Developments in Asphalt Testing and Specifications

(and other AI Updates)

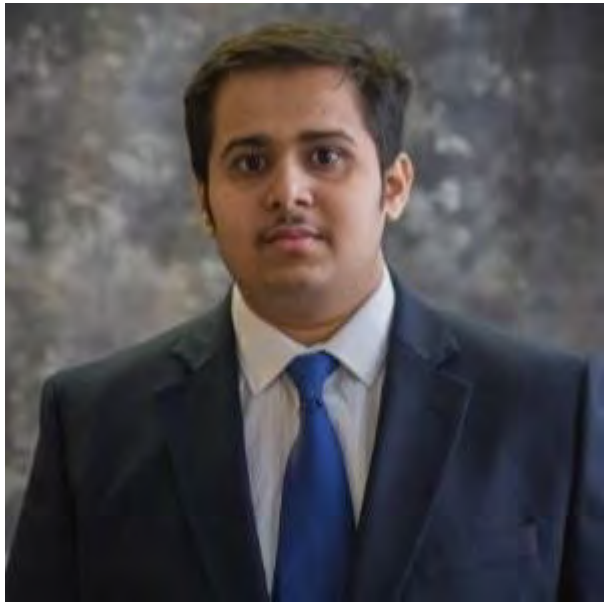
62nd ANNUAL CONFERENCE
January 17-19, 2022
The Hotel Hershey / Hershey, PA
Pennsylvania Asphalt Pavement Association

Gregory A. Harder, P.E.
Senior Regional Engineer
Asphalt Institute

gharder@asphaltinstitute.org

AI's New Sustainability Engineer

- Dr Chaitanya (Chait) Bhat, Ph.D., LCACP
  - Civil Engineering background: Michigan Tech. Univ.
  - Extensive experience in sustainability, with specialty in LCA
  - Previous position as consultant providing direct support to FHWA Office of Sustainable Pavements
  - Started Nov 15
  - Leading AI's sustainability programs
    - Including efforts to update and enhance AI's LCA for asphalt binders
      - Initial LCA published in Feb 2019
      - Possible EPD program on binders?



Military's Airfield Asphalt Certification Program, 3 Courses (http://airfieldasphaltcert.com/)

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AACP

The Airfield Asphalt Certification Program is intended to increase the quality of construction for work performed under the UFGS asphalt airfield specifications. The certification program will help to ensure that project team members are knowledgeable in the area of airfield asphalt pavements, with respect to specification and testing requirements, acceptance and quality control, as well as inspection during construction.

Inaugural course offering for Paving Inspector on Jan 25-28 at AI HQs in Lexington KY

Certifications

Lab Technician

The Airfield Asphalt Lab Technician Certification is required for personnel who are involved in sampling and testing of aggregates and asphalt mixtures during their production. Certified technicians are responsible for sampling materials and performing acceptance and QC tests on materials during construction. The Airfield Asphalt Lab Technician must be present in the laboratory any time laboratory testing is underway for airfield projects.

QC Manager

The Airfield Asphalt Pavement QC Manager Certification is required for personnel who oversee all QC testing and inspection, reviews asphalt pavement transmittals prior to submission to the Government, is responsible for making mix design adjustments, and in charge of all other quality related activities on an airfield asphalt paving project.

Paving Inspector

The Airfield Asphalt Paving Inspector Certification (under development) is required for personnel involved in inspecting airfield asphalt pavement projects. Certified inspectors are responsible for identifying any potential paving issues during construction and ensuring these issues are appropriately addressed by the Quality Control staff. The Airfield Asphalt Paving Inspector must be available on the project during all airfield paving operations.

Two AI Courses Specific to Latest FAA Standards

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1.5 days focused on P-401: materials, mix design, production, laydown, compaction, Q.C., acceptance

3 days on wider variety of airfield topics. Includes all the P-401 topics in APC, plus thickness design/evaluation, maintenance/preservation, rehab for airports.

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pic

The Asphalt Institute

Paving Inspector Certification Series

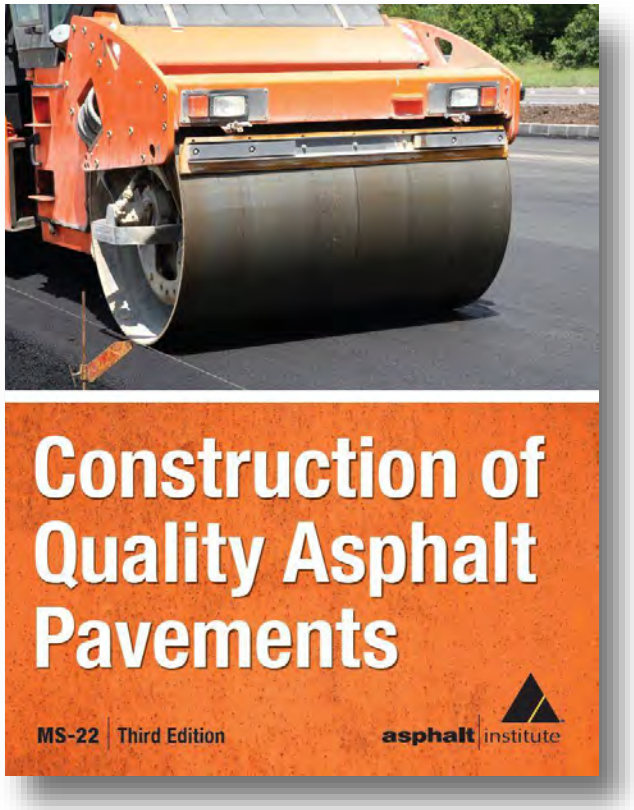
A Self-Paced Online Course

Why did we make PIC?

- Construction of high-quality asphalt pavement is the goal, and effective inspection plays key role.

- There is a large need for inspector training and certification on many levels:

- City, County, State, Federal, Contractor, Consultant
- Many new hires with little to no experience “thrown into fire”
- Demonstrate a level of understanding and competence



Asphalt Institute’s MS-22 “Construction of Quality Asphalt Pavements” naturally lends itself to asphalt pavement inspection training.

More on PIC

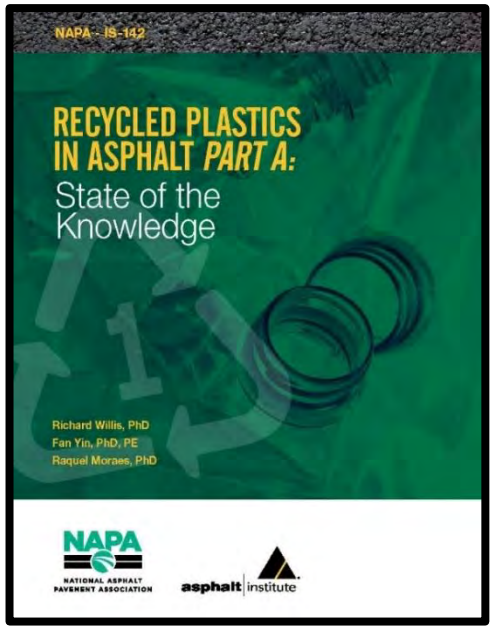
- **Course Outline (16 PDHs)**
  - Module 1: Inspector's Authority and Responsibility
  - Module 2: Materials
  - Module 3: Mixtures and Mix Design
  - Module 4: Plants & Production
  - Module 5: Transportation, Delivery, & Preparation
  - Module 6: Placement
  - Module 7: Compaction
  - Module 8: Acceptance and Testing
- **Each module roughly 90-120 minutes plus exam**
  - ppt slides with audio, exam
  - pass exam to proceed to next module

- **Orientation for new inspectors, augments knowledge of experienced inspectors**
- **Course fee: $495 *(includes e-copy of MS-22)***
- **Online since February 15, 2021**

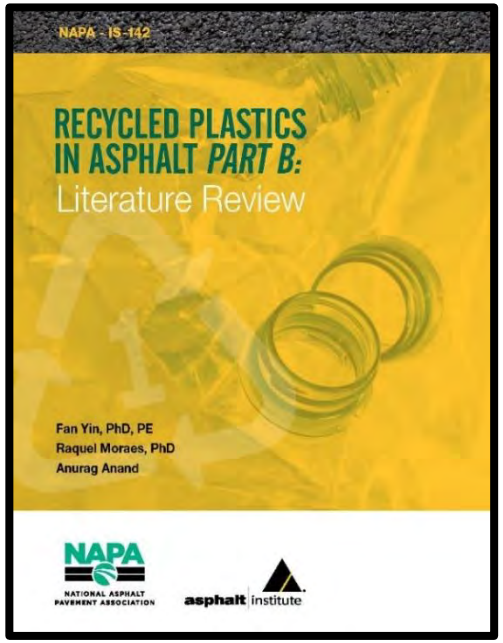
http://www.asphaltinstitute.org/training/seminars/paving-inspector-certification-pic/

Plastics in Asphalt - State of the Knowledge (NAPA and AI)

- Part A – 36 Page document
  - Introduction
  - Plastics Overview
  - Summary of Literature Review Findings
  - Knowledge Gaps and Future Research



- Part B – 145 page document
  - Literature review of all reports available on recycled plastics in asphalt



http://www.asphaltinstitute.org/engineering/plastics-in-asphalt/

ASPHALT article in Spring 2021 Edition

Learning More About Recycled Plastics in Asphalt Pavement

http://asphaltmagazine.com/

Developments in Asphalt Binder Tests and Specifications Resulting from National Research

Mike Anderson

NEAUPG Binder Committee Meeting

October 28, 2021

- NCHRP 20-44(19):
  “Implementation of Proposed AASHTO Standards for Asphalt Binders and Mixtures”
- Project Objectives
  - Facilitate actions needed to assure the timely adoption by the AASHTO Committee on Materials and Pavements (COMP) of the proposed AASHTO standards produced in the following NCHRP Projects:
    - **09-52, 09-54**, **09-56A**, **09-59**, **09-60**, and **09-61**
    - others later designated by NCHRP
- Project started May 1, 2020
- Expected completion by May 1, 2022

NCHRP 20-44(19) Research Implementation Team

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National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY


Mike Anderson


Randy West

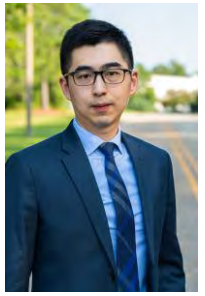

Mark Buncher


Bob Horan


Danny Gierhart


Jim Musselman


Raquel Moraes


Fan Yin


Pamela Turner

NCHRP 20-44(19) Activities

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- Tasks
  - Assess the technical basis for any new or revised AASHTO standards proposed in the research project.
  - Identify the gaps in supporting data that must be addressed before the proposed standards are submitted to COMP.
  - Identify and resolving any conflicts between the requirements of the various standards.
  - Assess the impact of the standard's adoption on state DOT and industry operations.
  - Prepare a consolidated report with commentary and conduct presentations.
  - Provide technical support to COMP during review and balloting.
  - Prepare and submit final report.

Tasks 1-4

Table 2. Working Group Assignments for Review of Individual Projects

Project No.	Title	Research Implementation Team Working Group Leaders
09-52	Short-Term Laboratory Conditioning of Asphalt Mixtures	Randy West, Lead Jim Musselman, Support
09-54	Long-Term Aging of Asphalt Mixtures for Performance Testing and Prediction	Fan Yin, Lead Raquel Moraes, Support
09-56A	Identifying Influences on and Minimizing the Variability of Ignition Furnace Correction Factors	Danny Gierhart, Lead Bob Horan, Support
09-59	Relating Asphalt Binder Fatigue Properties to Asphalt Mixture Fatigue Performance	Mike Anderson, Lead Mark Buncher, Support
09-60	Addressing Impacts of Changes in Asphalt Binder Formulation and Manufacture on Pavement Performance through Changes in Asphalt Binder Specifications	Mike Anderson, Lead Mark Buncher, Support
09-61	Short- and Long-Term Binder Aging Methods to Accurately Reflect Aging in Asphalt Mixtures	Raquel Moraes, Lead Pamela Turner, Support

Asphalt Binders: Improved Aging and Characterization of Asphalt Binder Fatigue and Durability

- NCHRP 09-59
  - Relating Asphalt Binder Fatigue Properties to Asphalt Mixture Fatigue Performance
- NCHRP 09-60
  - Addressing Impacts of Changes in Asphalt Binder Formulation and Manufacture on Pavement Performance through Changes in Asphalt Binder Specifications
- NCHRP 09-61
  - Short- and Long-Term Binder Aging Methods to Accurately Reflect Aging in Asphalt Mixtures

NCHRP 09-59

- Relating Asphalt Binder Fatigue Properties to Asphalt Mixture Fatigue Performance
  - Don Christensen (PI, AAT) and Nam Tran (NCAT)

Glover Rowe Parameter - 5000kPa (20 hrs) ; 8000 kPa (40 hrs)

R-Value - 1.5 – 2.5 ; (or maybe Delta Tc)

Zube and Skog: "Final Report on the Zaca-Wigmore Asphalt Test Road"

- 1969 AAPT Paper
- Relevance to PG Specification
  - From SHRP Report A-367 (Pages 36-37):
    - "At the suggestion of the A-003A researchers, and in light of an **evaluation of the fatigue performance in field trials such as Zaca-Wigmore** (figure 2.22), the fatigue criterion was changed to reflect the energy dissipated per load cycle. Dissipated energy in a dynamic shear test is appropriately **calculated as G*sin δ** (Ferry 1980)."

Zube and Skog:
"Final Report on the Zaca-Wigmore Asphalt Test Road"

2. Two main types of failure during service life were encountered on the project. The most prevalent was fatigue cracking as displayed by wheel track "alligator" type cracking. The other was a large block type cracking together with pitting and raveling. This was most prevalent in the passing lane. The amount of fatigue type cracking appears to be related to the consistency of the recovered asphalt as measured by penetration and viscosity. The other form of cracking appears to be related to the gain in shear susceptibility during weathering. This is also indicated by a marked drop in ductility during service life. This form of cracking, as found on this test project appears to be the same as that encountered by P. C. Doyle, reference (4), on other test roads.

- Fatigue Cracking
  - Related to recovered asphalt binder consistency (i.e., stiffness)
- Block Cracking with Raveling
  - Weathering characterized by drop in ductility (i.e., viscoelastic behavior)

Zube and Skog:
"Final Report on the Zaca-Wigmore Asphalt Test Road"

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- Fatigue Cracking **$G^* \sin \delta$**
  - Related to recovered asphalt binder consistency (i.e., stiffness)
- Block Cracking with Raveling **n/a**
  - Weathering characterized by drop in ductility (i.e., viscoelastic behavior)

Zube and Skog:
"Final Report on the Zaca-Wigmore Asphalt Test Road"

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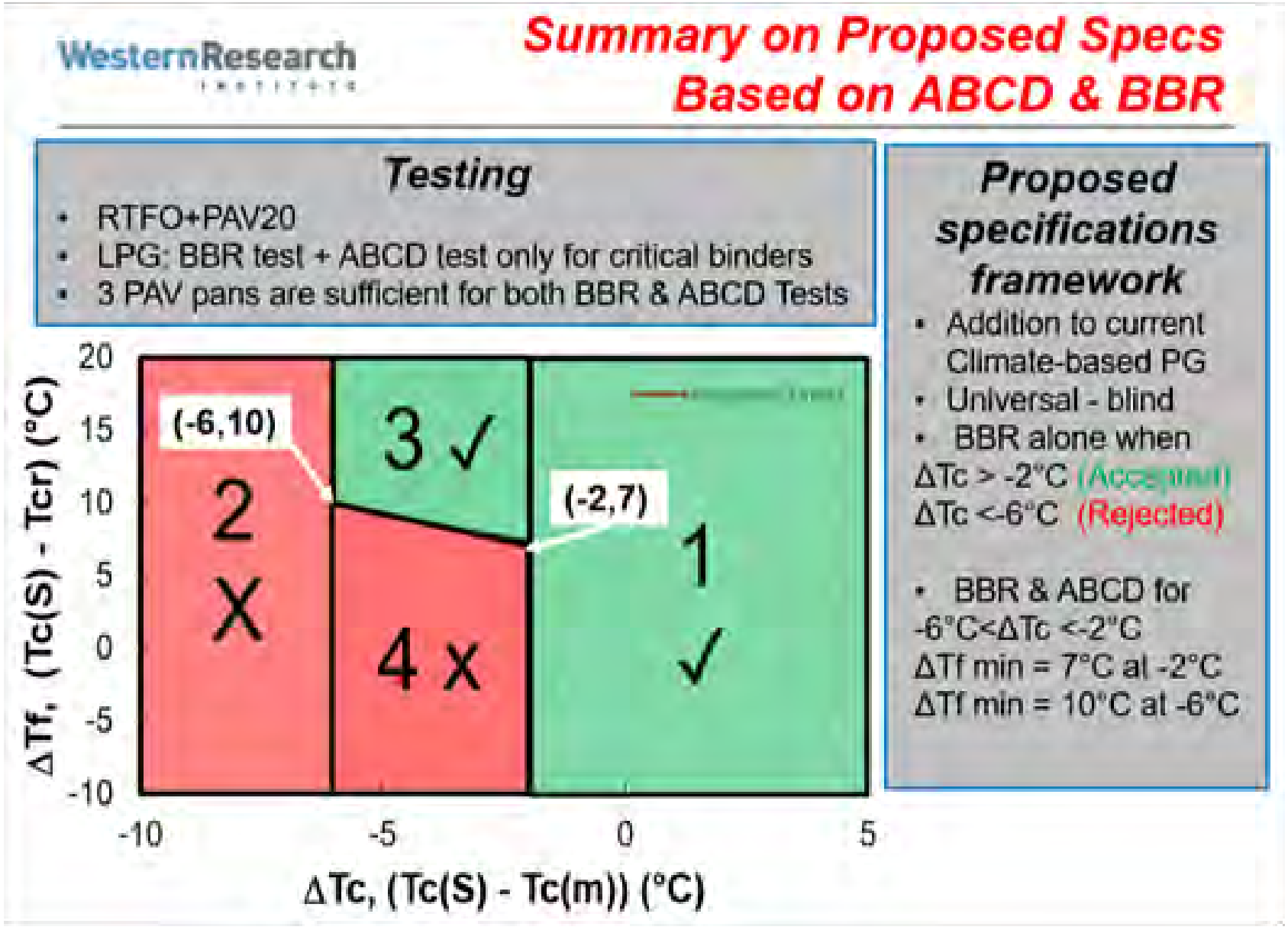
- Fatigue Cracking **GRP**
  - Related to recovered asphalt binder consistency (i.e., stiffness)
- Block Cracking with Raveling **R-value**
  - Weathering characterized by drop in ductility (i.e., viscoelastic behavior)

NCHRP 09-60

- Addressing Impacts of Changes in Asphalt Binder Formulation and Manufacture on Pavement Performance through Changes in Asphalt Binder Specifications
  - Jean-Pascal Planche (PI, WRI), Michael D. Elwardany (WRI), Donald Christensen (AAT), Gayle King (Consultant), Carolina Rodezno (NCAT),and Snehalata Huzurbazar (Consultant/Statistician)

NCHRP 09-60


WesternResearch
INSTITUTE
Summary on Proposed Specs
Based on ABCD & BBR
Testing
• RTFO+PAV20
• LPG: BBR test + ABCD test only for critical binders
• 3 PAV pans are sufficient for both BBR & ABCD Tests
Proposed specifications framework
• Addition to current Climate-based PG
• Universal - blind
• BBR alone when
ΔTc > -2°C (Accepted)
ΔTc <-6°C (Rejected)
• BBR & ABCD for
-6°C<ΔTc <-2°C
ΔTf min = 7°C at -2°C
ΔTf min = 10°C at -6°C
(-6,10)
(-2,7)
3 ✓
2
X
4 X
1
✓
20
15
10
5
0
-5
-10
-10
-5
0
5
ΔTf, (Tc(S) - Tcr) (°C)
ΔTc, (Tc(S) - Tc(m)) (°C)

NCHRP 09-60

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- ABCD
  - AASHTO T 387
  - Summary of Method
    - Asphalt binder is heated and poured into silicone mold with strain gauge
    - Sample is cooled at a constant rate
      - From 20°C to 0°C in 30 minutes
      - From 0°C to cracking temperature at a rate of 20°C/hr
    - Sample cracks when jump in strain appears
      - T_{cr} is temperature at which that jump occurs
    - The ABCD equipment is not widely available commercially at this time.
    - Estimated equipment cost is likely to be in the range of $40,000 to $50,000.

NCHRP 09-60

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- ABCD

Figure 2: ABCD setup: Temperature Chamber; Filled & Empty Ring (King, 2007).

NCHRP 09-61

- Short- and Long-Term Binder Aging Methods to Accurately Reflect Aging in Asphalt Mixtures
  - Ramon Bonaquist (PI, AAT), Jeramie J. Adams (WRI), and David A. Anderson (Consultant)

    - Continue to use RTFO for short-term aging of asphalt binders
    - If 20-hour PAV is to be used then no changes recommended
    - If longer aging simulation is required then instead of 40-hour PAV using 50 grams of asphalt binder at 90, 100, or 110°C use 20-hour PAV with 12.5 grams of asphalt binder at varying temperature based on high and low pavement temperature.

Optimal Timing For Chip Seal Application- A Binder Aging Study In NY

Asphalt Institute Annual Meeting

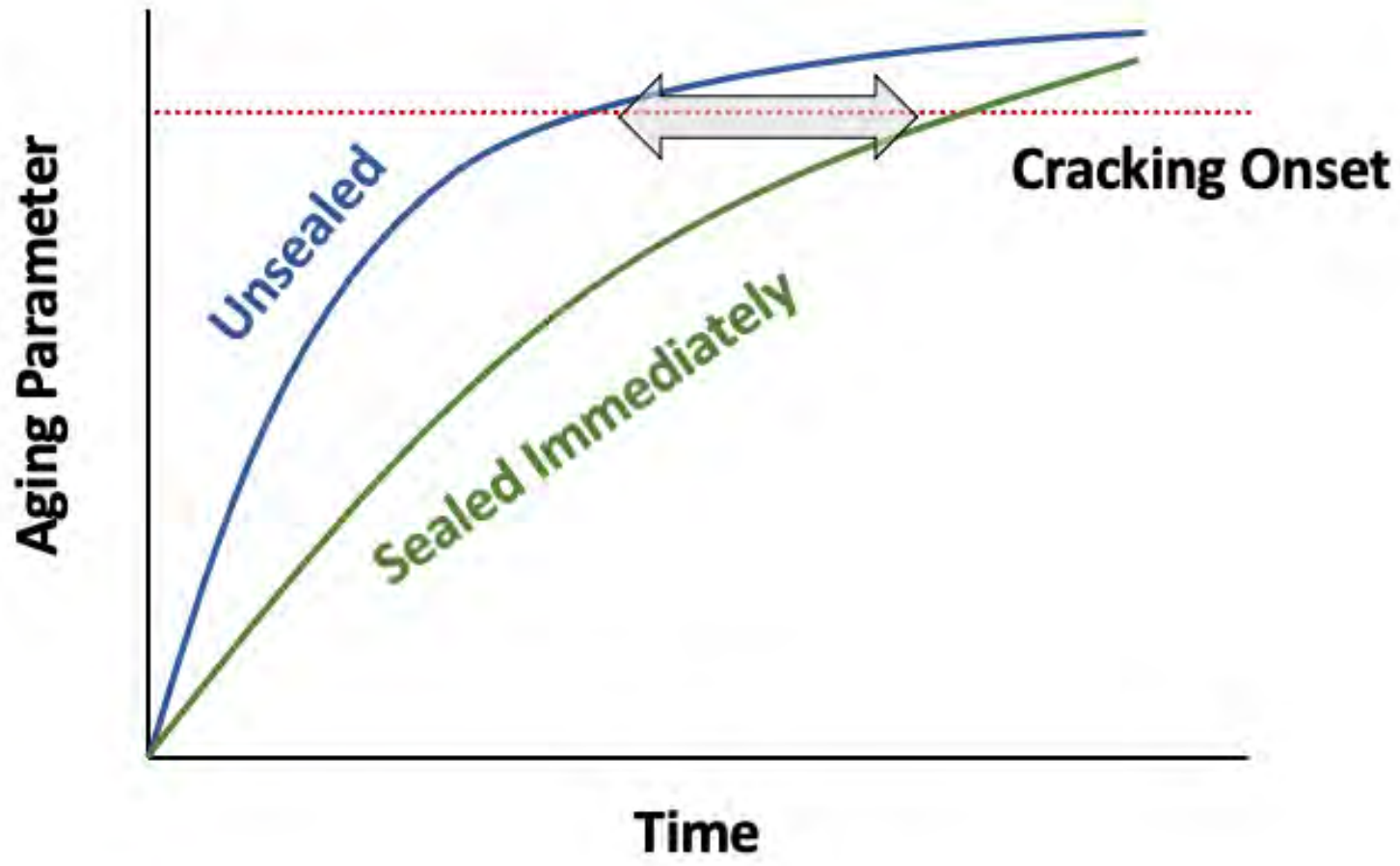
Affiliate Committee

Tucson, AZ – Dec. 7, 2021

Gregory A. Harder, P.E.

Suit-Kote®

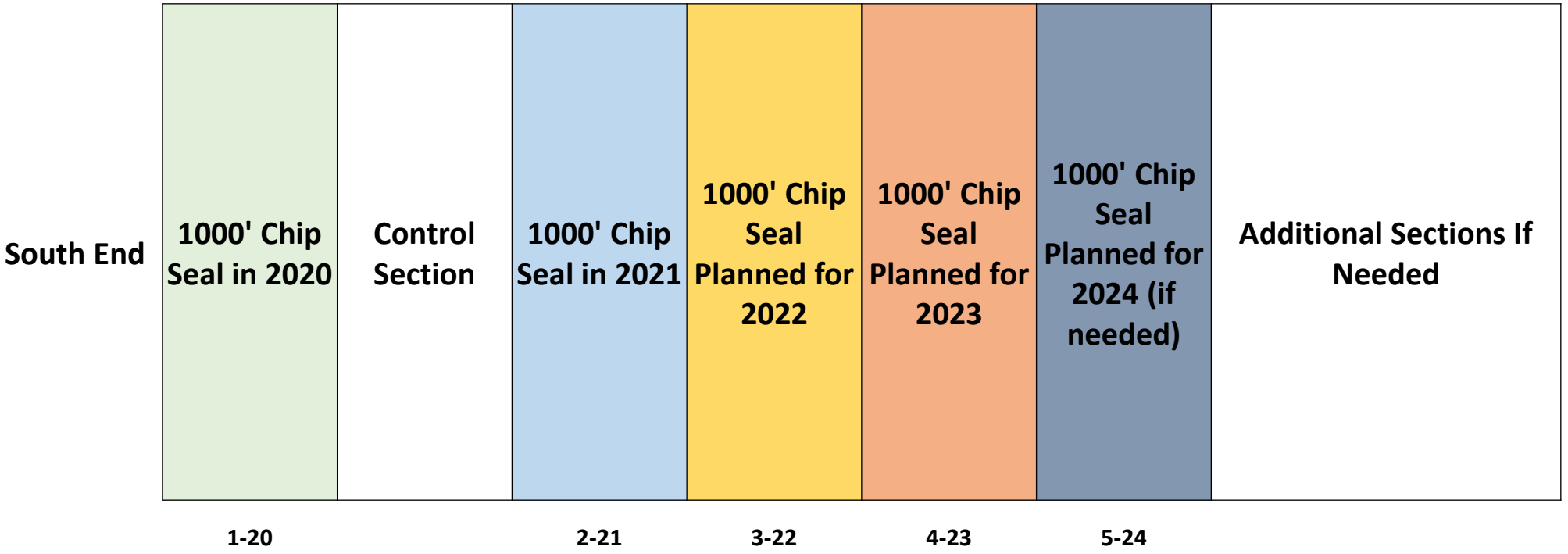
Conceptual Approach to Timing Preventive Maintenance



NYSDOT Rt. 11 Project Details

- 8.2 miles in length
  - 3-4 inches of CIPR (2019)
  - 1 inch of scratch course (2019)
  - 1 ½ inches of 9.5 mm HMA with PG 64V-22 (2020)
- 1st chip seal placed shortly after placement of wearing course
- 2000 AADT with 10% trucks

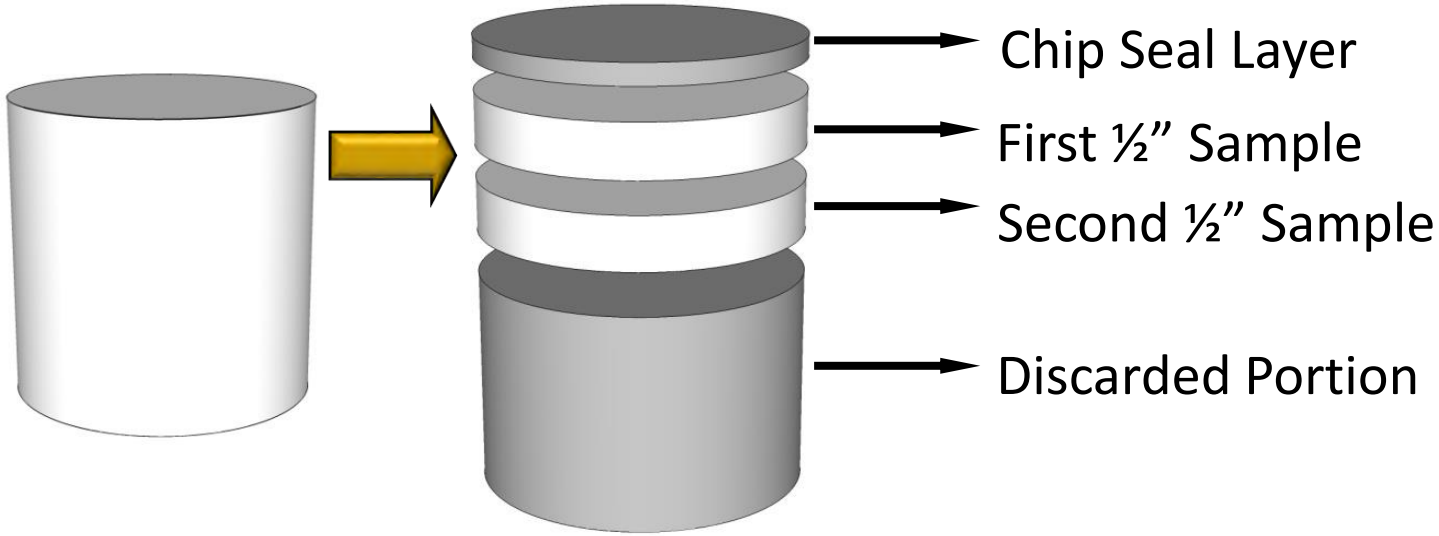
NYSDOT ROUTE 11 SITE LAYOUT



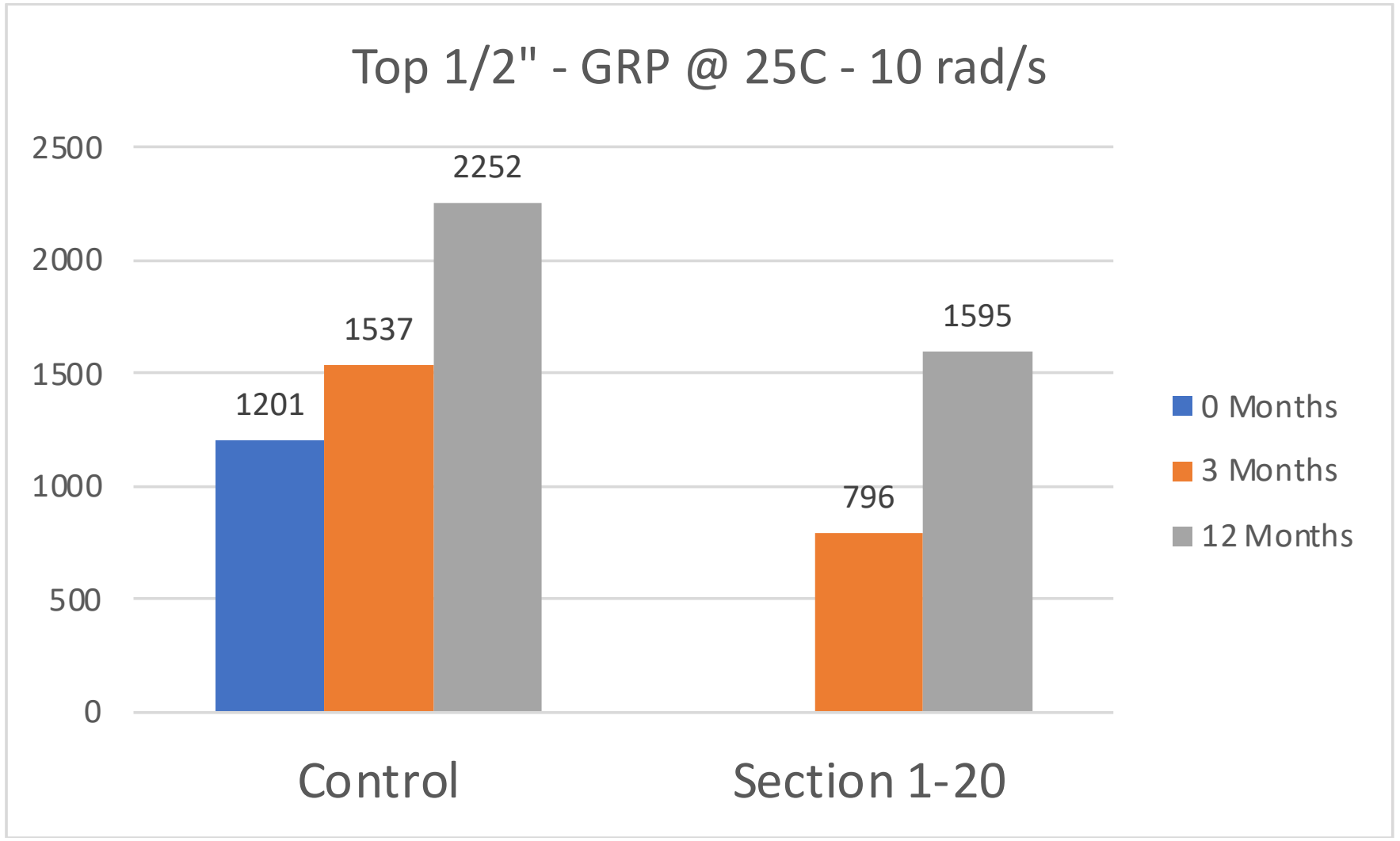
HFRS-2P with a fog and sand application

Testing

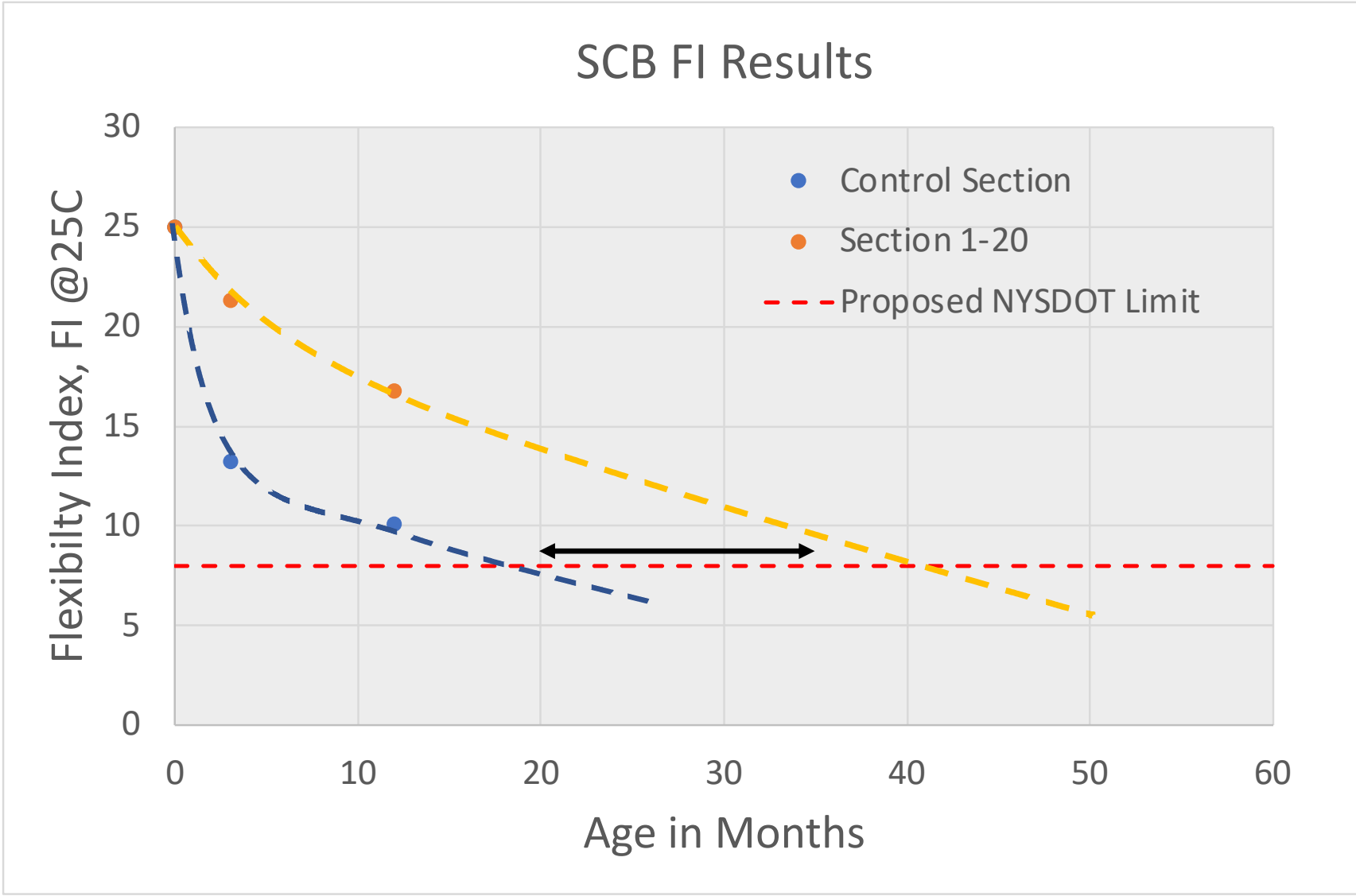
- Cores were taken at 0 , 3, and 12 months
- Recovered binder testing on the top ½” and the next ½” of the cores (chip seal removed)
- Mixture crack testing performed on the 1 ½” overlay (chip seal removed)

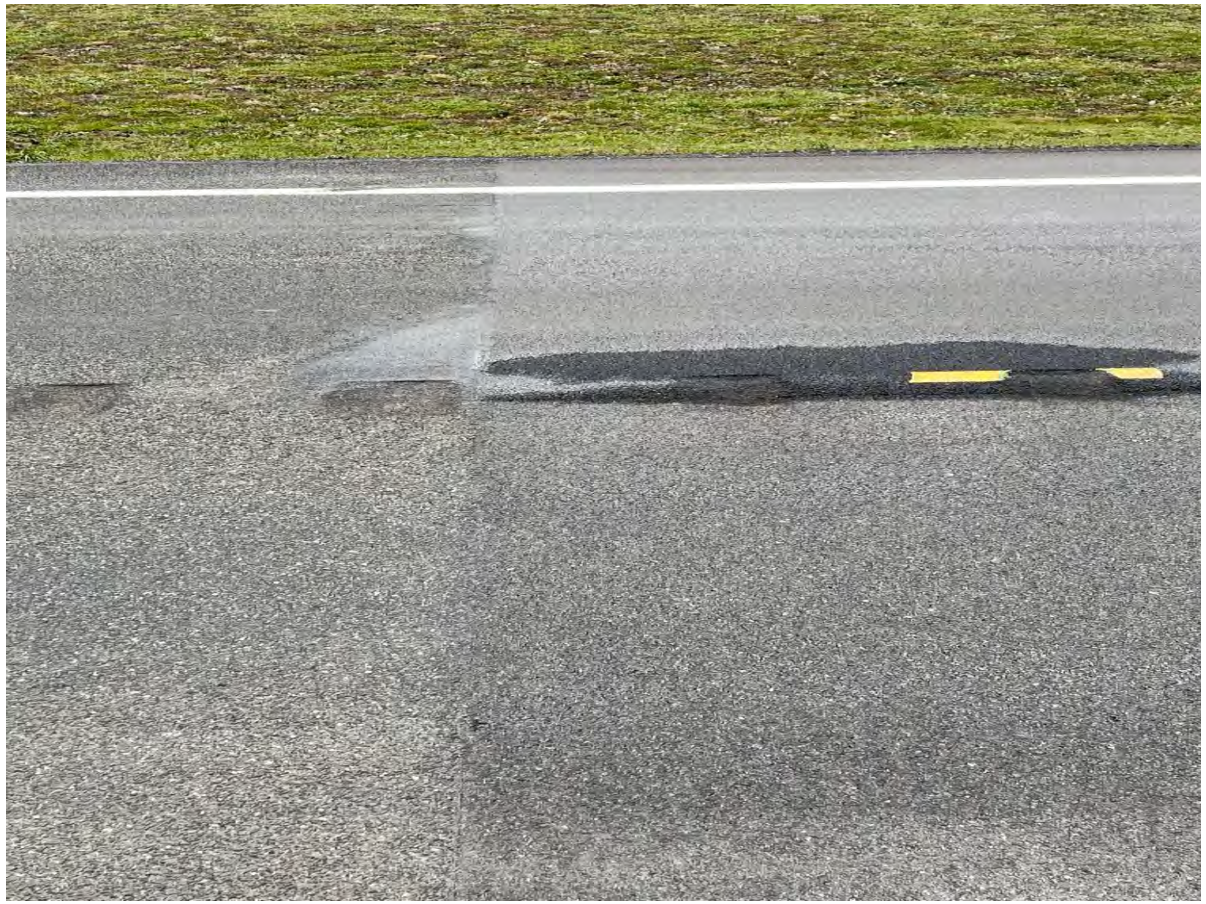


GRP


Top 1/2" - GRP @ 25C - 10 rad/s
2500
2000
1500
1000
500
0
1201
1537
2252
796
1595
Control
Section 1-20
0 Months
3 Months
12 Months

FI Results


SCB FI Results
Flexibilty Index, FI @25C
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Age in Months
Control Section
Section 1-20
Proposed NYSDOT Limit



2022-26 Paving Program Resource Needs

	2019 Program Level	2022-2026
Lane miles (LM) Resurfaced	2,445	3,221
LM Renewal / % of Program	122/5%	966/30%
LM Correct. Maint. / % of Program	1,149/47%	1,546/48%
LM Prevent. Maint. / % of Program	1,149/48%	709/22%
Paving Cycle (Years)	15.7	12.0
Avg. Treatment Life (Years)	9.4	12.0
Resource Needs ($millions)	431	1,188

Courtesy of Fred Hiffa

Thank you

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Husky Asphalt

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Jebro Inc.
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MATHY CONSTRUCTION CO.
OWENS CORNING
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MOUNTAIN STATES ASPHALT INC.
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safety-kleen
sasol
Shrieve
Sprague Our Energy Makes the Difference
TSRC Specialty Materials LLC
ULTRAPAVE, CORP.
UniqueChemicalSolutions.com
Vitol
ZE ZENITH ENERGY

Thank you

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