ETF AGENDA

2:00 p.m. – 2:05 p.m.	**1. Welcome & Status Review**	**Franco**
2:05 p.m. - 2:20 p.m.	**2. NCHRP 9-63 Update**	**Anderson**
2:20 p.m. – 2:35 p.m.	**3. Messaging & Implementation Subcommittee Update**	**Tomkins**
2:35 p.m. – 2:50 p.m.	**4. National Certification & Training Education**	**Franco**
2:50 p.m. – 3:00 p.m.	**5. Quality Assurance**	**Franco**
3:00 p.m. – 3:15 p.m.	**6. Rejuvenators**	**Tabatabaee**
3:15 p.m. – 3:30 p.m.	**7. ETF Realignment**	**Franco, Lubbers**
3:30 p.m.	**Adjourn**	

TSP2 EMULSION Task Force

Agenda Item1

Welcome & Status Review

Colin A. Franco, P.E.
Rhode Island DOT

TSP2 EMULSION Task Force

ETF – Original Mandate

A. Develop Performance Based Methods and Specifications for Emulsions (SPG)

1) Develop a Surface Performance Grade Specification for Emulsion Binders (SPG)
2) Develop Performance Based Specifications for Emulsion Treatments in AASHTO Format
    - Materials (M) - Specifications and Tests
    - Materials (R) - Design Practices
    - Construction - Guide Specs
    - QA Specifications

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ETF – Original Mandate (Cont.)

B. Encourage Adoption of Uniform National Specifications by DOTs/Local Agencies

1) AASHTO -
   - TSP·2 Regional Partnerships
   - Committee on Materials and Pavements
   - Committee on Maintenance
2) FHWA – Pavement Preservation ETG
3) TRB (Webinars)
4) Industry / Academia (Workshops & Webinars)

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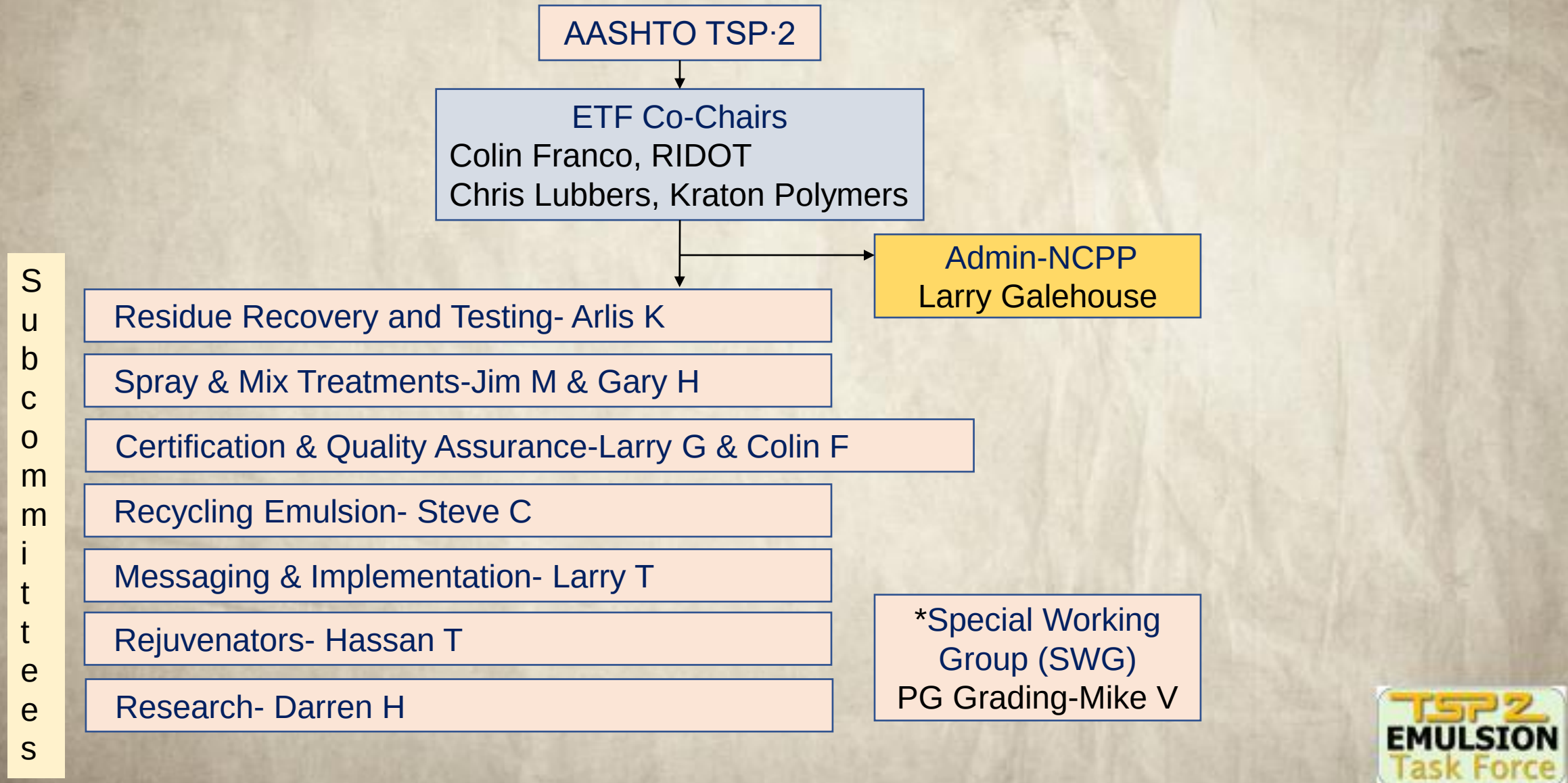
Emulsion Task Force Organization



Accomplishments – Emulsion Treatment Standards

Status: AASHTO Emulsion STDs (2019)

	AASHTO STANDARDS						
Emulsion Treatments	**M / MP**	**T / TP**	**R**	**W/ COMP**	**QA Specs**	**Construction Guide Specs**	**Best Practices**
Chip Seal	MP27-16		PP 82-16		P Approved	P Approved	Draft
Micro Surfacing	MP28-17		PP 83-16		P Approved	P Approved	Draft
Tack Coat	MP36-18		PP 93-18			NCHRP 14-44	
Fog Seal	MP33-17		PP 88-17			P Approved	
Scrub Seal	MP43=20		PP 91-18			NCHRP 14-44	
Sand Seal	MP34-18		PP 90-18			NCHRP 2022	
Slurry Seal	MP32-17		PP 87-17		P Approved	NCHRP 14-44	
Foam Asphalt Stabilization			PP 38-18			*See CRM	
Bonded Surface Treatments (Nova Chip)	MP44-20		PP 100-20			NCHRP 2022	
Cold Recycled Mixtures (CRM)	MP31-17		PP86-17			NCHRP 9-62 / D-07 NCHRP 14-43	

Emulsion Binder Standards	**M / MP**	**T / TP**	**R**	**W/TRB**
Emulsified Asphalt	M140-16			
Cationic Emulsified Asphalt	M208-16			
Polymer-Modified Cationic Emulsified Asphalt	M316-16			
Emulsion/Surface Performance Grades (E/SPG)				NCHRP 9-63

Legend

M=Material Specs

T=Test Methods

R=Design Practices

P=Provisional

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Mandate A – Part 1
Emulsified Asphalt SPG Specification

- The ETF Special Working Group (M. Voth) developed a draft Emulsified Asphalt Performance Grade (EAPG) specification.
  - Based on work by Drs. A. Epps, Texas A&M and R. Kim, NC State
- This draft was the basis for project NCHRP 9-63, “A Calibrated and Validated National Performance-Related Specification for Emulsified Asphalt Binder”.
- PI is Mike Anderson, Asphalt Institute and teamed with NCAT.
- The project will formally validate the EAPG specification.

TSP2 EMULSION Task Force

EAPG Draft Specification

Table 1 - Performance Graded Emulsified Asphalt Specification

Performance Grade	EPG 49				EPG 55					EPG 61				
	-25	-31	-37	-43	-19	-25	-31	-37	-43	-19	-25	-31	-37	-43
Average 7-day max pavement surface design temperature[a], °C	< 49				< 55					< 61				
Min pavement surface design temperature[a], °C	> -25	> -31	> -37	> -43	> -19	> -25	> -31	> -37	> -43	> -19	> -25	> -31	> -37	> -43
Tests on Residue Recovered Using AASHTO R 78, Procedure B														
High Temperature Performance Parameter														
Dynamic shear, T 315: G*/sinδ, min 0.65 kPa, test temp @ 10 rad/s, °C	49				55					61				
Low Temperature Performance Parameter														
Critical phase angle, δ_C, degree	45	42	39	36	48	45	42	39	36	48	45	42	39	36
DSR Temperature Frequency Sweep, NCHRP Report 837	5°C, 15°C, and 25°C													
Low[b] traffic max G* at δ_C, MPa	30	30	30	30	30	30	30	30	30	30	30	30	30	30
High[c] traffic max G* at δ_C, MPa	20	20	20	20	15	20	20	20	20	15	20	20	20	20
OPTIONAL: polymer identification parameter														
Max. phase angle[d] (δ) @ temp. where G*/sin δ = 0.65 kPa	–	–	84[e]	84[e]	–	–	84[e]	84[e]	84[e]	–	84[e]	84[e]	84[e]	84[e]

a Temperatures are at the surface of the pavement structure. These may be determined from experience or may be estimated using equations developed by SHRP or LTPP, but modified to represent surface temperatures. Surface-grade high temperatures are generally 3°C to 4°C greater than those determined for Superpave PG binders.

b Low traffic is defined as any roadway with an AADT between 0 and 1000 vehicles.

c High traffic is defined as any roadway with an AADT between 1001 and 20,000 vehicles.

d Phase angle is determined at the temperature where G*/sin δ =0.65 kPa. For routine testing and quality assurance, the phase angle can be interpolated from testing at two temperatures, one above and one below where G*/sin δ=0.65 kPa

e If required by the buyer, change to 80° for SBS/SB modified emulsions.

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Mandate A Part 1 (Continued)
Revised Emulsion Binder Standards

The ETF revised and received approval for three emulsified asphalt standards to AASHTO COMP – Technical Subcommittee 2a

- M 140-16 Standard Specification for Emulsified Asphalt
- M 208-16 Standard Specification for Cationic Emulsified Asphalt
- M 316-16 Standard Specification for Polymer-Modified Emulsified Asphalt

Mandate A Part 2
New Emulsion Treatment Standards

1. The ETF developed AASHTO Materials specs and Materials Design Practices for all emulsion treatments
2. ETF initiated NCHRP 14-37 - Construction Guide Specs were developed and received approval from AASHTO COMP – TS 5b
   - Construction Guide Specification for Emulsified Asphalt Chip Seals
   - Construction Guide Specification for Hot Applied Chip Seal
   - Construction Guide Specification for Micro surfacing
   - Construction Guide Specification for Fog Seal

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New Emulsion Treatment Standards (Continued)

The ETF drafted and received approval for two Quality Assurance (QA) Standards to AASHTO COMP – TS 5c

- (QA) Guide Specification for Emulsified Asphalt Chip Seals
- (QA) Guide Specifications for Slurry Systems

Accomplishments – Best Practices

The ETF has completed Drafts of two Best Practices Publications.

- Emulsified Asphalt Chip Seals
- Micro Surfacing

Note:

1. These Publications include the latest research and addresses the recently approved AASHTO Standards.
2. These will form the basis of the Messaging and Implementation Program, NCHRP 20-44(26).

Remaining Work

1. Develop Construction Guides and Quality Assurance standards for:
    a. Cold In-place Recycling - NCHRP 14-43
    b. Sand Seals - NCHRP 14-44
    c. Scrub Seals - NCHRP 14-44
    d. Ultra Thin Bonded Wearing Course - NCHRP 2022

Note:

All remaining Construction Guide Specs will be developed through the NCHRP program.

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Remaining Work (Continued)

2. Develop specifications for Bio-based & Petroleum-based asphalt rejuvenators - NCHRP 2022.
3. Encourage state DOTs and local agencies to use the new PP AASHTO Standards for Emulsion Treatments:
   - Pavement Preservation Materials AASHTO Standards
   - Construction Guides and Quality Assurance Standards
   - New Test Methods

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Remaining Work (Continued)

4. Work with state DOTs and local agencies to implement and host demonstration projects using the new AASHTO specifications.
    - NCHRP Project 20-44(26)
5. Research and develop new “Performance Related Tests” to support new standards
6. Education, Training and “National Certification”

ETF Research Initiatives

A. New research proposals status:
   1. Rejuvenating Sealers in Emulsions – NCHRP 2022
   2. Construction Guide Specs For Ultra Thin Bonded Overlays - NCHRP 2022

B. NCHRP 20-44(26) - Project for implementation of AASHTO Standards
   - Implement Construction Guide Specifications Chip Seals, Fog seals and Micro Surfacing

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Agenda Item 2

NCHRP 9-63 Update

Mike Anderson, P.E.

Asphalt Institute

TSP2 EMULSION Task Force

Acknowledgments

- National Cooperative Highway Research Program (NCHRP)
  - NCHRP 09-63 Panel Members
- AASHTO TSP·2 Emulsion Task Force
- Research Teams
  - NCHRP 09-50 Research Team
    - Dr. Y. Richard Kim
  - Texas A&M Research Team
    - Dr. Amy Epps Martin
- Member Companies of the Asphalt Institute

Project Objectives

- Develop a national performance-related material specification for emulsified asphalt binder for use with chip seals and microsurfacing/slurry seals that:
  a) is similar in concept and format to AASHTO M320 and M332
  b) is calibrated and validated with performance data from field test sections
  c) uses readily available testing equipment (i.e., Superpave test equipment)
  d) reflects varying climatic and traffic conditions

TSP2 EMULSION Task Force

NCHRP 09-63 Project Team

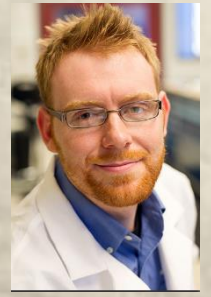
National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY

asphalt institute

Mike Anderson
Principal Investigator

Adriana Vargas
Lead Research Engineer

Greg Harder
Research Engineer



Wes Cooper
Lab Manager

Mike Beavin
Research Technician

Raquel Moraes
Research Engineer

Buzz Powell
Research Engineer

Pamela Turner
Research Engineer

TSP2 EMULSION Task Force

Phase 1 – Preliminary EPG Specification

- Starting point was draft Performance Graded Emulsified Asphalt Specification (EPG) developed by the AASHTO TSP·2 Emulsion Task Force (ETF)
  - A blend of specification systems proposed by the North Carolina State research (from NCHRP Report 837) and the Texas A&M research (from the Texas DOT report)
  - Supported by analysis of round-robin testing conducted by a working group of the ETF

Phase 1 – Preliminary EPG Specification

- Considerations for Recovery Procedure
  - AASHTO R78, Procedure A
    - Has been used in Europe successfully (as European standard EN 13074).
    - Starts the emulsion sample at ambient temperature to allow most of the moisture to come out before elevating the temperature to 60°C.
    - Concern is that in AASHTO R78, Procedure B the sample is immediately exposed to 60°C which can cause some emulsions to skim over and not effectively allow all moisture to escape by the end of the allotted time (6 hours).

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Phase 1 – Preliminary EPG Specification

- Considerations for Recovery Procedure
  - AASHTO R78, Procedure B
    - Texas A&M research appears to indicate that the AASHTO R78 Procedure B is the best procedure to produce residue close to that which would be obtained in the field at a reasonable time (6 hours).
    - Residue obtained using Method A produced higher values of G*/sin δ and therefore higher $T_{c,high}$ values than the residue obtained from Method B.
      - Hypothesized that the extended time the sample is maintained at an elevated temperature of 60°C in Method A is the factor affecting the results.

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Phase 1 – Preliminary EPG Specification

- Considerations for Recovery Procedure
  - Vacuum Recovery
    - ASTM D7944-15, “Standard Practice for Recovery of Emulsified Asphalt Residue Using a Vacuum Oven.”
    - Quicker testing time (2 hours) at 60°C
    - Potentially better reproducibility (i.e., less affected by testing factors)
  - High Temperature Evaporation
    - AASHTO T59, Section 7
    - Three total hours at 163°C (2 hours, stirred, one additional hour)

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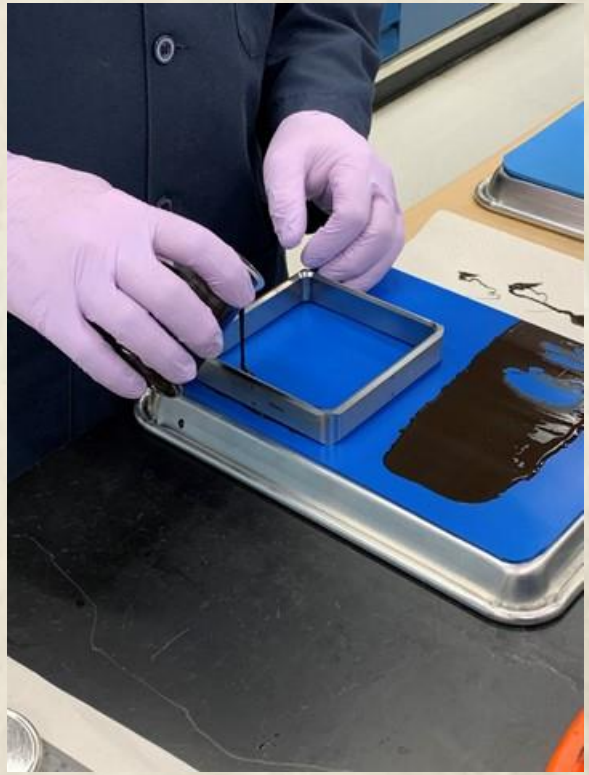
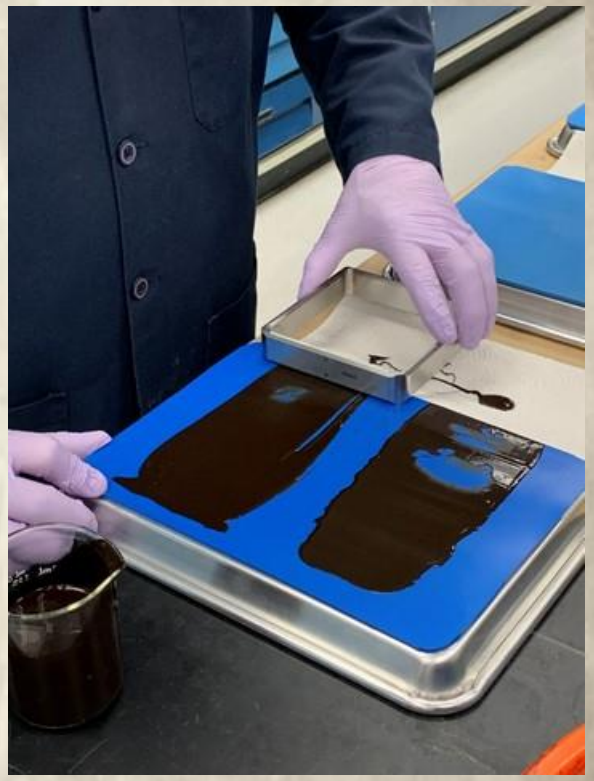
ASTM D7944



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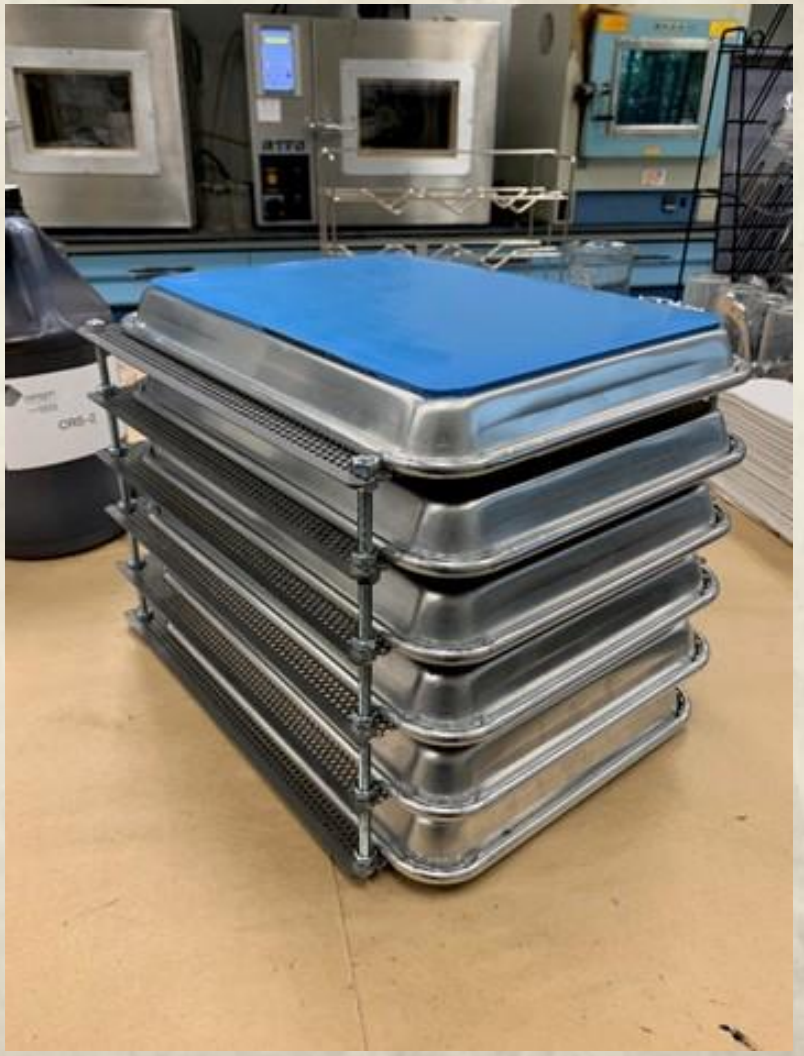
ASTM D7944



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Selection of Recovery Procedure for Draft EPG Specification

- The selected residue recovery procedure for the EPG specification will need to consider: (a) the similarity of the recovered residue to that obtained in the field; and (b) the impact of the residue recovery procedure on lab operations and testing variability.
  - Lab residue that is not representative of the field residue will make it difficult to definitively tie performance to the required specification parameters and values.
  - Lab residue that is difficult to obtain – both due to time and operational constraints – will make it less likely that the procedure will be followed precisely, potentially leading to higher testing variability.

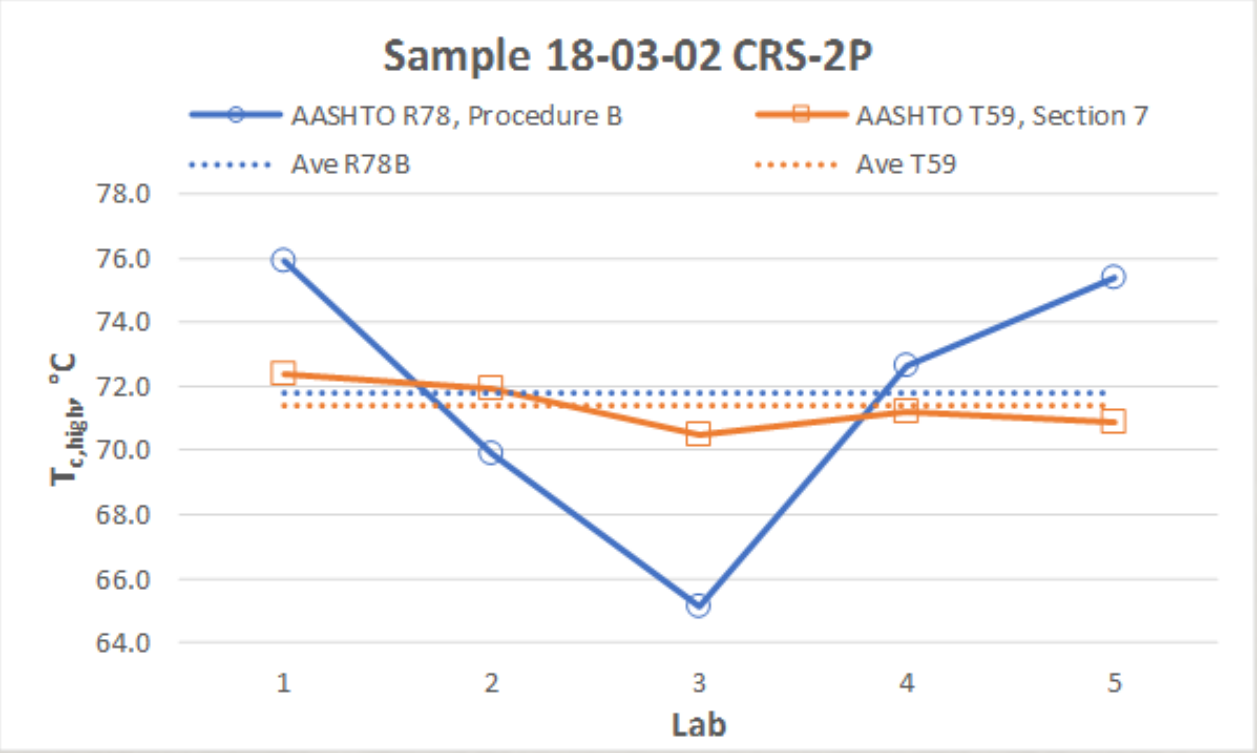
TSP2 EMULSION Task Force

Selection of Recovery Procedure for Draft EPG Specification

- AASHTO R78, Procedure B
  - Both the Texas A&M and North Carolina State research teams chose this procedure in their draft specifications
  - Validate and include work to improve the procedure to reduce between-lab variability

AASHTO TSP·2 ETF Round-Robin Testing

- Round-robin testing highlighted variability concerns with residue recovery
  - Mixed results, but often showed much higher variability than expected



Draft EPG Specification

- High Temperature Parameter in Draft Specification
  - Selected the SPG high temperature parameter (Texas A&M)
    - G*/sin δ criterion appeared to provide adequate discrimination
    - Variability known to be lower than variability from MSCR test, irrespective of any variability due to the residue recovery procedure
  - Continue to evaluate MSCR J_{nr} as possible high temperature parameter
    - Some agencies have already transitioned to AASHTO M332 for paving grade asphalt binders; more expected in the future

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Draft EPG Specification

- High Temperature Testing on Recovered Residue
  - Determination of G*/sin δ
    - Testing Details
      - Perform in accordance with AASHTO T315
      - 25-mm parallel plate geometry, 1-mm gap, 12% shear strain
      - Temperature sweep starting at 55°C and proceeding in 6°C increments until failure (the point where G*/sin δ is less than 0.65 kPa)
    - Report
      - G*/sin δ at each temperature
      - δ at each temperature
      - $T_{c,high}$ – the continuous high temperature grade where G*/sin δ = 0.65 kPa
      - δ at $T_{c,high}$ – the value of phase angle at the continuous high temperature grade

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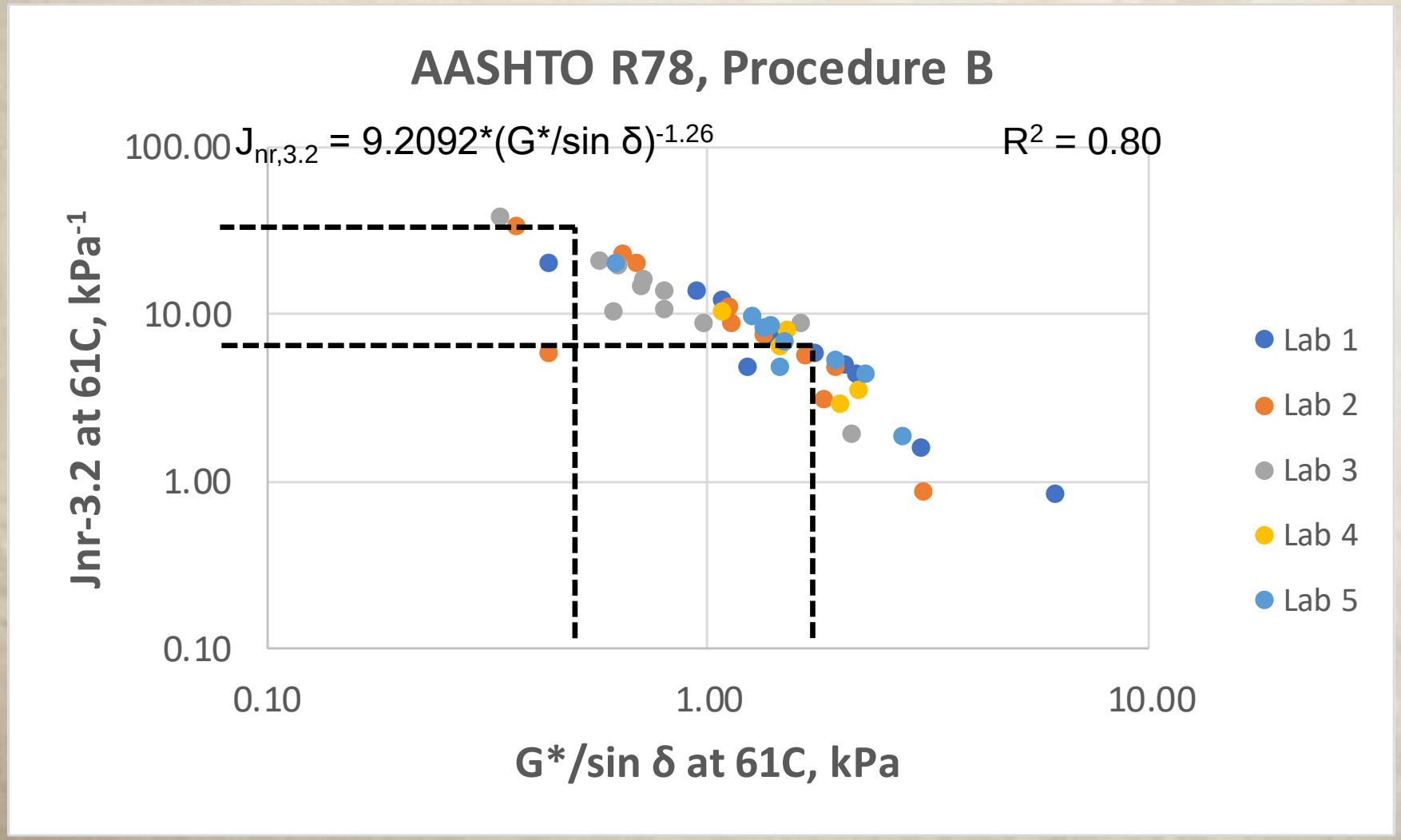
2018 AASHTO TSP·2 ETF Round-Robin Testing



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Draft EPG Specification: High Temperature Parameter

- SHRP Report A-410
  - "…minimum stiffness (1.0 kPa) is specified on the unaged binder to guard against mixture tenderness."
- Bleeding can be related to mix tenderness, so appropriate that a similar criterion could be used for the EPG high temperature parameter for chip seals.
  - Substantial field validation for the G*/sin δ parameter – albeit only in Texas – compared to the $J_{nr,3.2}$ parameter – which used the MMLS3 in the lab.
- Reasonable to stay with the G*/sin δ parameter and criterion for chip seals in the initial testing program and add MSCR testing to supplement the data.

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NCHRP Report 837

- Intermediate/Low Temperature Parameter
  - “The rheological residual binder property that demonstrated the strongest relationship to both chip seal aggregate loss and microsurfacing fracture energy is the dynamic shear modulus (G*) at a critical phase angle (δ_c). The critical phase angle values varied as a function of the low-temperature PG of interest.”

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NCHRP Report 837

- Intermediate/Low Temperature Parameter
  - Parameter is a way of estimating R-value and/or complex shear modulus at the crossover frequency (G_c^*) – which are temperature-independent parameters – into a temperature-dependent parameter that is more suited to specification testing
    - Relationship was developed using six asphalt emulsion residues – two CRS-2, three CRS-2L, and one CRS-2P.
    - Threshold values were set for aggregate loss (values of 25%, 30%, and 35% loss)
  - Microsurfacing threshold based on fracture energy – related to G* at δ_c

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Draft EPG Specification: Intermediate/Low Temperature Parameter

- Intermediate/Low Temperature Testing on Recovered Residue
  - Based on NCHRP Report 837
    - Tested on as-recovered residue
    - Criteria based on maximum allowable G* at critical phase angle (δ_c), based on low temperature grade
      - Temperature-frequency sweep test
        - DSR using 8-mm parallel-plate geometry, following draft research procedure
        - Two temperatures (5, 15°C)
        - 0.1-100 rad/s, logarithmically spaced with 10 loading frequencies per decade
      - Mastercurve generated at T_{ref}=15°C to determine G* at δ_c

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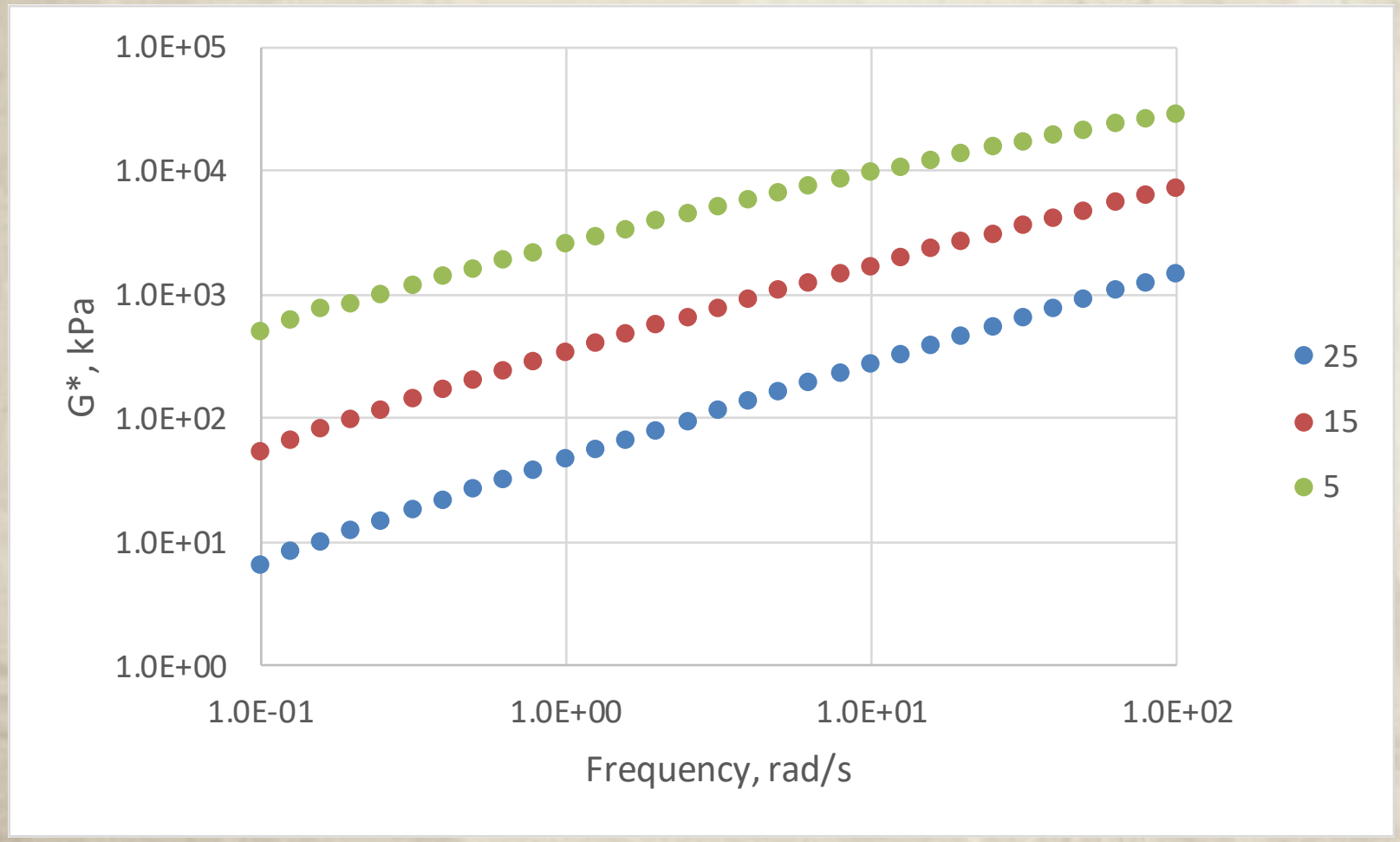
Isotherms



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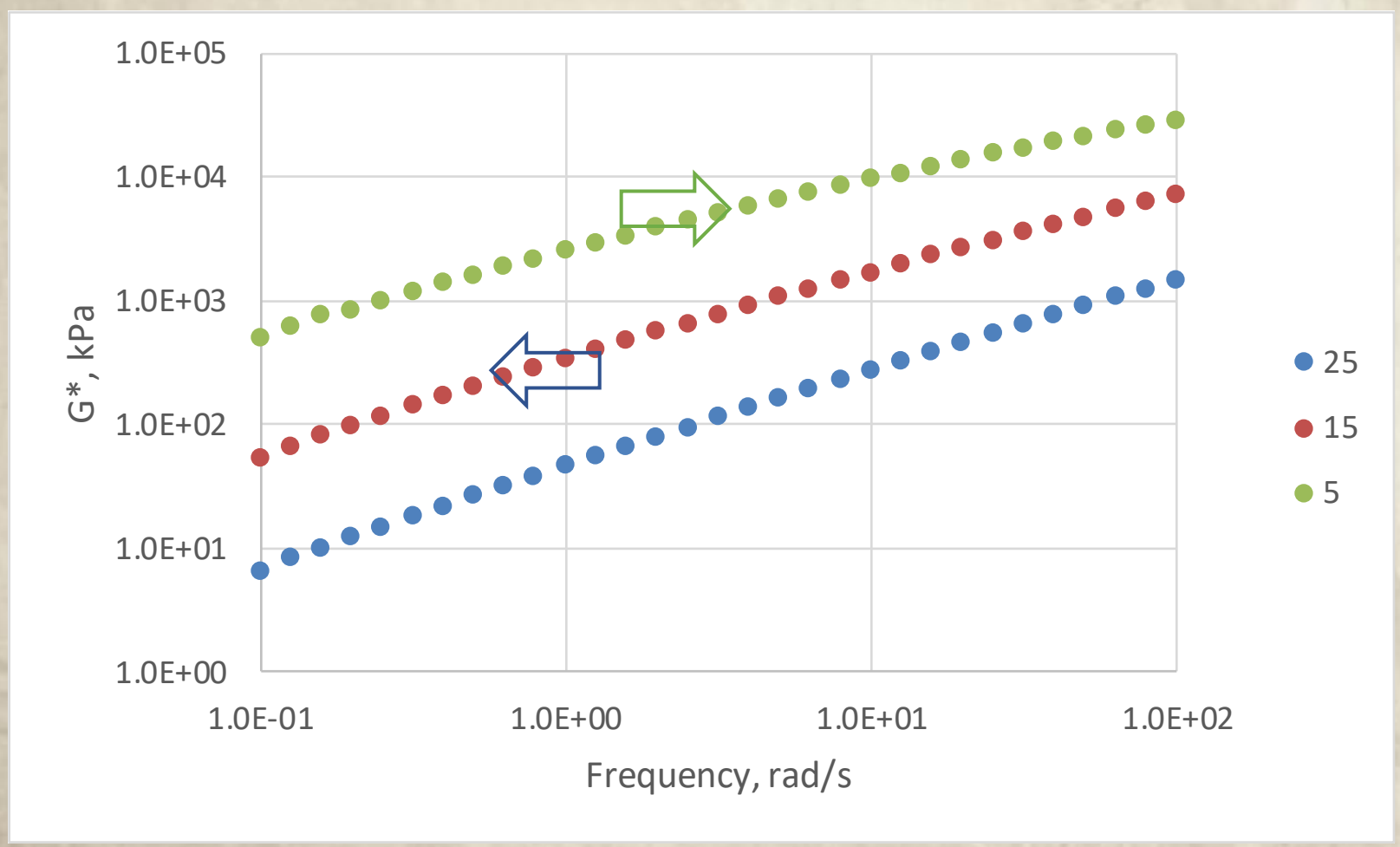
Isotherms



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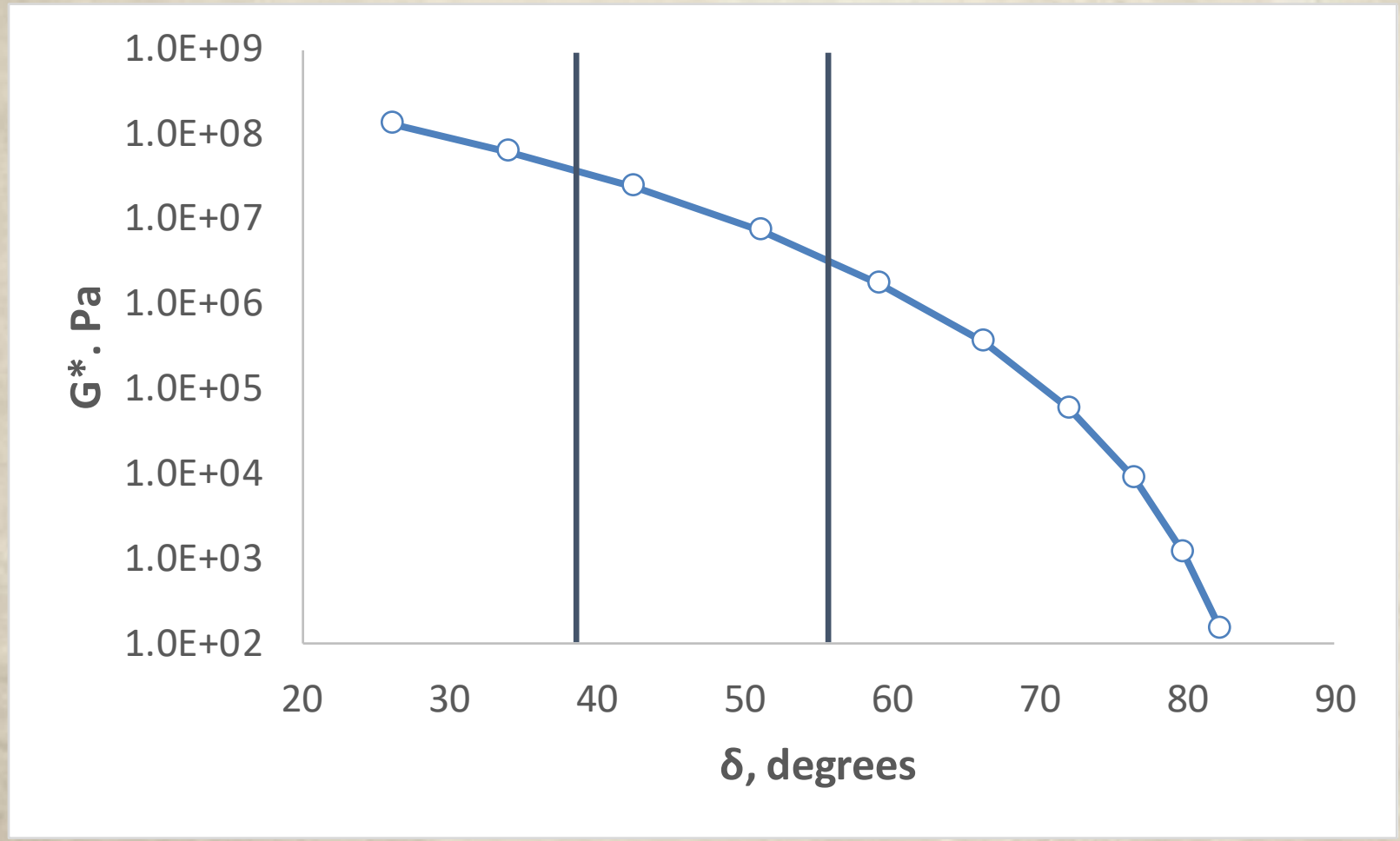
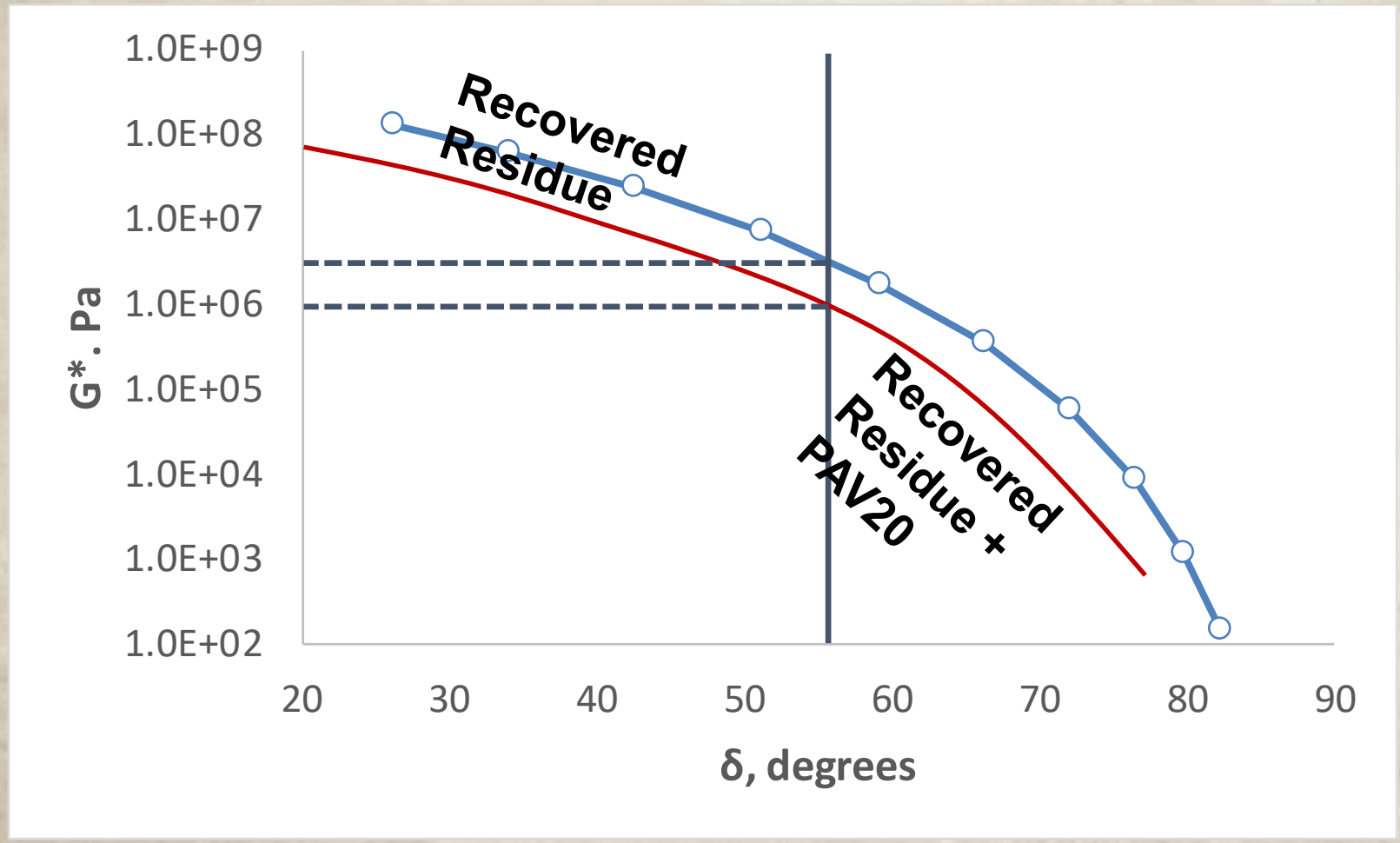
Shifted Data – Black Space



Black Space – Effect of Aging



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Draft EPG Specification

- Intermediate/Low Temperature Parameter
  - Increased emphasis on the intermediate temperature properties of paving grade asphalt binders in the NCHRP 09-59 and 09-60 projects as well as other research projects.
    - Durability cracking
  - Consider Glover-Rowe parameter
    - Easily determined using DSR and testing already conducted
    - Related to adhesion/cohesion?

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Draft EPG Specification

- Polymer Presence in Draft Specification
  - Uses maximum phase angle requirement at $T_{c,high}$
    - $T_{c,high}$ = temperature where $G^*/\sin\delta = 0.65$ kPa
    - From Texas A&M research
  - Concerns comparing values for SBR-modified residues compared to SBS-modified residues
  - Not a true performance-based parameter
    - Use as an EPG-Plus test?
      - Similar to manner in which user agencies ensure polymer modification for paving asphalt binders

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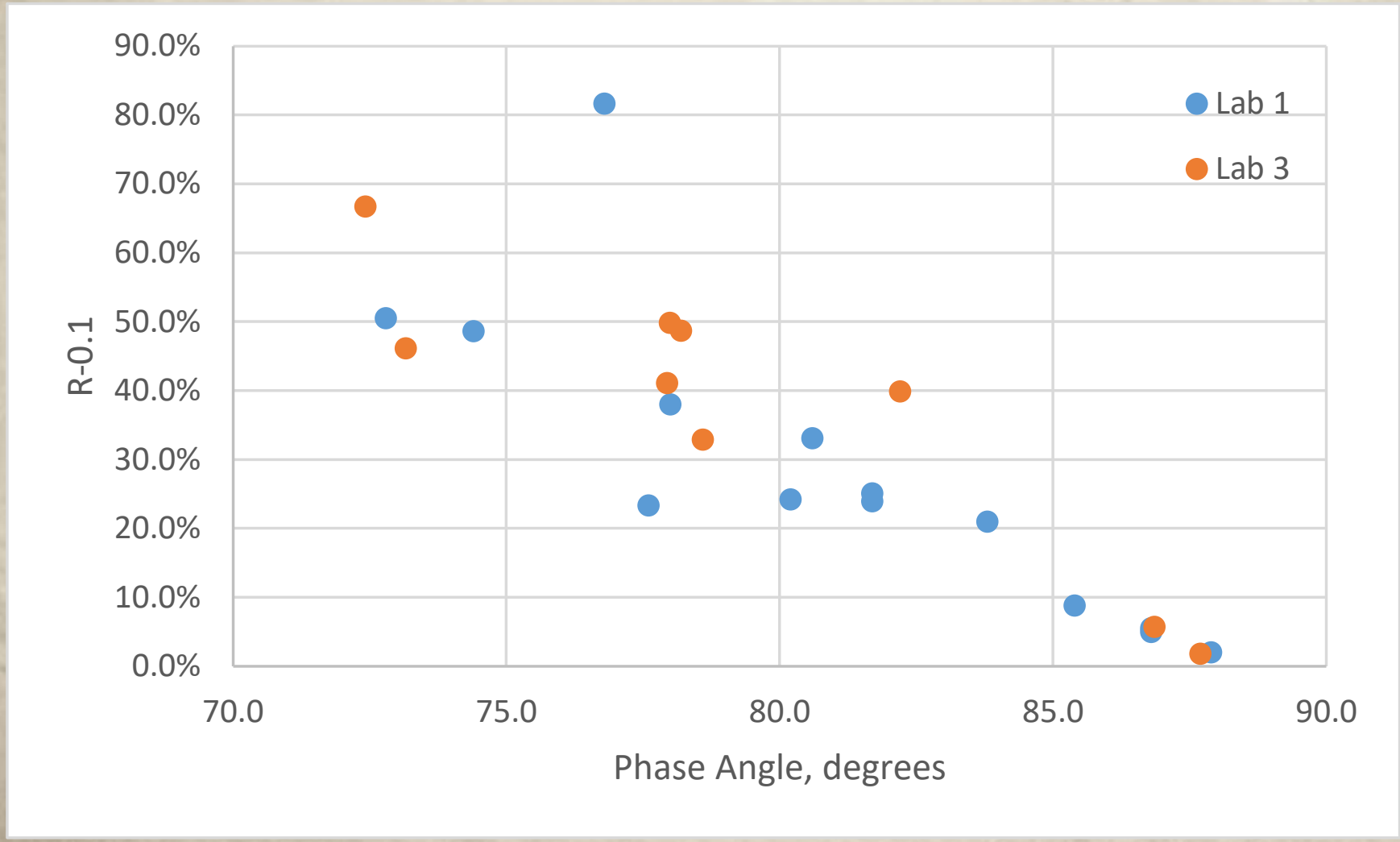
Draft EPG Specification

- Polymer Presence in Draft Specification
  - There may not be a “polymer identification” parameter in final version of EPG Specification.
    - The addition of that requirement could be a decision made by individual user agencies in the same manner that PG-Plus tests are now added by individual states in their contracts

Polymer Presence



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Draft EPG Specification

- Recovered Residue Aging
  - Accelerated lab aging requires additional manipulation and heating of the asphalt emulsion beyond the normal temperature range in which it is used and exists in-service.
  - Lowering the temperature to a more appropriate operating temperature (such as 60°C), runs the risk of significantly increasing testing time.
    - Texas A&M research indicates that one standard PAV aging procedure (20 hours at 100°C and 2.1 MPa) is approximately equivalent to aging in an environmental chamber at 60°C (1-mm thick film) for two months.

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NCHRP 09-63 Draft EPG Specification: Chip Seals

TABLE 16. Performance-Graded Emulsified Asphalt Binder Specification, Version 1 – Chip Seals

Emulsion Performance Grade	EPG 55					EPG 61					EPG 67			
	-19	-25	-31	-37	-43	-13	-19	-25	-31	-37	-13	-19	-25	-31
Surface design high temperature[1], °C	< 55					< 61					< 67			
Surface design low temperature[1], °C	> -19	> -25	> -31	> -37	> -43	> -13	> -19	> -25	> -31	> -37	> -13	> -19	> -25	> -31
Tests on Recovered Residue (AASHTO R78, Procedure B)														
High Temperature Parameter														
G*/sin δ ≥ 0.65 kPa, 10 rad/s @ Test Temperature, °C[2]	55					61					67			
Low Temperature Parameter														
G* at δ_c, MPa[3]														
Low Traffic[4] G* ≤ 30 MPa @ δ_c, degrees	48	45	42	39	36	51	48	45	42	39	51	48	45	42
High Traffic[5] G* ≤ 15 MPa @ δ_c, degrees														
OPTIONAL Polymer Presence Indicator														
Max. δ at $T_{c,high}$, degrees[6]	n/a	n/a	n/a	84	80	n/a	n/a	n/a	84	80	n/a	n/a	84	80

NOTES:

1 Determined at the pavement surface to represent the high and low design temperature for the EPG. Temperatures may be determined from experience or may be estimated using equations LTPPBind Online, modified to represent the expected surface temperature. High surface temperatures are generally 3°C to 4°C greater than those determined for PG asphalt binders used for paving.

2 AASHTO T315 is used to determine the G*/sin δ value of the EPG asphalt binder.

3 G* at δ_c is determined using temperature-frequency sweep testing at 5 and 15°C following the research test procedure described in NCHRP Report 837.

4 Low traffic is defined as having an AADT of 1,000 vehicles or less.

5 High traffic is defined as having an AADT greater than 1,000 but less than 20,000 vehicles.

6 Phase angle (δ) is determined at the continuous high temperature grade – $T_{c,high}$ – where G*/sin δ = 0.65 kPa. Two temperatures are needed – one where G*/sin δ < 0.65 kPa and one where G*/sin δ > 0.65 kPa – so that the phase angle can be interpolated at the temperature where G*/sin δ = 0.65 kPa.

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NCHRP 09-63 Field Projects

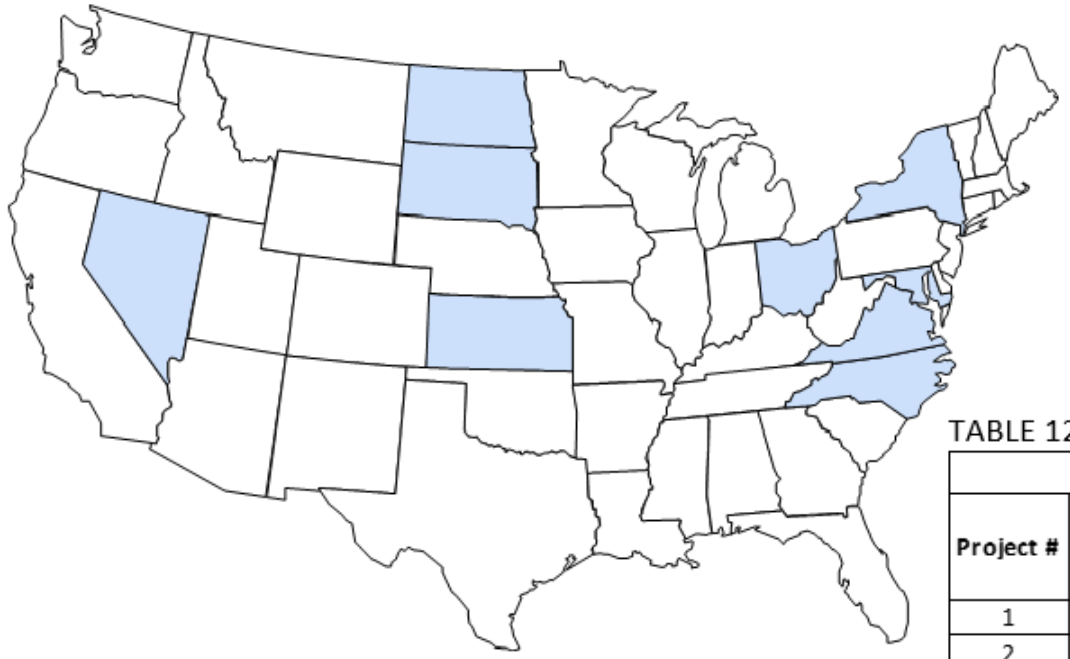

FIGURE 1. Location of NCHRP 09-63 Field Projects (shaded)

TABLE 12. Field Experiment Projects

PROJECT INFO						
Project #	Route/Street	City/Town	State	Agency	Type	Actual Construction Date
1	Rt. 80	Sherburne	NY	NYSDOT	Chip Seal w/Fog and Sand	9/6/2019
2	RT. 11	Homer	NY	NYSDOT	Chip Seal w/Fog and Sand	7/17/2020
3	Padgett Rd.	Union Mills	NC	Rutherford Co.	Double Chip Seal	7/22/2020
4	Rt. 9B	Rouses Point	NY	NYSDOT	Double Microsurfacing	8/10/2020
5	SR 117	Belle Center	OH	OHDOT	Microsurfacing	8/20/2020
6	CR 2	Colgan	ND	Divide Co.	Microsurfacing	8/27/2020
7	US 85	Fortuna	ND	NDDOT	Chip Seal w/Fog	8/28/2020
8	Norris Peak Rd	Rapid City	SD	Pennington Co.	Chip Seal w/Fog	9/1/2020
9	US 6	Dyer	NV	NVDOT	Chip Seal w/Fog and Sand	9/10/2020
10	SW Gage Blvd	Topeka	KS	Mission Township	Chip Seal	9/17/2020
11	CR 660	Farmville	VA	Cumberland Co.	Double Chip Seal	9/21/2020
12	Beulah Road	Vienna	VA	VDOT	Microsurfacing	9/22/2020
13	Arrants Road	North East	MD	Cecil Co.	Slurry Seal	9/25/2020

NCHRP 09-63 Phase 2 Distress Evaluation

TEST SECTION					
Start MP	1162				
End MP	1162+500				
Lane Directi	EB				
Distress Typ	*ASTM D6433*				
1	Alligator Cracking		11	atching/Utility Cut Patchi	
2	Bleeding		12	Polished Aggregate	
3	Block Cracking		13	Potholes	
4	Bumps and Sags		14	Railroad Crossing	
5	Corrugation		15	Rutting	
6	Depression		16	Shoving	
7	Edge Cracking		17	Slippage Cracking	
8	Joint Reflective Cracking		18	Swell	
9	Lane/Shoulder Drop Off		19	Raveling	
10	gitudinal/Transverse Crac		20	Weathering	
Severity	L – Low	M – Medium	H – High		

Distress / Severity	Starting MP	Ending MP	Length, ft.	Width, ft.	Location
3H	1162	1162+15	15	3	OWP
3L	1162+20	1162+52	32	3	OWP-IB
7L	1162+52	1162+74	22	4	EDGE
7L	1162+98	1162+162	64	3	EDGE
3M	1162+164	1162+243	79	4	IWP-CL
3M	1162+206	1162+249	43	3	EDGE-OWP
3M	1162+252	1162+297	45	3	IWP-CL
3M	1162+255	1162+268	13	2	EDGE-OWP
3M	1162+327	1162+335	8	3	IWP-CL
10L	1162+362	1162+374	12	N/A	FULL LANE
7M	1162+377	1162+395	18	2	EDGE
7M	1162+401	1162+416	15	1	EDGE
10H	1162+413	1162+443	30	3	OWP
7H	1162+448	1162+482	34	2	EDGE
13L	1162+495		N/A	N/A	OWP
10L	1162+34	1162+113	79	N/A	IB
10L	1162+123	1162+201	78	N/A	IB
10M	1162+214	1162+357	143	N/A	IB
10L	1162+403	1162+481	78	N/A	IB
20L	1162	1162+500	500	12	ENTIRE
15L	1162+411	1162+500	89	2	OWP

NCHRP 09-63 Field Projects

- Follow-up evaluation of projects
  - Condition of the surface treatment
  - Micro-sampling, extraction/recovery of the emulsion residue, and testing
    - conditions in service can be better correlated with the properties of the in-situ emulsion residue.

TSP2 EMULSION Task Force

NCHRP 09-63 Field Samples (2020)

Sample ID	Emulsion	State	Treatment	$T_{c,high}$ (°C)			δ at $T_{c,high}$ (degrees)		
				B	V	(B-V)	B	V	(B-V)
20-01-03	HFRS-2P	NY	Chip Seal w/Fog and Sand	72.7	72.0	0.7	78.9	78.2	0.7
20-02-03	CRS-2L	NC	Double Chip Seal	74.9	73.8	1.2	82.8	83.3	-0.5
20-03-03	CQS-1HP	NY	Double Microsurfacing	85.8	84.0	1.7	74.2	71.8	2.4
20-04-03	CSS-1HM	OH	Microsurfacing	80.7	82.0	-1.3	80.1	81.4	-1.3
20-05-03	CQS-1HP	ND	Microsurfacing	90.1	87.7	2.4	77.7	79.1	-1.4
20-06-03	CRS-2P	ND	Chip Seal w/Fog	75.6	78.0	-2.4	82.8	83.0	-0.2
20-07-03	AE 150S/HFRS-2	SD	Chip Seal w/Fog	73.6	70.6	3.0	81.4	79.5	1.9
20-08-03	LMCRS-2H	NV	Chip Seal w/Fog and Sand	81.1	78.8	2.3	85.1	85.1	0.0
20-09-03	CRS-1HP	KS	Chip Seal	76.7	75.6	1.1	80.1	79.9	0.2
20-10-03	CRS-2L	VA	Double Chip Seal	73.4	76.6	-3.2	83.3	83.4	-0.2
20-11-03	CQS-1HP	VA	Microsurfacing	84.1	81.9	2.2	77.7	76.7	1.0

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NCHRP 09-63 Field Samples (2020)

				B					
				G* @ δ_c, MPa					
Sample ID	Emulsion	State	Treatment	54	51	48	45	42	39
20-01-02	HFRS-2P	NY	Chip Seal w/Fog and Sand	2.4	4.4	7.5	12.2	19.0	28.6
20-02-02	CRS-2L	NC	Double Chip Seal	4.5	7.3	11.5	17.5	25.8	37.0
20-03-02	CQS-1HP	NY	Double Microsurfacing	2.7	4.7	7.6	12.0	18.4	27.3
20-04-02	CSS-1HM	OH	Microsurfacing	2.6	4.5	7.6	12.0	18.5	27.7
20-05-02	CQS-1HP	ND	Microsurfacing	2.5	4.4	7.4	11.8	18.3	27.3
20-06-02	CRS-2P	ND	Chip Seal w/Fog	3.7	6.4	10.3	15.9	23.9	34.8
20-07-04	AE 150S/HFRS-2	SD	Chip Seal w/Fog	5.5	8.9	13.9	20.8	30.2	42.7
20-08-02	LMCRS-2H	NV	Chip Seal w/Fog and Sand	3.0	5.2	8.5	13.3	20.3	30.0
20-09-02	CRS-1HP	KS	Chip Seal	3.9	6.5	10.4	15.9	23.7	34.3
20-10-02	CRS-2L	VA	Double Chip Seal	4.4	7.2	11.3	17.0	25.1	35.9
20-11-02	CQS-1HP	VA	Microsurfacing	2.1	3.7	6.2	9.9	15.5	23.4

Low Traffic Spec Value - Chip Seal

High Traffic Spec Value - Chip Seal

Microsurfacing Spec Value

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NCHRP 09-63 Field Samples (2020)

				B					
				G* @ δ_c, MPa					
Sample ID	Emulsion	State	Treatment	54	51	48	45	42	39
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20-03-02	CQS-1HP	NY	Double Microsurfacing	2.7	4.7	7.6	12.0	18.4	27.3
20-04-02	CSS-1HM	OH	Microsurfacing	2.6	4.5	7.6	12.0	18.5	27.7
20-05-02	CQS-1HP	ND	Microsurfacing	2.5	4.4	7.4	11.8	18.3	27.3
20-06-02	CRS-2P	ND	Chip Seal w/Fog	3.7	6.4	10.3	15.9	23.9	34.8
20-07-04	AE 150S/HFRS-2	SD	Chip Seal w/Fog	5.5	8.9	13.9	20.8	30.2	42.7
20-08-02	LMCRS-2H	NV	Chip Seal w/Fog and Sand	3.0	5.2	8.5	13.3	20.3	30.0
20-09-02	CRS-1HP	KS	Chip Seal	3.9	6.5	10.4	15.9	23.7	34.3
20-10-02	CRS-2L	VA	Double Chip Seal	4.4	7.2	11.3	17.0	25.1	35.9
20-11-02	CQS-1HP	VA	Microsurfacing	2.1	3.7	6.2	9.9	15.5	23.4
				-7	-13	-19	-25	-31	-37

Low Traffic Spec Value - Chip Seal

High Traffic Spec Value - Chip Seal

Microsurfacing Spec Value

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EPG Specification

- Features of a Good EPG Specification
  - Uses reproducible, quick, technician-friendly **recovery procedure**
    - Key first point before testing
    - Minimize opportunity for variability due to technician procedures
    - Reasonable speed of recovery
  - Uses reproducible, quick, technician-friendly **testing procedures**
  - **Provides reasonable assurance that the asphalt emulsion residue properties will not disproportionately contribute to surface treatment distress**
    - Don’t expect it to correlate perfectly as many other factors influence distress

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Agenda Item 3

Messaging & Implementation Subcommittee Update

Larry Tomkins, P.E.
Ergon Asphalt & Emulsions

TSP2 EMULSION Task Force

Task Groups

- Messaging, Scott Dmytrow (Group Leader)
- Outreach, Jerry Geib (Group Leader)
- Training, Stormy Brewster and Travis Walbeck (Group Leaders)
- Demo Projects, Larry Tomkins (Group Leader)

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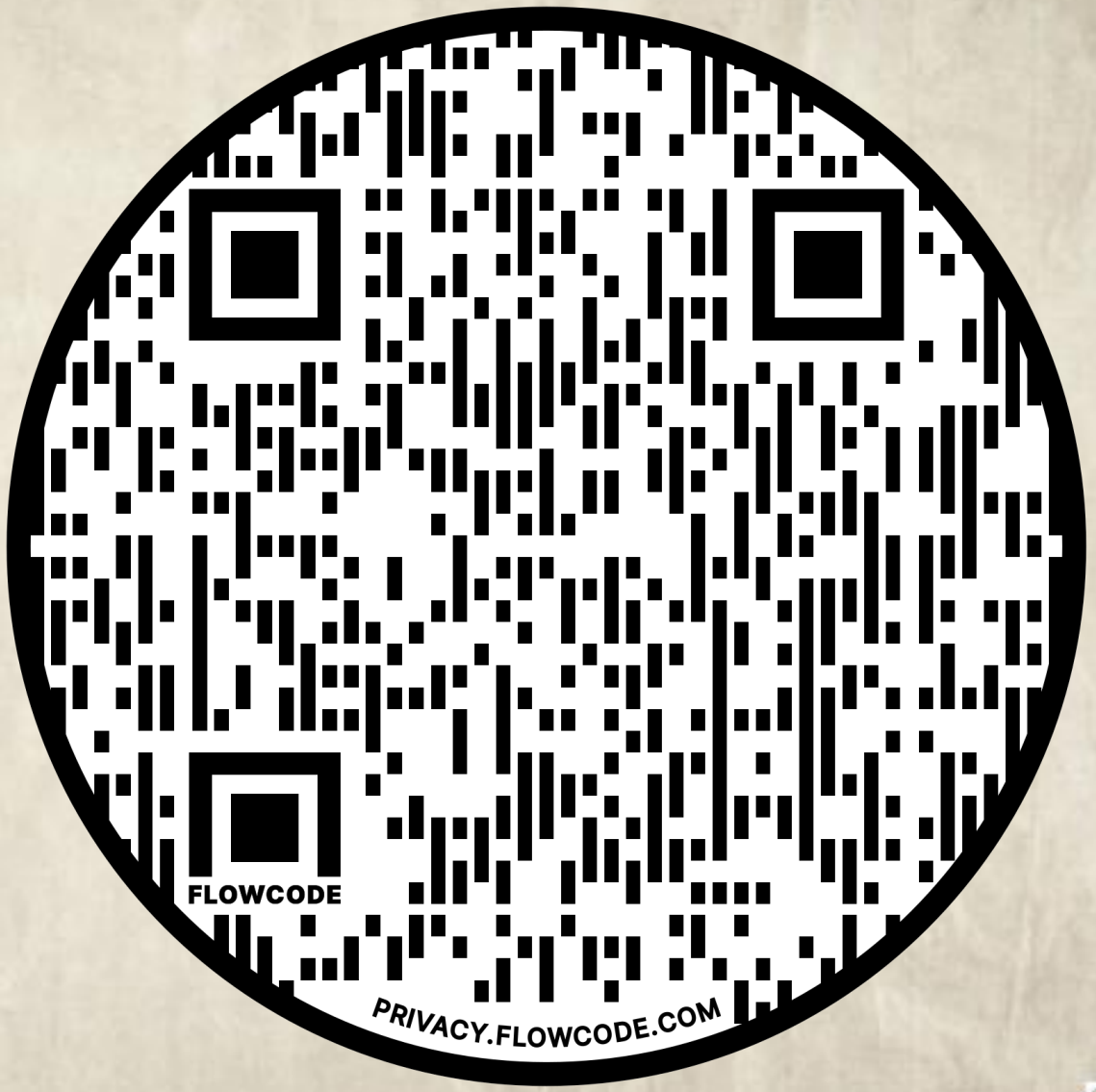
Messaging

- Introductory Video has been developed



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Outreach

- Slurry Systems Workshop
- AASHTO COMP

Training

- Construction Guide Highlights

Construction Guide Specification for Emulsified Asphalt Chip Seals

Specification AASHTO Construction Guide Specification 406	Author AASHTO COMP Technical Subcommittee 5b
Description This guide specification is intended to provide information needed for owners or contractors to construct emulsified asphalt chip seals. An emulsified asphalt chip seal is the application of emulsified asphalt, followed immediately by a single layer of aggregate chips to a prepared surface.	Terminology The terminology in this specification covers the different grades of asphalt emulsion. Specifically the names, additives, and governing standards for different grades.
Construction *Equipment:* Asphalt Distributor, Aggregate Spreader, Pneumatic-Tire Rollers, Broom. *Equipment Calibration* Tolerance and methods of calibrating distributors and aggregate spreaders. *Preconstruction Meeting* Importance of a preconstruction meeting prior to construction to discuss specific topics listed. *Road Surface Preparation* Sweep pavement no more than 30 min before application of emulsion and aggregate. Remove thermoplastic pavement markings. *Application* Addresses topics: Weather limitations, test strips, and the application of the materials; longitudinal and transvers joint construction methods; rolling and sweeping operations; traffic control and protection of motor vehicles; and fog seals. *Quality Control* Outline of roles for quality staff, testing facilities, stockpile management, calibration and workmanship. Requires certification of crew members. *Agency Acceptance Activities* Inspection overview, materials acceptance testing, and final inspection recommendations.	Materials • Emulsified Asphalt: That meet the requirements of AASHTO M 140, M 208, & M 316. • Aggregate: Gradations described in AASHTO MP 27 Tables 1 and 2. Measurement • Emulsion by volume • Aggregate by area (or weight) • Completed Chip Seal by area • Fog Seal Emulsion by volume Payment Payment for chip seals can be done by either paying for the materials in unit costs, or for the completed chip seal by area of pavement sealed. Unit price examples: Emulsified asphalt (gal), Aggregate (sq.yd.), Aggregate (tn), Chip Seal (sq.yd), diluted emulsion for fog seal (gal)
Deal breakers and no fly zone Top keys that are critical to a successful project: 1. Aggregate gradation and quality specs met 2. Conduct mix design 3. Perform calibration 4. Weather requirements are met 5. Incorporate a QA/QC program into spec 6. Trained (certified) inspector & contractor staff	Points to Understand 1. Aggregate dust above the limits inhibit bond between the chips and the asphalt emulsion. 2. Slower setting emulsions take much longer to cure thus sweeping and traffic must be delayed. 3. Rounded aggregate is difficult to bond with asphalt emulsion in chip seals. 4. First roller pass within two minutes, limit roller speed to 3 mph maximum. 5. Longitudinal spray rate of emulsion is verified through calculation of tank volume and area of application. 6. Aggregate spread is verified checking truck weight and dividing by the area covered. 7. Aggregate gradations from both the stockpile and hopper ensure the aggregate quality on the project. 8. Quick checks of application rates (volume of emulsion/area & weight of aggregate/area) are recommended ~4 times a day. 9. Ambient and pavement temperatures both need to meet requirements.
Referenced Documents AASHTO: M 140, M 208, M 316, MP 27, PP 82, T 27, T 49, T 50, T 59, T 96, T 301, T 335 AASHTO 10th Edition of Guide Specifications for Highway Construction ASTM: D5624 The Asphalt Institute: Manual Series 19 Texas DOT: Tex-224-F NCHRP: Report 680	

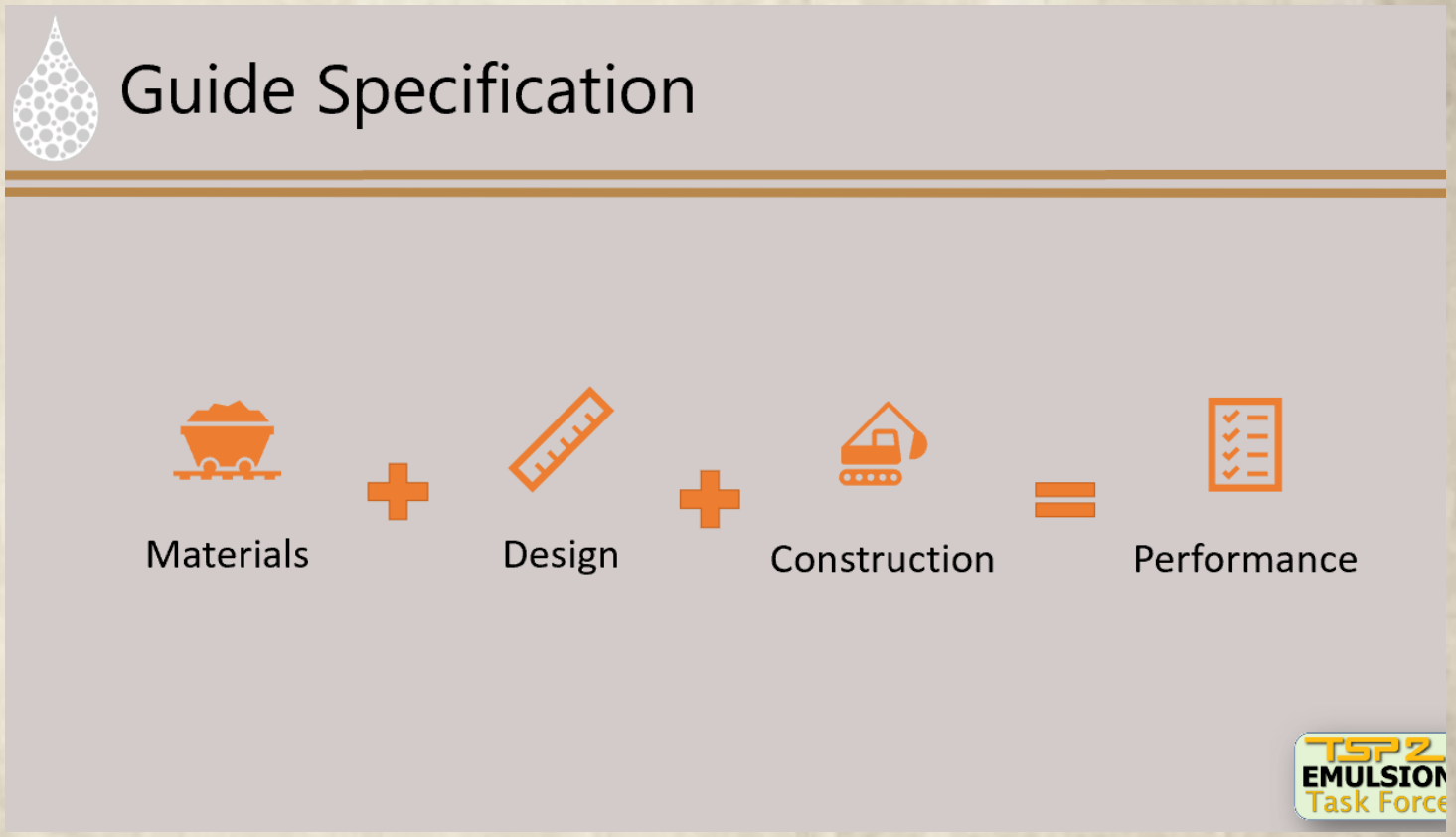
TSP2 EMULSION Task Force

Training

- Construction Guide Highlights
- Treatment Presentations

Training

- Construction Guide Highlights
- Treatment Presentations
  - How to implement specs



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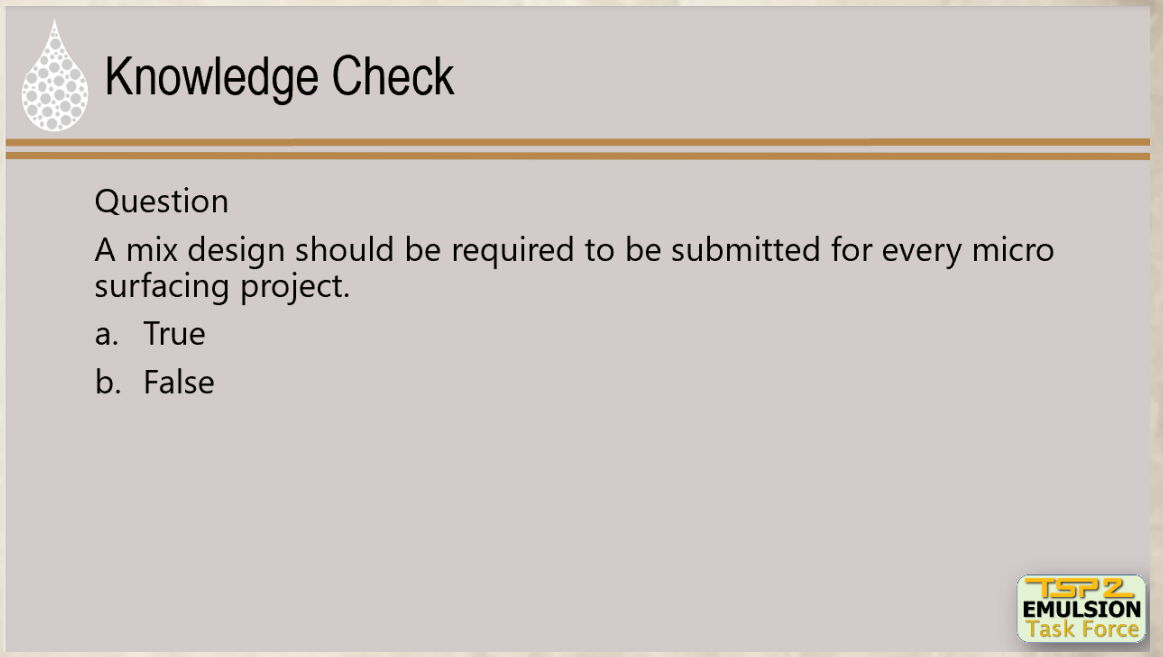
Training

- Construction Guide Highlights
- Treatment Presentations
  - How to implement specs
  - Keys to success
  - Red flags

Training

- Construction Guide Highlights
- Treatment Presentations
  - How to implement specs
  - Keys to success
  - Red flags
  - Knowledge Checks
  - Narrated



TSP2 EMULSION Task Force

Demonstration Projects

- Goal

TSP2
EMULSION
Task Force

Demonstration Projects

- Goal
- Interested Agencies

Demonstration Projects

- Goal
- Interested Agencies

Region	Chip Seal	Fog Seal	Micro Surfacing
Northeast	4	2	2
Southeast	4	0	7
Midwest	8	4	8
Rocky Mountain	4	4	3
Total	20	10	20

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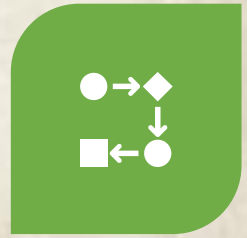
Demonstration Project Process

IDENTIFY

REVIEW

INCORPORATE

COMMENT



FINALIZE

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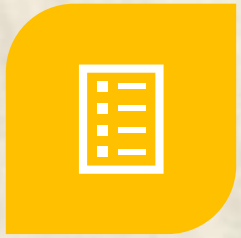
Demonstration Project Process

BID

AWARD



DOCUMENT

RECAP

MONITORING

Agenda Item 4

National Certification & Training Education

Colin A. Franco, P.E.
Rhode Island DOT

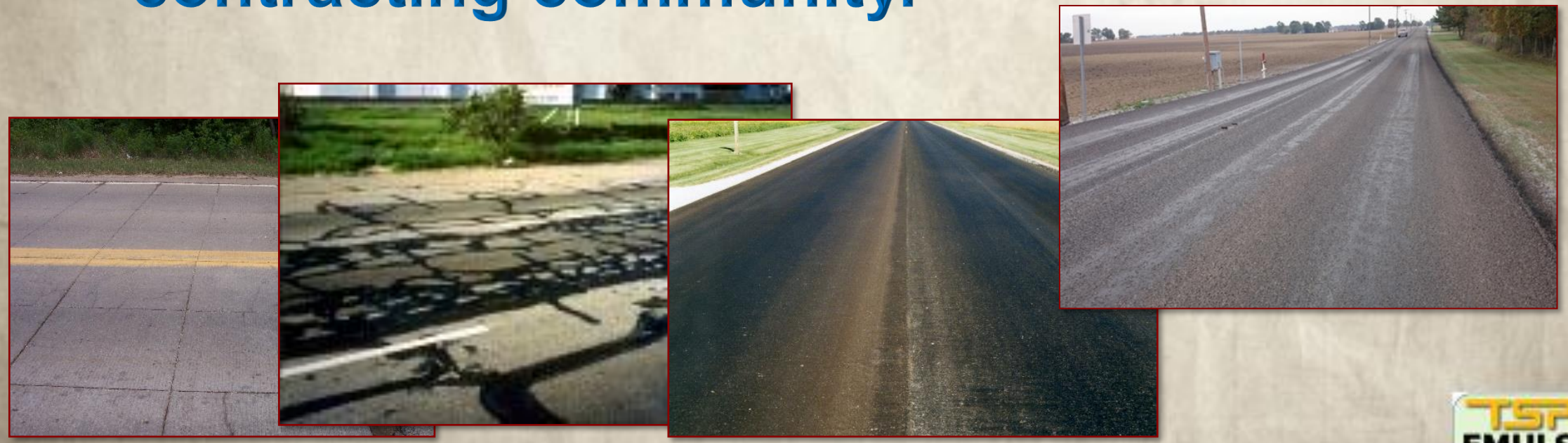
TSP2 EMULSION Task Force

Credit and Acknowledgement

I would like to gratefully acknowledge that much of this presentation was the work of Neal Galehouse P.E. of the NCPP at MSU, who made compelling presentation for certification at the Pavement Preservation National Conference last week.

The Argument for Certification

Failed pavement preservation treatments are detrimental to both the agency and contracting community.



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The Argument for Certification

Failed Preservation Treatments

Impacts to Agency:

- Adversely affects public relations
- Wastes limited funds
- Staff time overruns for remediation
- Potential claims from motorists
- Negatively influences network condition

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The Argument for Certification

Failed Preservation Treatments

Impacts to Contracting Community:

- Negatively influences the market
- Potential moratorium on treatment
- Adversely affects company reputation
- Loss of profit to correct treatment
- Potential impact on performance bond

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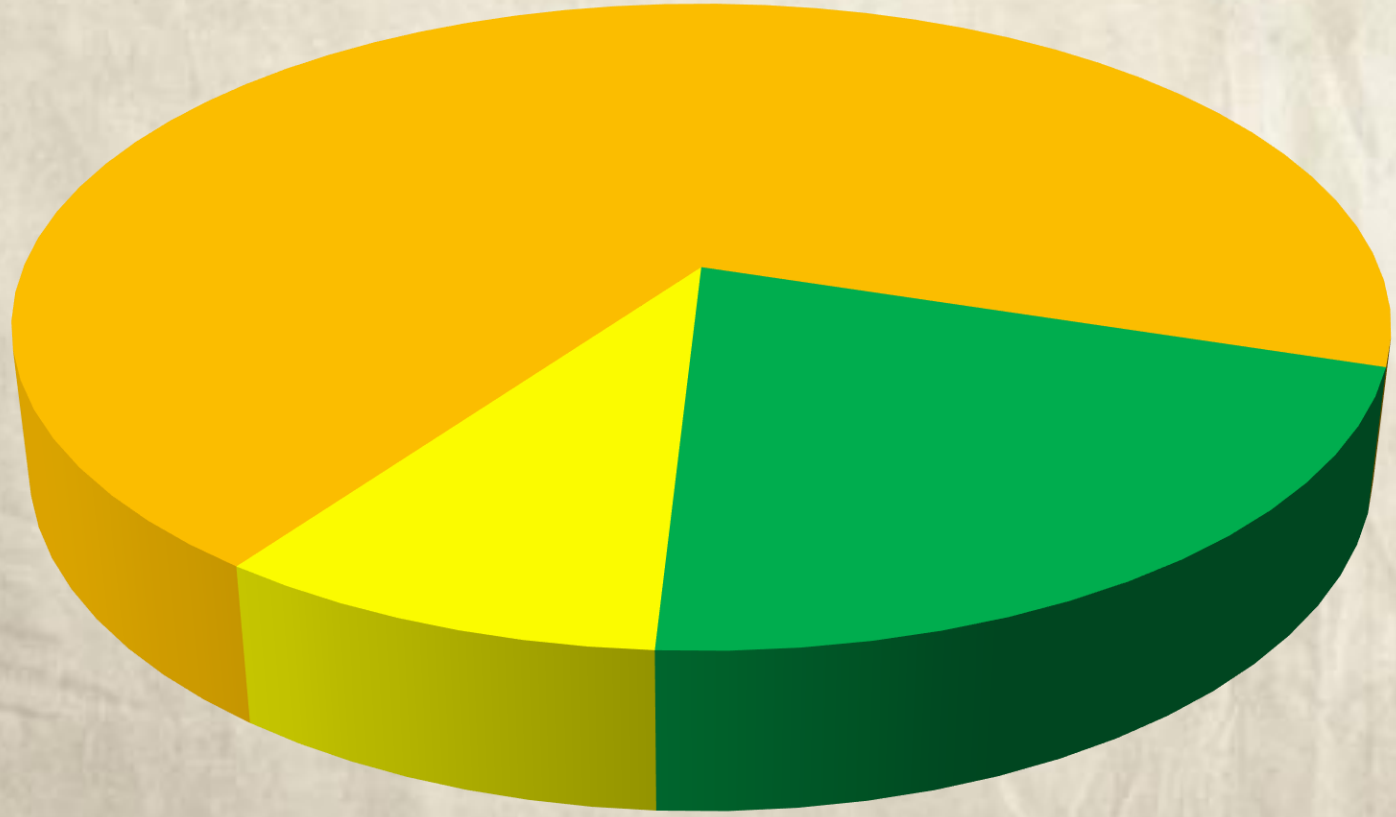
Causes of Poor Pavement Performance in USA



Workmanship - 66% Design Deficiency - 21% Material Failure - 9% Natural Disaster - 4%

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The Rationale for Certification

- Validates a person's knowledge.
- Prepares key personnel to deal with day-to-day project challenges.
- Helps insure a higher and more consistent quality of work.
- Inspires greater confidence for success for the agency and contractor.

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Ensuring Preservation Project Success

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Certification Background

- Approved by the AASHTO TSP·2 Oversight Panel and endorsed by the ISSA Board of Directors in 2016.
- AASHTO Committee on Maintenance encouraged state DOTs to require the certification of agency and contractor personnel involved in the design and construction of preservation treatments.

Qualified Personnel

- Certifications serve as a credible, third-party assessment of one's skill and knowledge of a specific pavement preservation treatment.
- Certifications require examination in a controlled environment by an independent authorized TSP•2 agent specializing in pavement preservation.

TSP2 EMULSION Task Force

Agenda Item 5

Quality Assurance

Colin A. Franco, P.E.
Rhode Island DOT

TSP2 EMULSION Task Force

Quality Assurance - Definition

AASHTO R10 & TRB Circular E-C 037

Quality Assurance – *All those planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service …*

A Good Quality Assurance Program

Establishes the core programmatic elements required to achieve quality materials and workmanship.

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Core Elements of a QA Program

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Agency Acceptance

Acceptance is the process which the Agency, Owner, or Designated Agent determines whether the quality of the product meets the contract requirements.

Agency independently performs:

- Random (Verification) Testing (Materials)
- Inspection (Workmanship)

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Quality Control

The system used by a Contractor to monitor, assess and adjust their production or placement processes to ensure that the final product will meet the specified level of quality.

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Contractor Quality Control

Contractor QC Plan

1. Scope of the QC Plan
2. Definitions
3. QC Organization Personnel
4. QC Testing Labs and Equipment
5. Material Control
6. QC Activities
7. Placement and Workmanship
8. Documentation
9. Non-Conformance and Corrective Action

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Personnel Qualification

Training is essential for successful pavement preservation projects.

Qualified Personnel –

"Personnel who are capable as defined by appropriate programs established or recognized by each Agency."

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Certified Personnel

Definition

Personnel who are recognized by a formal certifying body as those who are capable of performing specific procedures.

Requirements for Personnel Qualification / Certification

A complete personnel qualification/certification program should include, at minimum:

- Formal training
- On-the-job training
- Specified re-qualification intervals
- Proficiency demonstration
- A written exam
- A process for disqualification or decertification

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Need for a National Pavement Preservation Certification Program

1. AASHTO sponsored and administered by ‘third party’ entity.
2. The certification should be accepted nationally
3. Training for various areas and levels of certification should follow a unique established syllabi that reflects the Best Practices and AASHTO standards
4. Training should be conducted by qualified trainers/organizations

TSP2 EMULSION Task Force

Agenda Item 6

Rejuvenator Subcommittee Update

Hassan Tabatabaee, Ph.D.

Cargill Industrial Specialties

TSP2 EMULSION Task Force

Rejuvenator Subcommittee Members

- Hassan Tabatabaee, Cargill (Chair)
- Andrew Hanz, MTE
- Andy Clayton, Blue Line
- Colin Durante, Pavement Technology
- Larry Galehouse, NCPP
- Russell Milan, Michigan Paving
- Vacant – (Gayle King vacancy)
- Vacant - (Peter Montenegro vacancy)

Last Meeting held virtually on March 2021.

TSP2 EMULSION Task Force

Objectives

1. Research Need Statements

   Create RNS to address identified gaps in performance-based test methods and mechanisms for rejuvenators pavement preservation.

   – RNS accepted by NCHRP as of 4/22/21

2. Education

   Offer educational material to ETF and industry on past and current state of the practice for rejuvenators in pavement preservation. Joint presentation by Andy Clayton, Hassan Tabatabaee, and Andrew Hanz, hopefully during next ETF meeting.

3. Specification

   - Address gaps in pavement preservation specifications with regards to rejuvenators.
   - Utilize and build on existing and historical state agency and industry specifications
   - Align activities with other parallel rejuvenator committees (e.g. ASTM and AI).

TSP2 EMULSION Task Force

NCHRP Problem Statement Outline

Developing Performance and Safety Specifications for Rejuvenating Seals

RESEARCH OBJECTIVE

The objective of this project is to study rejuvenating fog seals to determine the extent that they penetrate and rejuvenate the asphalt pavement. Key questions to answer are:

- How are the different rejuvenating compounds penetrating and rejuvenating the underlying pavement?
- How is the desired performance for rejuvenating seal measured and quantified in the laboratory and field?
- How can the impact of a rejuvenating seal design be measured and quantified in the laboratory and field?
- How can one determine the optimum dose of rejuvenator required to provide the desired performance and friction properties?
- And most importantly, how can the answers to the aforementioned questions be developed into a practical and implementable specification for agencies and the industry to better prescribe and monitor such preservation methods.

Recommended Funding: $450,000 **Research Period:** 24 months

PERSON(S) DEVELOPING THE PROBLEM

- AASHTO TSP2 Emulsion Task Force - Task Group for Rejuvenators. Members: Hassan Tabatabaee (Chair), Edith Arambula, Gayle King, Russel Milan, Andy Clayton, Amy Epps Martin, Andrew Hanz, Colin Durante

SUBMITTED BY: Colin Franco, RIDOT and Darren Hazlett, University of Texas, October, 2020

TSP2 EMULSION Task Force

Action Items and Questions

Group to schedule Rejuvenator State-of-the-Art presentation for next ETF, if ETF support/interest exists.

Other Questions:

- Are there any activities that this group can perform in anticipation or preparation for upcoming NCHRP project?
- Do this group's stated objectives still serve a purpose?
- What other initiatives should this group pursue?

Appendix: Updated ASTM D4552 Published

Designation: D4552/D4552M – 20

Standard Classification for Classifying Hot-Mix Recycling Agents[1]

1.1 This standard covers a standardized method whereby recycling agents to be used in hot recycling of asphalt concrete can be classified. The recycling agents are classified by viscosity in mm^2/s measured at 60 °C [140 °F]. This classification does not apply to emulsified recycling agents.

TABLE 1 Physical Properties of Hot-Mix Recycling Agents

Test	ASTM Test Method	RA 0 Min	RA 0 Max	RA 1 Min	RA 1 Max	RA 5 Min	RA 5 Max	RA 25 Min	RA 25 Max	RA 75 Min	RA 75 Max	RA 250 Min	RA 250 Max	RA 500 Min	RA 500 Max
Viscosity - 60 °C [140 °F], mm^2/s	D2170/D2170M	10	49	50	175	176	900	901	4500	4501	12 500	12 501	37 500	37 501	60 000
Flash Point, COC, °C [°F]	D92	219 [425]	...	219 [425]	...	219 [425]	...	219 [425]	...	219 [425]	...	219 [425]	...	219 [425]	...
Saturates, wt, %[A]	D2007	...	30	...	30	...	30	...	30	...	30	...	30	...	30
Tests on Residue from RTFO 163 °C [325 °F]	D2872														
Viscosity Ratio[B]	D2872	...	3	...	3	...	3	...	3	...	3	...	3	...	3
Wt Change, ±, %	D2872	...	4	...	4	...	4	...	4	...	4	...	4	...	4
Specific Gravity at 25 °C [77 °F]	D70 or D1298	0.900	1.100	0.900	1.100	0.900	1.100	0.900	1.100	0.900	1.100	0.900	1.100	0.900	1.100

[A] The suitability of Test Method D2007 for measurement of saturates content and determination of compatibility of non-petroleum-based recycling agents has not been established. Additional testing may be required for assessment of the compatibility of non-petroleum-based recycling agents.

[B] Viscosity Ratio = $\frac{\text{Viscosity of residue from RTFO test at 60 °C [140 °F]}}{\text{Original viscosity at 60 °C [140 °F]}}$

TSP2 EMULSION Task Force

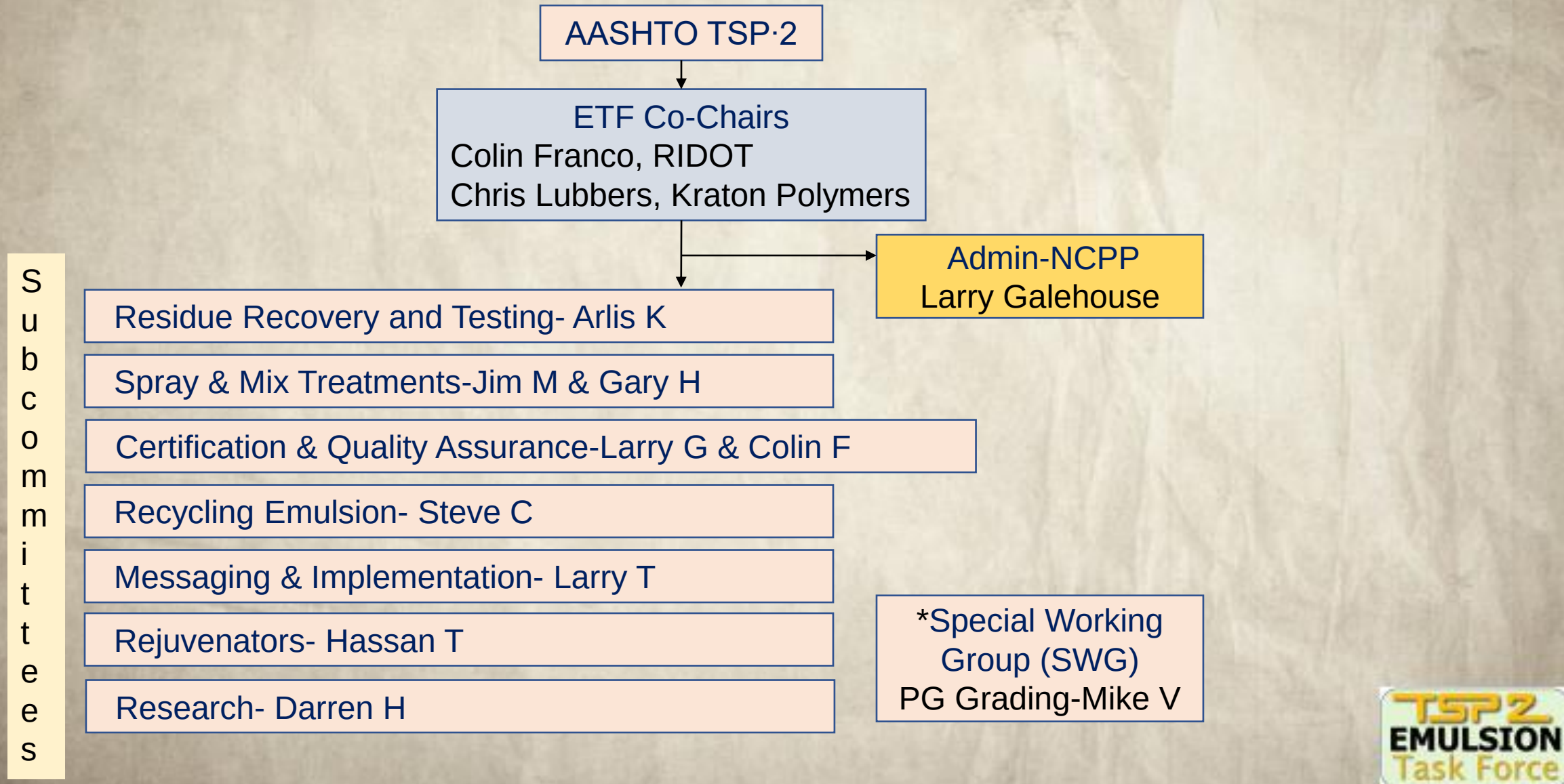
Agenda Item 7

ETF Realignment

Colin A. Franco, P.E.
Rhode Island DOT
&
Chris Lubbers
Kraton Polymers

TSP 2 EMULSION Task Force

Emulsion Task Force Organization



Questions