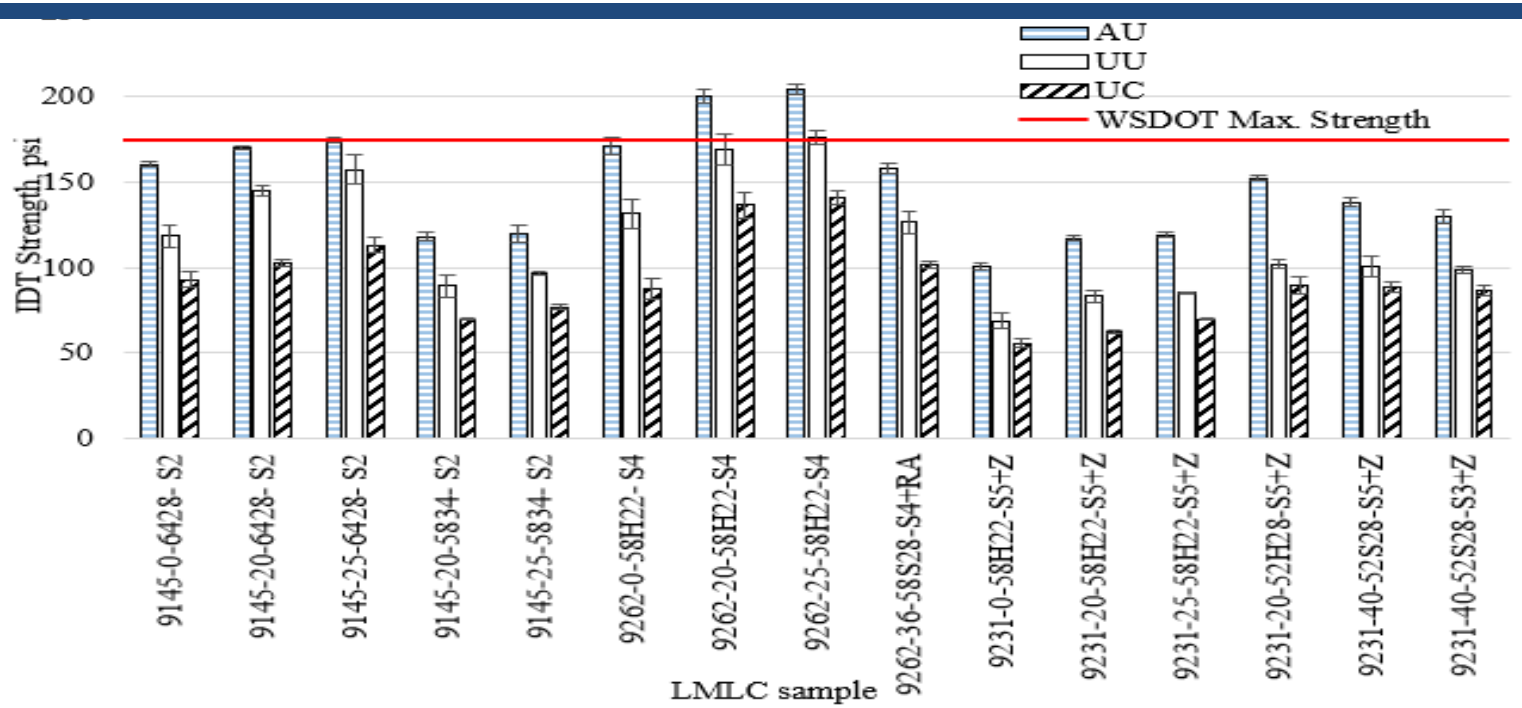
5.6- Blended BPG2: virgin binder (RTFO+40-hr PAV) + RAP binder (RTFO+20-hr PAV)



5.8- Physical PG1 vs. BPG2 (virgin & RAP binder (RTFO+40-hr PAV))

5- Lab Results & Analysis *5.A- LMLC*

5.9- LMLC IDT Strength values (UU, UC, AU)



- 36% RAP with softer virgin binder and 3.1% RA (9262-36-58S28-S4+RA), ↓ IDT strength by 4%, and 8% for UU, and AU specimens, compared to virgin mixtures.
- 40% RAP with softer virgin binder in contract 9231, ↑ IDT strength on average by 33% and 45% for UU and AU specimens, compared to virgin mixtures.

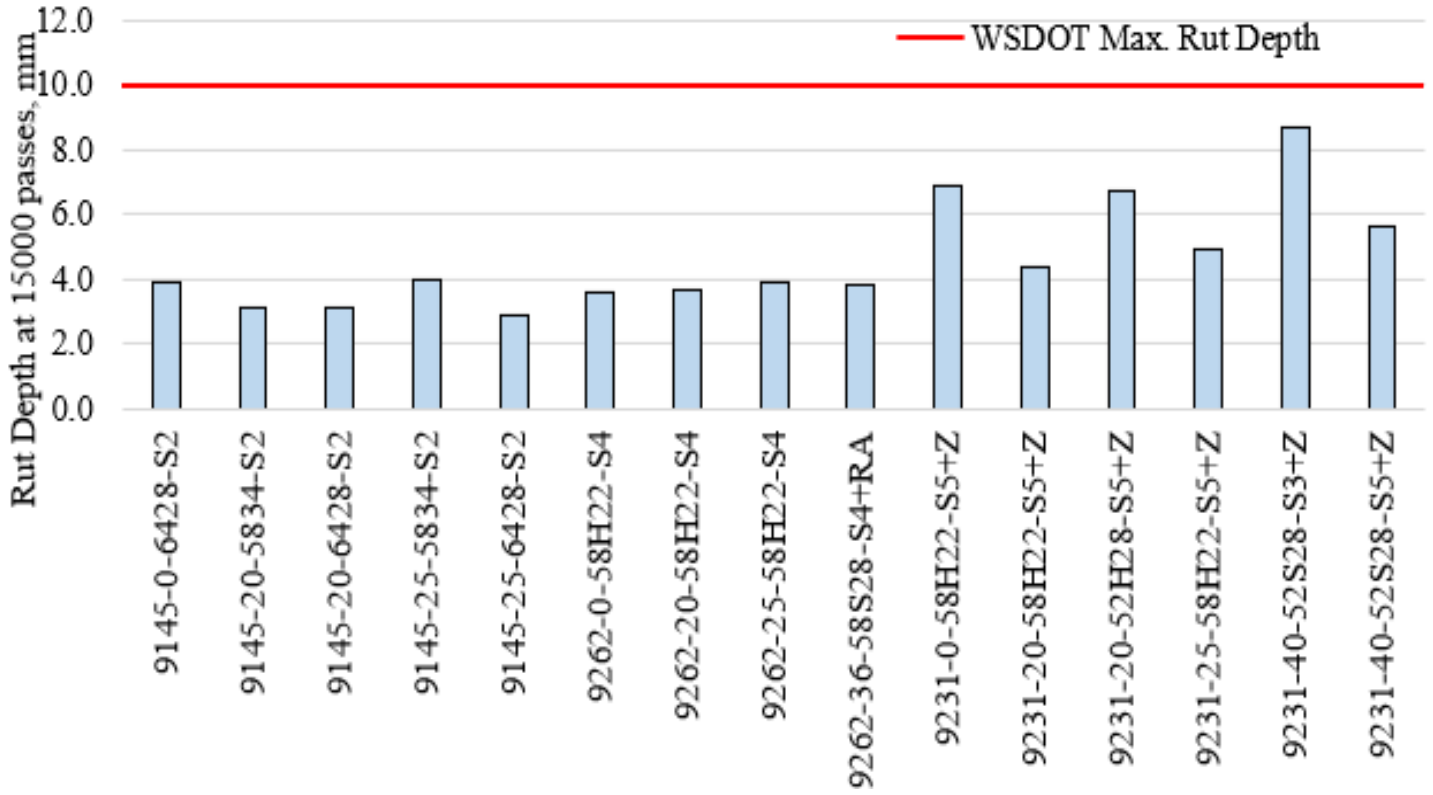
within the same binder supplier grade and source:

- 20% RAP ↑ IDT strength by 24% and 13% for UU and AU specimens, compared to virgin mixtures.
- 25% RAP ↑ IDT strength by 31% and 16% for UU and AU specimens, compared to virgin mixtures.
- 25% RAP ↑ IDT strength by 6% and 2% for UU and AU specimens, compared to 20% RAP mixtures.

5- Lab Results & Analysis *5.A- LMLC*

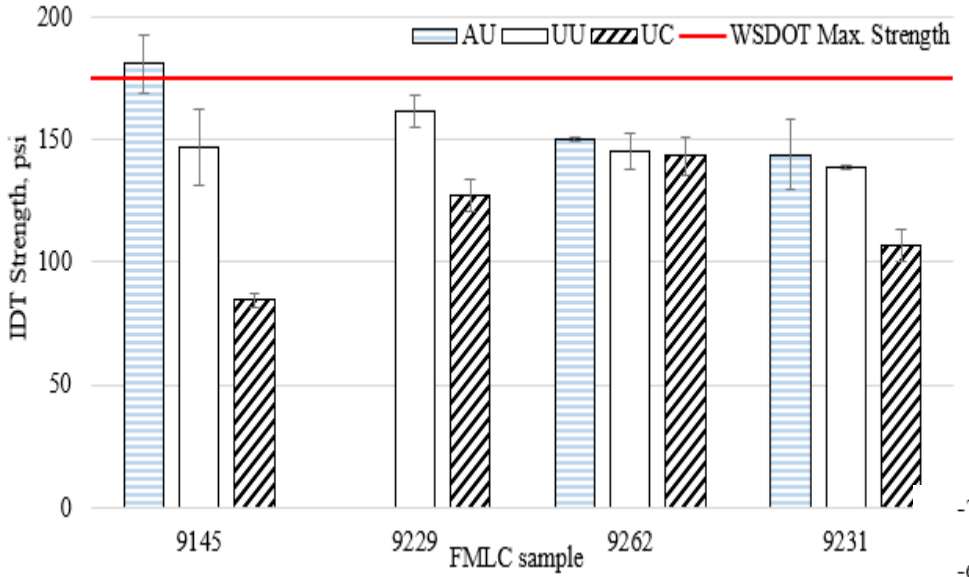
- WSDOT Performed HWTT

5.10- LMLC HWTT values



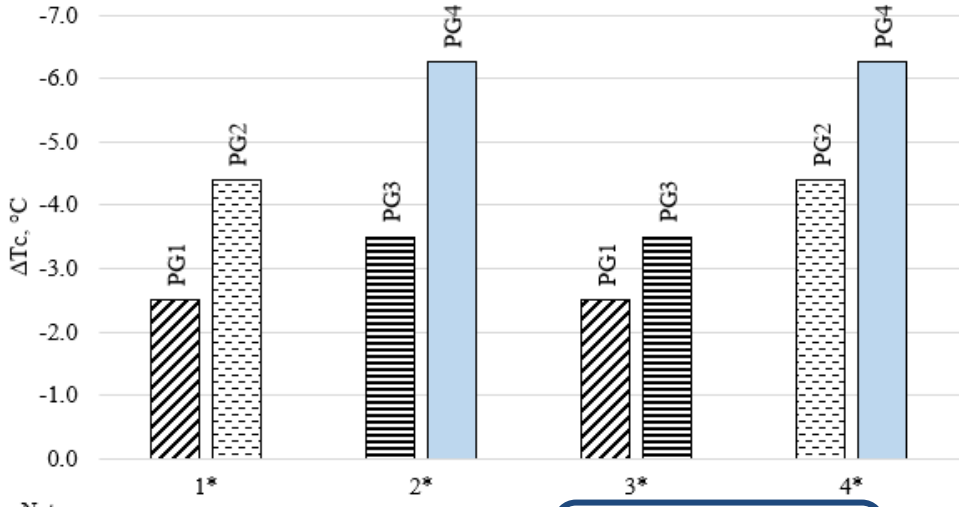
5- Lab Results & Analysis *5.B- FMLC*

5.11- FMLC IDT values



- All UU dry tensile strengths < WSDOT 175 psi criteria
- The 95% confidence level error bars → lower variability associated with IDT strength results compared to CT-Index and fracture energy
- IDT strength parameter: most consistency between LMLC and FMLC, compared to CT-Index and fracture energy.

- 20-hour PAV aging reduced ΔTc by 1.9°C, for UU samples, and by 2.8°C for AU samples.
- Aging compacted specimens for 5 days at 185°F reduced ΔTc by 1.0°C after RTFO aging, compared to 1.9°C after RTFO and 20-hour of PAV aging.
- 20-hour PAV aged mixtures and drop ΔTc more than the 5 days at 185°F long-term aging on compacted specimens.

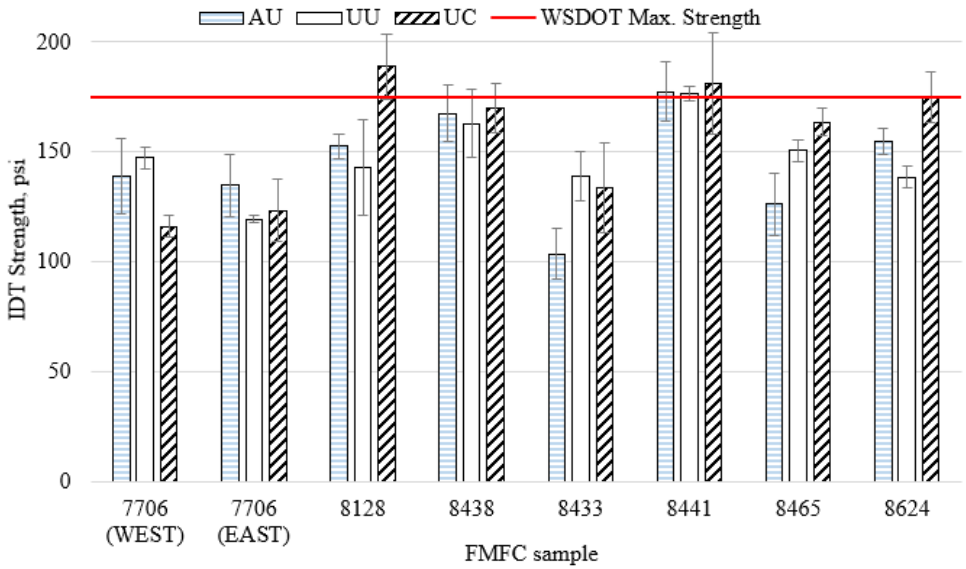


Note:-
1* = Effect of 20-hour PAV aging on ΔTc UU sample
2* = Effect of 20-hour PAV aging of ΔTc AU sample
3* = Effect of 5days 185°F (85°C) aging on binder ΔTc
4* = Effect of 5days 185°F (85°C) aging on binder ΔTc

5.12- FMLC 9145 ΔTc Comparison

5- Lab Results & Analysis *5.C- FMFC*

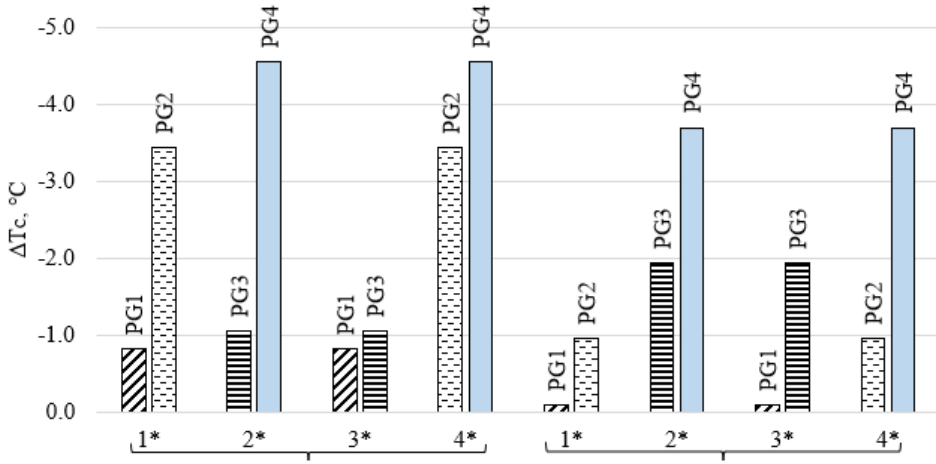
5.13- FMFC IDT values



- No clear trend observed between these test results, due to the high field variability
- All the dry tensile strength of UU samples < WSDOT max criterion of 175 psi except for contract 8441
- The 95% confidence level error bars → lower variability associated with IDT strength results compared to CT-Index and fracture energy

- 20-hour PAV aging reduced ΔTc by 2.5°C, for UU samples, and by 2.8°C for AU samples.
- Aging compacted specimens for 5 days at 185°F reduced ΔTc by 1.0°C after RTFO aging, compared to 1.3°C after RTFO and 20-hour of PAV aging.
- Consistent with the FMLC findings, 20-hour PAV was able to age the mixtures and drop ΔTc more than the 5 days at 185°F long-term aging on compacted specimens.

5.14- FMFC 8465 and 8624 ΔTc Comparison



Note:-
1* = Effect of 20-hour PAV aging on ΔTc UU sample
2* = Effect of 20-hour PAV aging of ΔTc AU sample
3* = Effect of 5days 185°F (85°C) aging on binder ΔTc
4* = Effect of 5days 185°F (85°C) aging on binder ΔTc

6- PMS Data Analysis

WSDOT PMS Data Analysis of low and high RAM projects

Howell et al. *(WSDOT PMS:2007-2017)* → Similar field performance of low and high RAP mixes

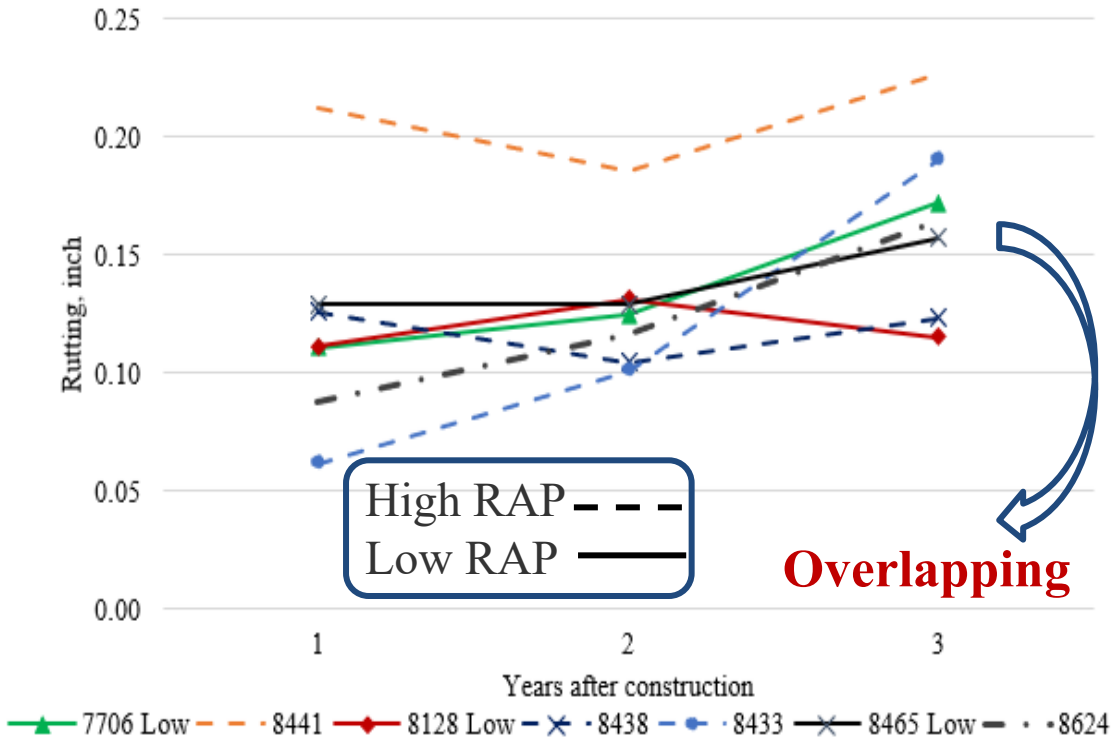
Only five years of high-RAP field and performance data

WSDOT → FMFC detailed distress survey for 3 low RAP (≤20%) and 4 high RAP (>20%) contracts.

Rutting PMS Data

Over 4 years:

Max Rut $_{\text{High RAP}}$ = **0.3** in. > Max Rut $_{\text{Low Rap}}$ = **0.2** in.

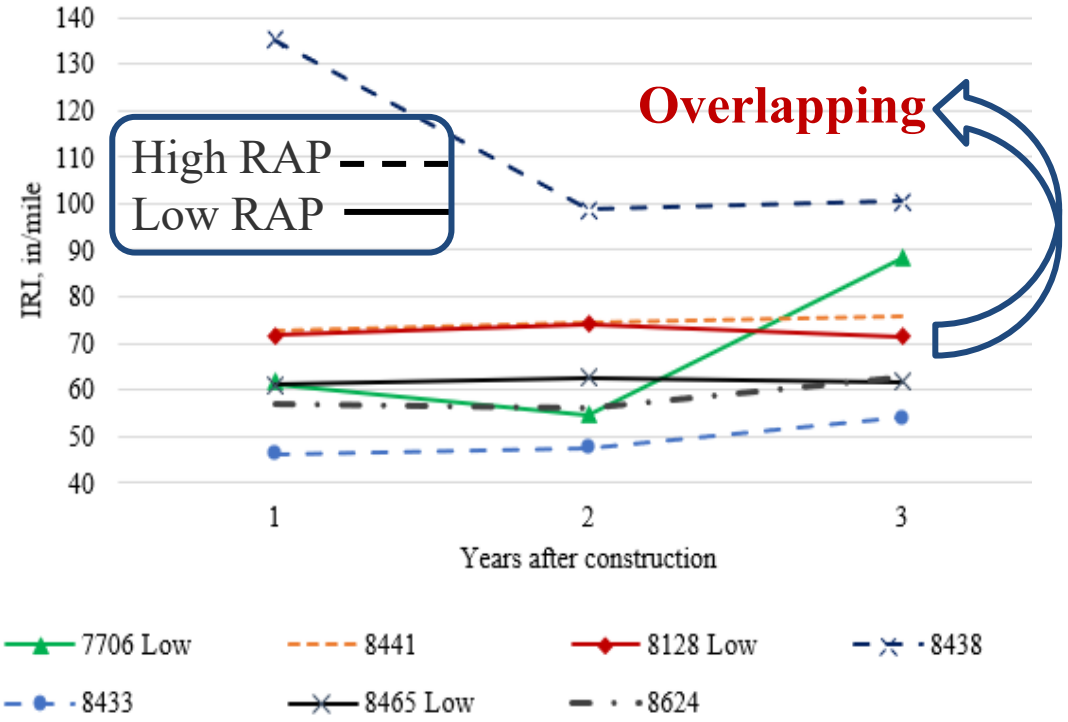


6- PMS Data Analysis

IRI Data

Min $_{IRI}$ = **46** in/mile (High RAP project 8433)

Max $_{IRI}$ = **135** in/mile (High RAP project 8438)

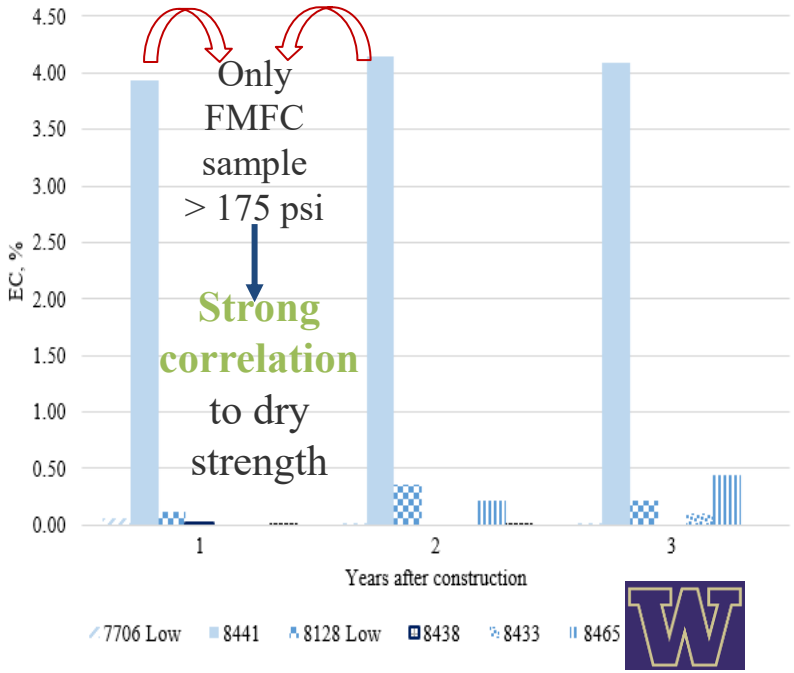


EC%

(alligator cracking, longitudinal cracking, transverse cracking, patching)

Tight range (low and high RAP):

0.00-0.44 EC%



7- Statistical Analysis

Rheological Parameters from Blending Charts versus Physically Blended Samples

- Significant difference in ΔTc parameter → **uncertainty in predicting ΔTc parameter from blending charts**
- Δ of -2.7 °C and +0.3°C, **Physically blended binders had lower (more negative) ΔTc** values than those calculated from blending charts (average difference of -0.9°C).

- Significant difference (in terms of fracture energy, IDT, CT-Index) between two LMLC mixtures (same binder grades from two different sources).
- **Binder source/supplier has a significant influence** on cracking properties, under AU and UU conditions.

- FMLC compared with same LMLC replicated in the laboratory with 0 and 20% RAP (WSDOT allows incorporation of up to 20% RAP in the mixture without including the RAP in the mix design).
- **FMLC: significant differences in IDT strength parameters, compared to the mix design**.
- **The IDT strength parameter was able to detect significant differences** between field and laboratory replicated mixtures (always greater for the field mixture).

7- Statistical Analysis

LMLC Comparison of 20% and 25% RAP Mixtures

- What if transitioned from 20% to 25% RAP mixtures → ANOVA analysis on all the mixtures with 20% and 25% RAP (at 95% confidence level)
- **Neither binder parameters nor mixture cracking test properties** (for LMLC specimens) were **significantly different between 20% and 25% RAP** → Include RAP in mix designs

- 0% and 25% RAP (with same virgin binder grade): 67 % of the mixture properties were significantly different
- 20% and 25% RAP (with same virgin binder grade): 7 % of the mixture properties were significantly different
- High RAP Mixtures (softer binder) and 0% RAP Mixtures: 55% of the mixture properties were significantly different
- The **IDT strength value captured most of the statistically significant differences at various RAP doses**,
- IDT most consistent with dynamic modulus (E*), indirect tie to pavement design

- Includes PG6428-S2 versus PG5834-S2 (PG-1) for contract 9145.
- **Virgin mixtures exhibit significantly higher CT-Index, fracture energy, IDT strength values, and dynamic modulus** than 20% and 25% RAP mixtures both with PG-1.

7- Statistical Analysis

- WSDOT current specifications for IDT strength is 175 psi maximum on UU samples.
- **The highest correlation observed for UU IDT = 0.971 with AU IDT**, followed by 0.965 with UU fracture energy.
- **A preliminary criterion for AU IDT: amplified by 30%** (based on the average increase of LMLC samples).
- → The preliminary AU IDT strength criterion would be a maximum of 228 psi.

- A linear regression was fitted between ΔTc and IDT strength test parameters (IDT strength value, CT-Index, and fracture energy under UU and AU conditions) for LMLC samples (with similar aging conditions).
- **The ΔTc parameter correlated better to the fracture energy under both aging conditions evaluated, followed by the IDT strength values, and then CT-Index.**
- ΔTc showed a negative trend with IDT strength values and fracture energy, while showing positive trend with CT-Index.

- Linear regressions (with similar aging conditions) between ΔTc of recovered binder, and FMFC IDT test parameters.
- Despite the overall high variability among the cores, the regression analysis →**AU IDT strength value is best correlated with ΔTc** among all IDT test results on FMFC specimens.

- FMFC laboratory test results were correlated with PMS data of same projects, in terms of ΔTc and IDT test parameters.
- The EC% values observed among the contracts were extremely low (< 1.2%), → Not adequate range of EC% values to develop reliable regression analyses.
- The very small range of EC% value observed in the **relatively young pavements resulted in unreliable regression models between IDT test parameters and field cracking.**

8- Conclusions

1. **LMLC binder properties:** Low PG of most binders was controlled by the relaxation parameter m-value
2. **Physical blending and blending charts:** Blending charts underestimated the ΔTc (less negative) comparing to physically blended binders
3. **LMLC mixture properties:** UU IDT strength values were better correlated to the fracture energy than the CT-Index
4. **LMLC mixture properties:** IDT strength values, and CT-index illustrated more consistent trends with increased RAP doses, compared to fracture energy
5. **LMLC mixture properties:** Preliminary min CT-Index criteria of 65 and 37 were identified for short-term aged (UU) and long-term aged (AU) samples
6. **LMLC statistical comparison:** 43% of mixture properties were significantly different between 0% and 20% RAP mixtures.

8- Conclusions

7. **FMLC and FMFC extracted binder:** 20-hour PAV aging of extracted binder aged the binder and reduced ΔTc more than the long-term aging of compacted specimens.

8. **FMLC /FMFC mixture properties:** Lower variability was associated with IDT strength results than CT-Index and fracture energy results

9. **FMFC (core) mixture properties:** Significant difference between the cracking properties of high and low RAP contracts not identified. However, *young High RAP pavements*, continue to monitor

10. **IDT criteria:** UU IDT strength surpassed CT-Index and fracture energy in capturing the significant differences with different RAP doses.

11. **IDT criteria:** UU IDT strength parameter surpassed the CT-Index and fracture energy parameters in capturing the differences between field mix and replicated laboratory mix test results.

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8- Conclusions

12 **IDT criteria:** IDT strength parameter was the most consistent with the dynamic modulus (E*) engineering property, in identifying significant differences between mixtures at varying RAP doses.

13 **PMS data:** Statistical analysis comparing the pavement condition (i.e., rut depth, IRI, EC%) did not capture any statistically significant differences between high and low RAP projects.

14 **ΔTc regression with LMLC performance**: ΔTc parameter correlated best with fracture energy followed by the IDT strength values, and then the CT-Index.

15 **ΔTc regression with FMFC performance:** ΔTc parameter correlated best with the IDT strength values following a rational trend.

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9- Short-term Recommendations:

1. Include RAM in all mix designs regardless of % used or RBR.
2. Integrate ΔTc into virgin asphalt binder and virgin binder/RAM binder blend specifications with ΔTc determined by physical blending.
3. *High RAM*: Require PG of blended binder meet project specific requirements.
4. *High RAM*: Require AASHTO M323 minimum VMA as mix design, test section and acceptance requirements.

9- Short-term Recommendations:

5. *High RAM*: Integrate volumetrics and performance tests in BMD process for mix design and test sections by maintaining WSDOT HWT and ITD tests. Been doing BMD for many years

6. *High RAM*: Calculate CT-Index, and fracture energy from ITD tests (no additional testing) & shadow proposed STOA CT-Index ≥ 65

7. *High RAM*: As resources allow add LTOA to mix design and test sections for ITD test specimens for information only

8. Collect ITD, CT-Index and fracture energy data whenever performing ITS. Calculations, not additional tests.

9- Long-term Recommendations:

1. Evaluate the preliminary short-term and long-term aged ITD strength (≤175psi and ≤230psi) and CT-Index (≥65 and ≥37) criteria by collecting data on all WSDOT projects.
2. Use the data from recommendation 1 to refine the preliminary IDT strength and CT-Index criteria.
3. Evaluate the relationship between short-term and long-term aged IDT strength or CT-Index from projects.
4. Analyze the impacts of recommendations 1 and 2 on acceptance and payment.

9- Long-term Recommendations:

5. Share the information from recommendations 1-4 with industry partners via WAPA and provide training on changes selected

6. Revise the current WSDOT 504 specifications to eliminate the mix design classification based on RAP/RAS content

7. Revise the current WSDOT 504 specifications to add short-term and long-term aged IDT strength or CT-Index criteria to mix design and test strip acceptance criteria

8. Revise the WSDOT 504 specifications to add ITD strength or CT-Index to acceptance criteria after shadow specification implementation for a construction season.

Questions ?

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Improving HMA Committee, MS Teams – November 3, 2022
Meeting Agenda

Present	Name	Company	Present	Name	Company	Present	Name	Company
	Anderson, Taj	Poe	X	Gent, Dave	WAPA	X	Pedroza, Jared	CalPortland
	Anderson, Cooper	Am. Rock		Griffith, Brad	Miles	X	Phillips, Scott	WSDOT
X	Beier, Spencer	WSDOT	X	Hill, Kentin	Granite	X	Terrill, Keith	Road Science
	Benson, Ed	Interstate C&A	X	Huang, Shin-Che	FHWA		Raynes, Bob	Cadman
X	Cantrell, Logan	Granite		Joy, Justin	Idaho Asphalt		Schofield, Kim	WSDOT
	Carlie, Karen	WSDOT		Johnson, Torrey	Tucci & Sons	X	Schultz, Brett	Miles
	Chapman, Josh	Granite		Keeth, Jon	WSDOT	X	Swearingen, Shawn	Inland
X	Clayton, E. J.	Granite	X	Kull, Spencer	CalPortland	X	Waligorski, Kevin	WSDOT
X	Crouse, Jeff	Lakeside		Malley, Stuart	CRH	X	Webster, Garrett	WSDOT
X	Davis, Steve	WSDOT		Mathis, Gerome	Inland Asphalt	X	Williams, Chris	ICON
	Dempsey, Bill	Lakeside	X	Methvin, Dave	Central Pre-Mix	X	Williams, Kurt	WSDOT
X	Fishel, Greg	Miles	X	Pederson, Chris	CTL		Winger, Leon	WSDOT
						X	Zemke, Erik	Shamrock

OLD BUSINESS Roll call/Introductions: Dave Schofield (CWA)

17-02 How can we cost-effectively increase the service life of HMA Pavements?

HMA Changes From WAPA and WSDOT, Updated June 8, 2020
Relating to Mix Design Approval, Field Acceptance of Mixture, and Field Acceptance of Compaction

Mix Design Approval

SPEC	REGARDING	CURRENT	2018	2019-2020	2021	2022
9-03.8(2)	⅜ VMA Lower Spec Limit	15.0%	no change	no change	15.0%	15.0%
	½ VMA Lower Spec Limit	14.0%	no change	no change	14.0%	14.0%
	¾ VMA Lower Spec Limit	13.0%	no change	no change	13.0%	13.0%
	1 VMA Lower Spec Limit	12.0%	no change	no change	12.0%	12.0%
9-03.8(7)	VMA Tolerance (⅜, ½, ¾, 1	-1.5%	-1.0%	-1.0%	-0.5%	-0.5%

Field Acceptance

SPEC	REGARDING	CURRENT	2018	2019-2020	2021	2022
9-03.8(2)	⅜ VMA Lower Spec Limit	15.0%	no change	no change	15.0%	15.0%
	½ VMA Lower Spec Limit	14.0%	no change	no change	14.0%	14.0%
	¾ VMA Lower Spec Limit	13.0%	no change	no change	13.0%	13.0%
	1 VMA Lower Spec Limit	12.0%	no change	no change	12.0%	12.0%
9-03.8(7)	VMA Tolerance	N/A	-1.5%	-1.0%	-0.5%	-0.5%
9-03.8(7)	No. 8 Tolerance			±4% *	±4%	* See Key Points
9-03.8(7)	No. 200 Tolerance			±2.0% *	±2.0%	* See Key Points
Revision to FOP for T166	Gmb wait time		15 hours	15 hours	Follow AASHTO	Follow AASHTO

HMA Changes From WAPA and WSDOT, Updated May 19, 2020

SPEC	REGARDING	CURRENT	2018	2019-2020	2021	2022
5-04.3(9)B5	Factor "f" for statistical evaluation (of VMA)	N/A	2	2	10	10
9-03.8(7)	JMF Binder Tolerance	-0.5% to +0.5%	-0.4% to +0.5%	-0.4% to +0.5%	-0.4% to +0.5%	-0.4% to +0.5%
5-04.3(10)C3	HMA compaction Lower Spec Limit - disincentive	91.0	91.0	91.5	92.0	92.0
5-04.3(10)C3	HMA compaction Lower Spec Limit - incentive	91.0	91.5	92.0	92.0	92.0
5-04.3(10)C3	Factor in Compaction Price Adjustment equation - disincentive	0.40	0.40	0.60	0.40	0.40
5-04.3(10)C3	Price Adjustment Equation - incentive	0.40	0.80	1.00	1.00	1.00
Key Points:						
Agree to keep 4% tolerance on #8 but allow to go beyond control point during production - * Evaluate for 2022						
Agree to keep 2% tolerance on #200 but allow Upper Spec limit to go from 7% to 8% during production.* Evaluate for 2022						
No. 8 and No. 200 production tolerances will be implemented via GSP for 2021 and evaluated to determine next steps						
Develop an optional system to obtain WSDOT Gsb prior to mix design submittal (added fee), will compare results to mix design test results for precision and bias (d2s) for T 84 and T 85.						

- November 5, 2020: *Note the items under the Key Points have been incorporated by a GSP for 2021. Dave Gent - How do we finalize the optional system to obtain WSDOT Gsb prior to mix design submittal so it is broadcast and operational as soon as possible?
- April 29, 2021: Working on a process to incorporate into QC8 to add preliminary Gsb testing. Joe DeVol update. The pre-Gsb for use in mix designs is not going to be feasible as originally anticipated. Looking at options to address concerns other ways. Possibilities include: Informational Pre-Gsb, Running Averages, Submit and store aggregates during development of Mix Design, accepting contractor testing if by certified testers. A sub-group will discuss this issue and recommend how to proceed. QC8 revision will be released without the Pre-Gsb process incorporated for now.
- October 28, 2021: For 2022 we are matching the 2021 spec's including the expanded tolerances for the #8 and #200 as allowed by GSP. We will not be able to implement the Pre-Gsb testing during mix design submittal.
- April 28, 2022: No significant changes anticipated for 2023 book. Analyzing data from '21 season now. Continuing to see significant improvements in compaction (see attachments). Mixture data still under review in the Materials office.
- Nov 3, 2022: No changes to 2023 Standard Specifications. WSDOT will be reviewing HMA data for 2021 and 2022 to assess if any further changes warranted. Any future proposed specifications changes will be brought to the improving HMA group for further discussion.

14-16 Concerns with SAM

- October 31, 2019 – Dave Gent,

  - October Construction Manual update: Dyer
    - Prepave meeting – discuss process of notifying mixture and compaction results
    - Prepave meeting – timely results needed to keep track of CPF
    - Inspector roles and responsibilities – OK to provide unofficial results at time of testing
  - Data on timeliness of data entry: Kurt Williams
- June 9, 2020 - The lab has pulled data from SAM regarding the time to post test data in SAM and has shared the data with the regions. In general the turnaround times are good for compaction and mix. Mineral Aggregate tests tend to lag behind. Contractors should contact the Project Office if this issue continues.
- November 5, 2020: We did have instances of untimely SAM data entry this season primarily tracked to one area. While this doesn't appear to be a systemic issue it does warrant continued effort. WSDOT is proposing pull SAM data entry reports annually and submit to region management.
  - Granite pointed out some project hey had issues with Timely SAM Data entry, Timely Challenges, Timely Min Agg data entry, and accuracy of Challenges.
    - Requesting time limit for Min Agg, and Min Agg samples run per mix design and not combined together (is this a new topic?).
  - Dave Schofield noted need to check accuracy of data entry and calculations and communication.
- April 29, 2021 – Kurt Williams pulled the SAM entry data and is being reported to the region construction engineers. Continues to be a focus and was discussed at the WAPA Joint training and Construction Engineer meetings. COVID telework certainly didn't help the issue, will continue to monitor. Contractors brought up question about testers double checking data prior to entering into the system. Always a best practice to double check not only data entry, but also that SAM is using the correct spec version.
- October 28, 2021 – This is an ongoing issue and will continue to be with staffing shortages and turnover. WSDOT will continue to pull SAM data entry data annually and provide to the regions and timely and accurate data entry will continue to be reinforced during trainings. Inconsistencies with compaction sublot sizes was pointed out. Should we consider adding language allowing irregular areas (intersections, turn lanes, etc.) not completed during the main paving operation to be broken out into a separate lot with varying sublot sizes?
- April 28, 2022 – SAM data discussed at WAPA/WSDOT Joint Training held 3/3/2022. Team brought up looking at adding a maximum timeframe for SAM Data? (example - can't get below 1.0 if not entered into SAM within 7 days?) including min. agg. Also mentioned to CN manual language emphasizing timely and accurate data entry. (This is already covered in the CM chapter 5-04.1, 5-04.2, 5-04.3(9)B3, and 5-04.3(10)C, reference note from 10/31/19). Original test data on retests? The original test data is accessible if the contractor requests.
- November 3, 2022 – Accurate and timely data continues to be problematic on smaller paving projects where paving may be done before getting data and jobs with GEC or consultant testers. An example of a project where resistance to sharing test data was noted. Sharing unofficial test results is addressed in the Construction Manual GEN 5-04.2 Inspector Roles and Responsibilities.

19-01 Challenge Testing Uncompacted Void Test Results

- April 28, 2022 – Kurt noted that a challenge or retest option is not supported per the notes above. Dave Gent requested this remain an agenda item for now. Keep as a line item but hide notes for future, reference 4/28/22 minutes for lates notes.

19-09 Is WSDOT cooling the pavement adequately before taking cores?

- October 31, 2019 - Dave Gent – Is a change to the coring test procedure needed to address this? A couple of ideas that came up included modifying SOP 734 to require the use of ice if coring the same day, or maybe require the contractor to acquire the cores. Bob and Kurt will review with regions.
- June 9, 2020 - Procedure discussed with Region IAI's. Appears to be more related to education than a problem with the test procedure. This has been addressed and WAPA has been asked to bring problems forward if they occur.
- November 5, 2020 – This issue was brought up on at least one occasion this year. Should the responsibility for taking cores be transferred to the Contractor? Dave Gent to review the idea of contractor coring with other WAPA members, Joe DeVol/Kurt Williams to review idea with Region Materials Engineers.
- April 29, 2021: Update on cores. Joe DeVol - There's a push for contractor provided coring but some resistance in areas of WSDOT. Leon brought up a scenario were the contractor releases the mat for coring, and the contractor takes care of the icing if they feel it's needed.
- October 28, 2021 – WSDOT is resistant to modifying coring test procedures. There are standard items for contractor coring of bridges and roadway in the specifications that can be included in contracts or change ordered in if requested and accepted.
- April 28, 2022 – Coring multiple lift paving too early. Issue potential on fish passage work particularly. (Possibility - Require waiting 24 hours minimum to core multi-lift paving?) Random sampling concern – coring multiple lifts at same time. What challenges are we having out in the field?
- November 3, 2022 – A question was raised about the use of liquid nitrogen. It is allowed in the testing procedures, has anyone used it and if so how much was used? Brief Discussion that the use of nitrogen is allowed by the test procedure, but no one at the meeting was aware of it being used.

19-16 Recycled Materials Toxicity Testing – RAP/RAS – New Spec Joe/Steve

- October 31, 2019 – Kurt Williams and Joe DeVol – Discussion on FHWA Audit of Standard Spec 9-03.21 and changes in state law regarding asbestos (as it relates to RAS). Discussion, will be updating Std Spec Section 9-03.21(1) to require toxicity testing data for Asbestos as well as providing documentation on the source of the RAP used on the project.
- June 9, 2020 - Goes back to Section 1-06, 9-03.21. Toxicity testing for RAP/RAS requirements needs more certification for non-DOT sources. Recent WSDOT audit has triggered increased requirements for mix design and production of HMA. While the current specifications allow WSDOT to request certifications, the updated Standard Specifications effective 2021 will further clarify the need to provide a certification on materials source. The certification will be needed up front for mix designs coming through the door and no later than 90 days before HMA placement. WAPA asked WSDOT to discuss production concerns as discussions move forward.
- November 5, 2020 – Initial spec updates have been made. Continuing to review requirements with environmental to ensure WAC requirements are being met. WAPA has concerns with the need for this particularly for RAP, also noting the 90 day requirement could impact paving schedules. Joe noted he is still working with the Environmental group to nail down the requirements and that changes may be coming.
- April 29, 2021: Update on toxicity testing certification. Joe or Kurt. The initial issues have been handled however the topic is still evolving. This item will be collapsed and left on the agenda as a check in to see if anything new comes up.
- October 28, 2021 – Nothing new on this item. Monitoring – Dave Gent observation: It would be great to start a simple data base list the documents that there is no toxicity documented in this process (or, if there is a toxic of some ilk found, what is it for info. to the group). A recent development since our

meeting, a RAS mix sample was tested and found to have asbestos in it. Use of RAS mixes have been put on hold.

- April 28, 2022 – Update on the new GSP & QC 8 RAS requirements associated with Asbestos.
- November 3, 2022 – Reported only 1 RAS design submitted this season. No issues encountered although did take extra time to get through process with added asbestos testing requirement. Particularly noting the climate initiatives coming and that manufacturers are working to minimize mfg. waste, it was pointed out we should work on getting tear off shingles back in the program. Finally, a question was asked if there was enough data to show there are no issues with RAP surrounding toxicity testing. Can this be eliminated?

21-03 RAP Reset Update

- April 29, 2021 - Joe DeVol: Data will be sent out as soon as it's finalized. This may lead to new spec changes…Stay tuned.
- October 28, 2021 – Steve Davis to provide update. Steve Davis to set up a presentation with Adam Hand to go over RAP Reset study. Discuss potential changes resulting from this study at the next meeting.
- April 28, 2022 – Adam Hand presented findings at meeting on 4/7/2022 (see attachment), how will this information be used moving forward? Look into getting a new RAP Reset subcommittee together. (Higher RAP, RAP Reset modifications, Green HMA)
- November 3, 2022 – Logan Cantrell – Proposing bumping RAP to 50% and to get the ball rolling on a RAP Reset subcommittee to see how we can expand the use of RAP. Logan volunteered to do a trial very high RAP project. Dave Gent noted it would be good to stay ahead of the climate initiative wave which is pushing for higher use of recycled materials. Currently only 2 contractors using the existing high RAP any RAS specifications.

21-04 Tack Lab Test Failure Uptick

- October 28, 2021 – Steve Davis to provide update on an increasing number of Tack samples failing. Failed tests went from 3% in 2020 to over 18% in 2021 (7 of 38 failed). These are contractor provided samples out of the spray bars that appear to be contaminated samples rather than issues with the emulsion. How do we reign this issue in?
- April 28, 2022 – Failed Tack discussed at WAPA/WSDOT Joint Training held 3/3/2022. Review for 2022.
- November 3, 2022 – For 2022 this issue was cleaned up. Out of 71 samples there were 0 contaminated samples, 2 samples submitted in metal containers which is not allowed, 3 samples were submitted with insufficient quantity, and 2 samples were overdiluted. Still a couple of issues to clean up but the failure rate was greatly improved. This item will be removed from the next agenda.

21-05 Alternative Compaction Testing Methods

- October 28, 2021 – A question has been raised concerning different density testing methods such as electro-magnetic, Rolling Density Meter. A question also raised about using Method A in AASHTO T355. There are reliability concerns with the electro-magnetic test and the T355 Method A test so those are not going to be used. Kim would like to pilot RDM for bridge compaction as a possible alternative to bridge deck coring. Kim has applied for a State Transportation Innovation Council (STIC) grant.
- April 28, 2022 – Update on STIC grant for RDM on bridge decks. Have a list of projects, will be coordinating testing with the paving schedules. Update results in the fall meeting. Calibrating RDM with gyratory pucks and compare with cores.
- November 3, 2022 –WSDOT did collect data from 2022 and are evaluating. Plan to collect more data in 2023. Logan Cantrell noted they had done some testing with the RDM and identified issues with calibrating the RDM to the cores.

21-06 Indirect Tensile Strength Requirement

- October 28, 2021 – Request by Kentin to eliminate IDT until IdealCT implemented. Has there been any failures from IDT? Steve Davis noted the IDT is a test run that is counter to the Hamburg to ensure the mix is not too stiff. Verification compared back to the design. Need to keep this test. A question was raised about increasing the spec when different binder grade mixes are tested.
- April 28, 2022 – Steve noted IDT test will remain in place while research is being performed by WSU to determine appropriate limits for IDEAL CT. Update aging process based on results, expected in about a year. For IDT Logan noted need different IDT number depending on binder grade.
- November 3, 2022 – Update on the WSU study which is another year out from completion. An IdealCT spec will not be ready for at least a couple of years.

22-01 ASA & QPL Renewal Policy Suggestion

- April 28, 2022 – Discussion surrounding timelines for ASA and QPL approvals/renewals. 5-04.2(1) currently sets the timeline for inclusion on the QPL for a mix design as 24 months from date of initial approval. For renewals this tends to lead contractors to wait until expiration of the current design before pursuing renewal which can create issues. Suggestion would be to allow the contractor to begin renewal prior to expiration and setting the new period based on 24 months from the current expiration. Maybe tied to some timeline in advance of the expiration date, example would be if an approved mix design is reapproved within 60 or 90 days of expiration, the new expiration date will be 24 months from the current expiration date. This would encourage early submittal and may help with flexibility of the testing process.
- November 3, 2022 – See 22-02 a new subcommittee has been formed to look at ways to improve process. This item will be covered under 22-02 and will be deleted from the next agenda.

New Items:

22-02 HMA Mix Design Approval Process Subcommittee

- November 3, 2022 – Assembling a subcommittee to look at possible updates to WSDOT Standard Practice for HMA Mix Designs QC 8 or the Standard Spec's to address concerns with HMA mix design approval time frames taking longer than expected and address changes to process with DPS budget. Initial meeting was 11/2/22, follow up meeting 1/19/22.

22-03 HMA Compaction – Cyclic Density

- November 3, 2022 – A question has been raised regarding the use of Cyclic Density under 5-04.3(10)B. There seems to be limited evidence of use of the Cyclic Density item for jobs that require an MTD/V. Should cyclic density only be required for jobs where an MTD/V is not required under 5-04.3(3)D? No interest in making any adjustments at this time. The spec notes it is used at the Engineers discretion and this is a good just in case tool, particularly when no MTV/D is used. This will be removed from the next agenda.

22-04 Auto Samplers at HMA Plants AASHTO R97

- November 3, 2022 – The question surrounds where in the setup an auto sampler may be used. The current WSDOT FOP for AASHTO R97 notes "A mechanical sampling device installed between the discharge of the silo and the truck transport that is approved by the Regional Materials Engineer." There was discussion about this in 2016. Some plants have samplers prior to the silo's, there are concerns with tracking the mix representing that sample in those cases. WSDOT is open to more

discussion on this topic with the primary concern of being able to track what was tested to placement in the field, particularly on plants with silo's.

22-05 Density Accuracy

- November 3, 2022 – Logan brings up a couple of things on accuracy. One topic is that he's noting more often than not the agency test is testing low theorizing an unlevel surface or rock propping the gauge up. Recommends switching to Method A of 2 1 minute tests under AASHTO T 355 (currently not recognized by WSDOT. Also, would like ability to retest high shots, 100 plus. And proposing an adjustment to 5-04.3(10)C4 which limits retest request to noon the day following the sublot test result provided or made available and only allowed when the lot is running below 1.0. Proposing to remove the timing requirement allowing retest requests when the lot falls below 1.0 if at a later time. Method A was the old procedure, WSDOT worked with Troxler to change to the current procedure which is more accurate. Could be some training to ensure gauges are not rocking or sweep prior to initiating the test. WSDOT will touch bases with WAQTC training. WSDOT will also review the current specifications for coring low tests in lots at or above 1.0 and will look at how to handle very high test results.

22-06 Warm Mix Additives for High RAP Mix

- November 3, 2022 – Logan Cantrell – Noting 5-04.2(2)B does not allow using additives that reduce mixing temps for High RAP/Any RAS Mixtures. Notes that with coming Climate discussions this could be a good tool. WSDOT will revisit this spec.

22-07 Performance Testing for QA

- November 3, 2022 – Logan Cantrell - Explore the idea of moving away from gradations and volumetric testing and toward performance testing only in production. You don't have to run hamburgs, IDT run at high temp can give correlated result. This is the future and gives confidence that mix is going to perform, putting less focus on the mix design produced years ago and on the materials here and now. Could still use 1 box of mix to do rice, 2 high temp IDT, 2 CT tests. Also similar timeframe with 1-2 hours to get pucks done and another 1-2 hours to test. Less constituents to balance. Currently producing mix 0.4% below binder and at top end of dust might still be in spec but doubt would have good performance. Also would help verify quicker if right oil and constituents are added to the mix. Contractor would not try to bring factors into spec at the detriment of the mix (ie lowering oil to fall into spec from high oil to start). Steve Davis noted performance testing is coming but not ready yet. This topic will be removed from the next agenda until future date.

22-08 Fuel Price Escalation Clause

- November 3, 2022 – Kevin Waligorski to update group on planned updates to the Fuel Price Escalation clause GSP's. This will be removed from the next Agenda.

22-09 Sample Splitting Protocol

- November 3, 2022 – New topic for the next meeting

Additional information:

Kevin Waligorski did a quick update on e-Tickets. An FHWA sponsored Peer Exchange is scheduled for January 24-25 in Vancouver Washington. Currently looking at options to put together a portal system that will be able to bring in data from any e-ticket vendor. Options being considered include vendor supplied portal systems

including DOTSlip by HaulHub and Connex by Command Alcon (others?), also looking at developing own portal systems. Goal is to incorporate into Unifier – e-Construction process.

Jeff Crouse also brought up a discussion on "non-statistical" mix for use on Local Agency jobs, which is no longer in the current standard specifications. Non-statistical mix is still allowed for Local Agency jobs in the Local Agency GSP's.

SET DATE FOR NEXT MEETING –
Date:, April 13, 2023
Time: 9:00 – 12:00
Location: Hybrid – Looking into Potential Meeting Rooms.