

Seal Coat Binder Performance Specifications

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87th Annual Transportation Short Course
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OUTLINE

- Motivation, Objective, & History
- Recommended SPG Specification
- Implementation Project



MOTIVATION & OBJECTIVE

- Need to improve seal coat binder specs
 - replace empirical tests (penetration, ductility) with performance-related tests applicable to both unmodified and modified binders
 - consider temperatures that cover entire *in service* range that are tied to specific climate
 - consider aging during critical 1st year
 - reduce variability in grades
- Developed Surface Performance-Grade (SPG) spec for seal coat binders *in service*
- Validated with 75 TX highway sections



TxDOT 0-1710 (3.5 yr+ project, 9/99 – 3/03) Superpave Binder Tests for Surface Treatment Binders

Traditional Specification for Surface Treatment Binder RESIDUE Inadequate

- Develop Performance-Based Specification & Grade Selection Process for Surface Treatment Binder RESIDUE
 - Surface Treatment Distresses & Conditions
 - Superpave Equipment
 - Qualitative Performance Rankings & Corresponding Environmental Conditions
- Validate Specification
 - Laboratory Measured Binder SPG Grade
 - Observed Field Performance on 45 Highway Sections



NCHRP 14-17 (2.5 yr+ project @ A&M, 4/08 – 12/09) Manual for Emulsion-Based Chip Seals for Pavement Preservation

- Provide technology-based *tools* that promote sound engineering decisions and reduce the subjectivity in chip seal design and construction processes
- Create a *manual* which describes how to design and construct chip seals with a very high confidence level in the success of the resulting project
- A&M: Emulsion residue recovery, chemical & rheological binder characterization for 5 emulsions + 3 Highway Sections



TxDOT 0-6616 (2 year project, 9/10-8/12) Validate Surface Performance-Graded (SPG) Specification for Surface Treatment Binders

Improve SPG Specification

- Standardize Emulsion Residue Recovery Method
- Explore Exclusive Use of DSR – Predict S, m-value
- Evaluate Additional Performance Parameters
- Further Field Validate SPG Thresholds on 30 Highway Sections



Emulsion Task Force (ETF) of FHWA Pavement Preservation ETG (formed 08, ~30 members, 2 X per year)

- Review Ongoing Research & Integrate Work
- Recommend / Propose / Evaluate Research Needs
- Advance Development of Performance-Based Methods & Specifications
- Facilitate Implementation / Adoption of Standards through AASHTO/ASTM
- Share Info w/Other ETGs



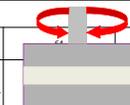
RECOMMENDED SPG

with AASHTO PP 72-11 Method B	Performance Grade											
	SPG 64				SPG 67				SPG 70			
Average 7-day Maximum Surface Pavement Design Temperature, °C	-13	-16	-19	-22	-13	-16	-19	-22	-13	-16	-19	-22
Minimum Surface Pavement Design Temperature, °C	>-13	>-16	>-19	>-22	>-13	>-16	>-19	>-22	>-13	>-16	>-19	>-22

Original Binder

Dynamic Shear, AASHTO TP5
G*/Sinδ Minimum: 0.65 kPa
Test Temperature @ 10 rad/s, °C

Shear Strain Sweep
% strain @ 0.8G_i*, Minimum: 17.5 (25)
Test Temperature @ 10 rad/s linear loading from 1-50% strain, 1 sec delay time with measurement of 20-30 increments, °C

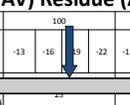



Pressure Aging Vessel (PAV) Residue (AASHTO PP1)

PAV Aging Temperature, °C

Creep Stiffness, AASHTO T 313/ASTM D6648
S, Maximum: 500 MPa
(m-value, Minimum: 0.24)
Test Temperature @ 8s, °C

Shear Strain Sweep
G_i*, Maximum: 2.5 MPa
Test Temperature @ 10 rad/s linear loading at 1% strain and 1 sec delay time, °C




RECOMMENDED SPG

with AASHTO PP 72-11 Method B	Performance Grade			
	SPG 67			
Avg 7-day Max Surface Pavement T, °C	-13	-16	-19	-22
Min Surface Pavement T, °C	>-13	>-16	>-19	>-22

- Method B for Emulsion Residue Recovery
 - Thin Film on Silicone Mat
 - 60 °C for 6 hrs



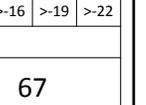
RECOMMENDED SPG

	Performance Grade			
	SPG 67			
	-13	-16	-19	-22
	>-13	>-16	>-19	>-22

Original Binder

G*/Sinδ ≥ 0.65 kPa
Test Temperature @ 10rad/s, °C

0.8G_i* ≥ 17.5% strain
Test Temperature @ 10rad/s w/ 1-50%, °C

RECOMMENDED SPG

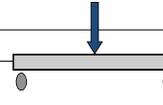
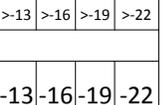
	Performance Grade			
	SPG 67			
	-13	-16	-19	-22
	>-13	>-16	>-19	>-22

PAV Residue

S ≤ 500 MPa
Test Temperature @ 8s, °C

G_i* ≤ 2.5 MPa
Test Temperature @ 10 rad/s, 1% strain, °C

OR Predict S from DSR Frequency Sweeps @ 6 °C



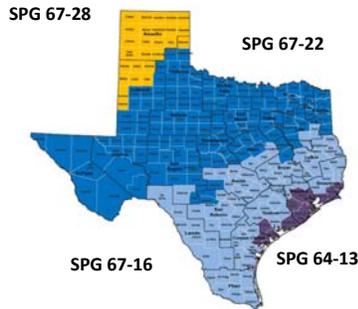
IMPLEMENTATION PROJECT

- 4 Years
- Implement SPG specification statewide to replace Seal Coat Binder Selection Table & Item 300 for seal coat binders *in service*
- Task 1 - Conduct Technical Briefings for Industry & TxDOT twice a year



IMPLEMENTATION PROJECT

- Task 2 - Document SPG Grade Requirements & Identify 2 Districts for 2014 Implementation
- Task 3 – Finalize SPG for 2014



IMPLEMENTATION PROJECT

- Task 4 – Produce Seal Coat Binder Utilization Map
- Task 5 – Monitor Field Performance of Selected 2013 Field Sections

Binder	SPG Grades	Districts
AC20-5TR	70-13, 67-16, 70-16, 73-16, 76-16, 79-16, 67-19, 70-19	AMA, ATL, BMT, BRV, BWD, FTW, LBB, LFK, PAR, SAT, SJT, TYL, WAC
AC15P	73-13, 70-19, 73-19, 73-22	CRP, LFK, PHR, SAT, WAC
CRS-2P	70-10, 70-16, 76-16, 76-19	BMT, BWD, LFK, PAR, WAC
CRS-2	64-10, 67-13	BWD
AC10	64-16, 64-19	AMA, CHS, SJT
AC10-2TR		AMA, BWD, LBB, ODA, SAT, SJT, WFS, YKM



IMPLEMENTATION PROJECT

- Task 6 – Finalize SPG for 2015
 - Check DSR+SAT for T_{low} properties
 - Check PAV = 1 year aging
 - Consider 3 vs 6 °C, single T_{max} , traffic effects
 - Evaluate field performance monitoring + embedment depth + binder characterization
 - 2013: ten 6616 sections + 20 new sections
 - 2014: 20 sections @ 1 yr + 10 new sections in 2 districts
 - 2015: 10 sections @ 1 yr + 20-25 new statewide sections
 - 2016: 20-25 statewide sections @ 1 yr



IMPLEMENTATION PROJECT

- Task 7 - Implement SPG in 2 Districts in 2014
- Task 8 – Finalize SPG Based on Feedback from TxDOT & Industry
- Task 9 – Implement Statewide in 2015, Estimate Economic Impact, & Document Implementation



THANK YOU

