

Improving Testing Requirements in Item 300 Of TxDOT Standard Specifications

24 July 2024

TxAPA MASTERS PROGRAM



Research Team

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Goals

- Improve accuracy and speed
- Reduce equipment diversity
- Improve health, environment, and safety
- Improve performance prediction



Scope – Item 300

AC Binders	Emulsions	Cutbacks	Crack Sealers	AR Binders	Recycling Agents	PG Binders				
Viscosity Tests	Stiffness Tests	Ductility & Elastic Recovery	Integrity Tests	Safety Tests	Emulsion Tests	Cutback Tests	Crack Sealer Tests	PG Tests	Polymer Tests	Aging
T201	T49	T51	T44	T48	T50	D95	Tex-543-C	T313	Tex-533-C	T179
T202		Tex-539-C			T59		Tex-544-C	T314	Tex-541-C	Tex-541-C
T72		D6084	Tex-509-C	T79	Tex-542-C		D5329	T315	Tex-540-C	R28
T316	T53				D2007	T78				T240
D2196					D412					
					D471					
					Tex-238-F					

Scope – Item 300

AC Binders	Emulsions	Cutbacks	Crack Sealers	AR Binders	Recycling Agents	PG Binders				
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T72		D6084	Tex-509-C	T79	Tex-542-C		D5329	T315	R28	R28
T316	T53				D2007	T78			Tex-540-C	T240
D2196					D412					
					D471					
					Tex-238-F					

Scope – Item 300

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T316	T53				D2007					T240
D2196					D412					
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Scope – Item 300

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T72		D6084	Tex-509-C	T79	D2007	T78	D5329	T315	Tex-540-C	R28
T316	T53				D412					T240
D2196					D471					
					Tex-238-F					

Item 300 – Aging Track

- T179 – TFOT
- Tex-541-C – RTFOT
- T240 – RTFOT
- R28 – PAV



- Remove T179 and replace with T240
- Minimal impact on current downstream specs

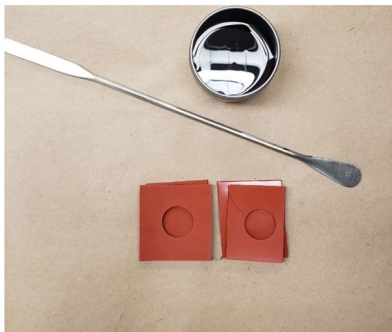
- Improve accuracy and speed
- Reduce equipment diversity
- Improve health, envi., and safety
- Improve performance prediction



Scope – Item 300

AC Binders	Emulsions	Cutbacks	Crack Sealers	AR Binders	Recycling Agents	PG Binders				
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T316	T53				D412				T240	
D2196					D471					
					Tex-238-F					

Item 300 – Polymer Separation Track



Agency →	Lab 1 (Producer)	Lab 2 (Producer)	Lab 3 (Research)	Lab 4 (Research)
Test Performed →	ASTM D7173 + G*/sin d; Jnr and Elastic Recovery from MSCR test at 0.1 and 3.2 kPa*			
PG 76-22 PS01	2	2	2	2
PG 76-22 PS02	2	2	2	2
PG 76-22 PS03		1	2	2
PG 76-22 PS04		1	2	2
PG 70-28 PS05		1	2	2
PG 70-28 PS06		1	2	2
AC 15-P PS07		2	2	2
AC-20-5TR PS09	2	2	2	2
AC-20-5TR PS10	2	2	2	2
AC-20-5TR PS11	2	2	2	2
AC-20-5TR PS12	2	2	2	2
PG 76-22 A			2	2
PG 76-22 B			2	2



Item 300 – Polymer Separation Track

- Tex-540-C → D7173



- Improve accuracy and speed
- Reduce equipment diversity
- Improve health, envi., and safety
- Improve performance prediction

Scope – Item 300

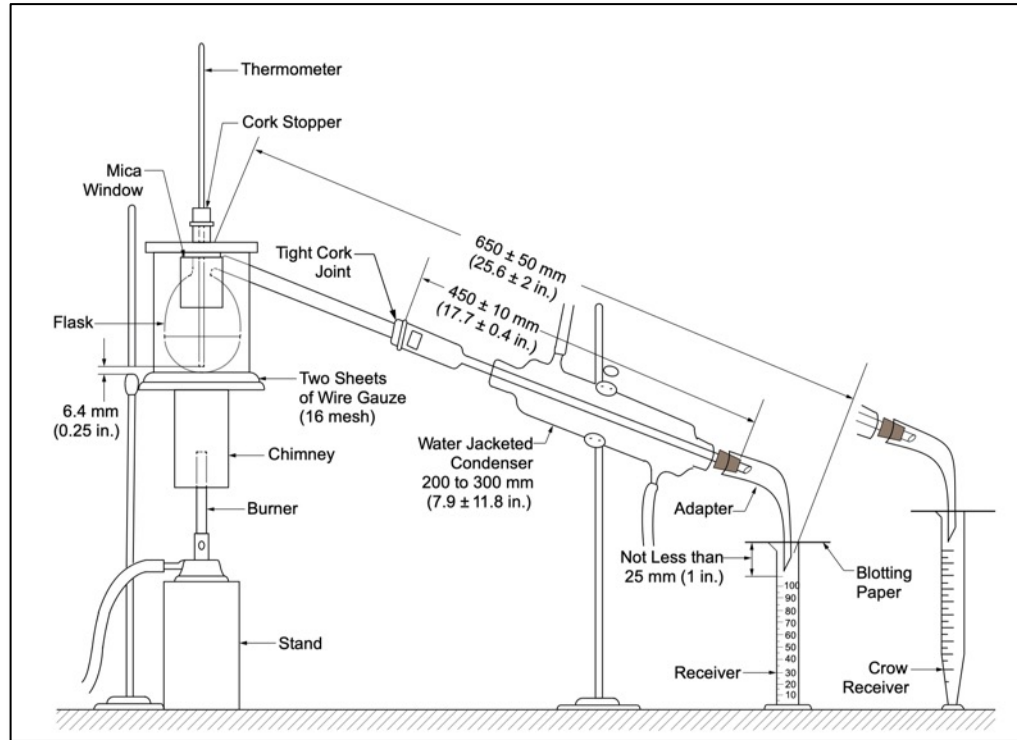
AC Binders	Emulsions	Cutbacks	Crack Sealers	AR Binders	Recycling Agents	PG Binders				
Viscosity Tests	Stiffness Tests	Ductility & Elastic Recovery	Integrity Tests	Safety Tests	Emulsion Track	Cutback Track	Crack Sealer Tests	PG Tests	Polymer Tests	Aging
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T316	T53		Tex-509-C	T79	D2007	T78	D5329	T315	Tex-540-C	T240
D2196					D412					
					D471					
					Tex-238-F					

Item 300 – Residue Recovery Track

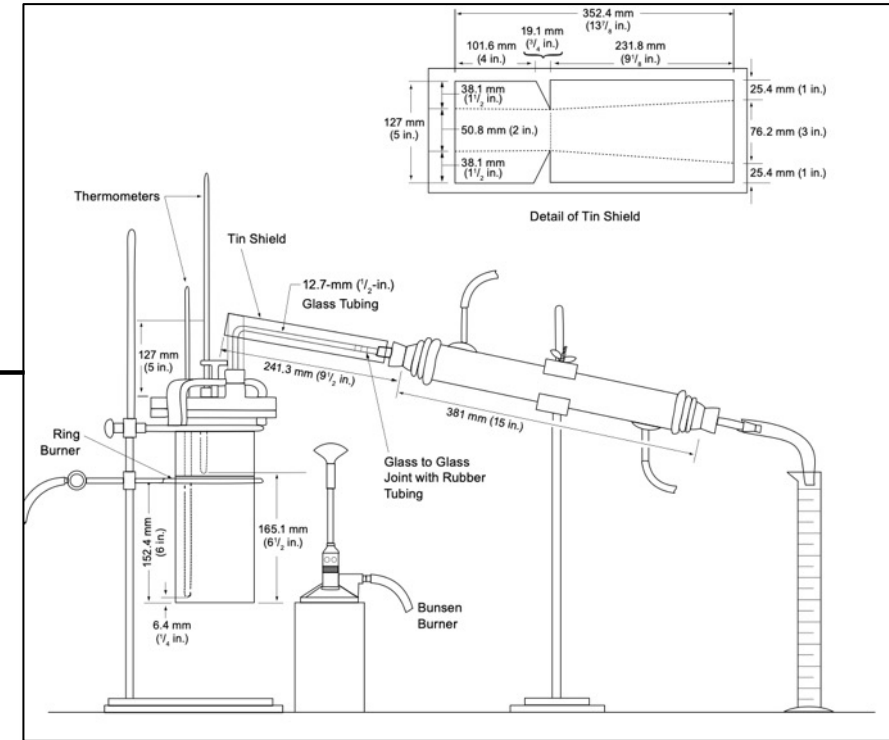
- T59 and T78 → Modified R78
- Downstream impact → viscosity / ductility tests (discussed later)



Item 300 – Residue Recovery Track



Ref: AASHTO T78



Ref: AASHTO T59

Reserved for use on
an as needed basis

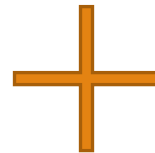
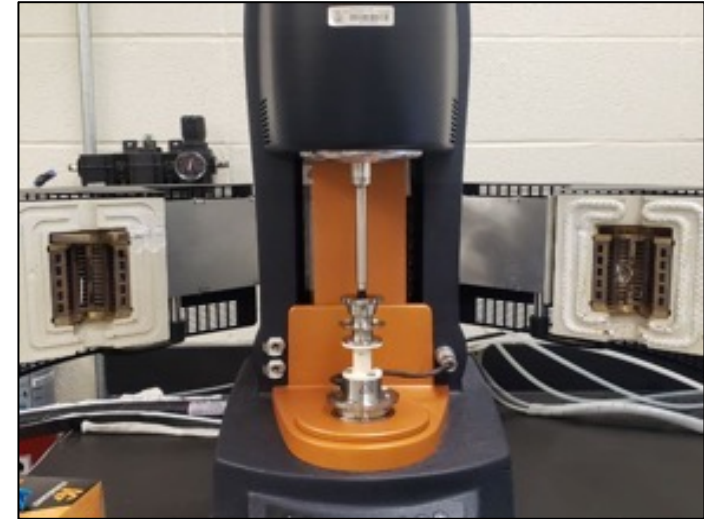
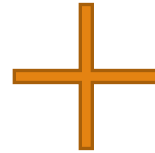
Composition
Analysis

Residue for
Binder Testing

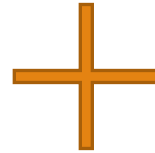
Vacuum
oven



Item 300 – Residue Recovery Track



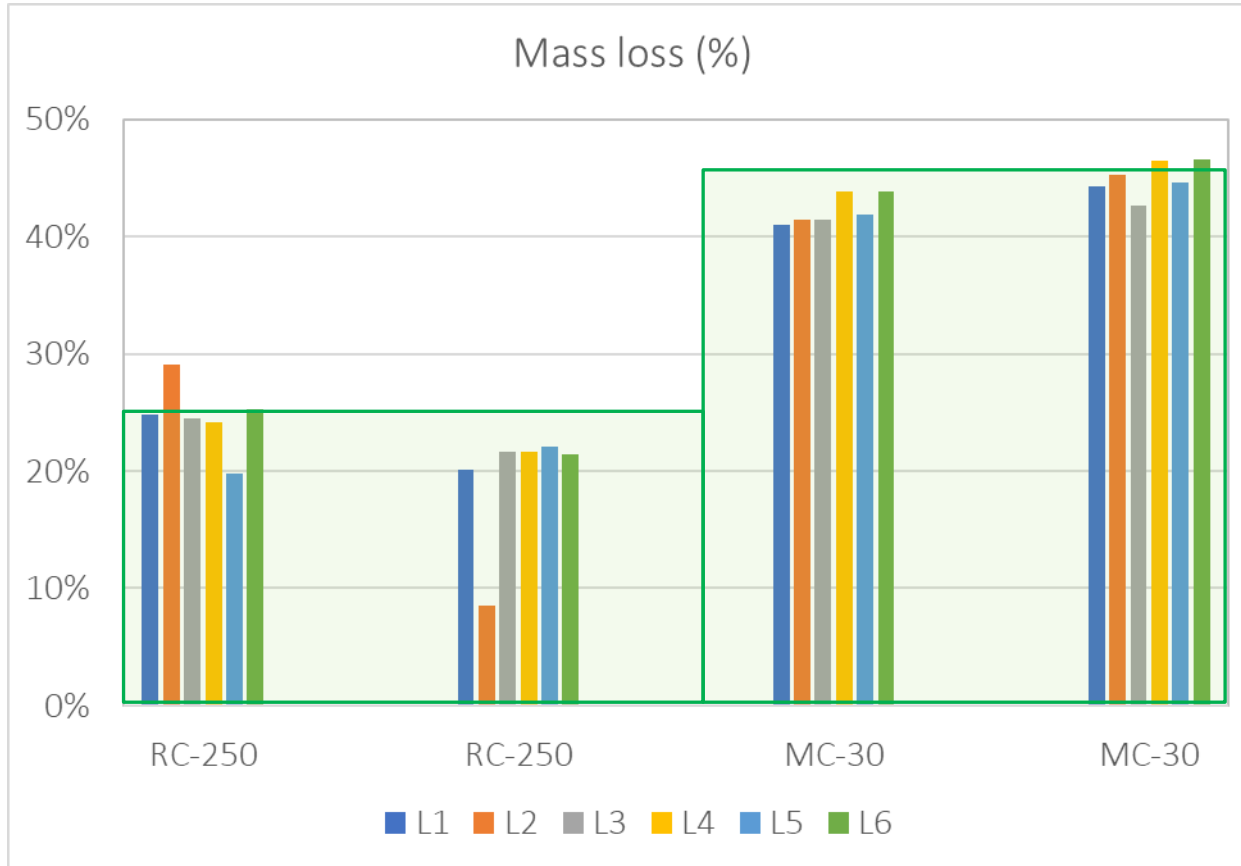
Item 300 – Residue Recovery Track



- Improve accuracy and speed
- Reduce equipment diversity
- Improve health, envi., and safety
- Improve performance prediction



Item 300 – Residue Recovery Track – Cutback

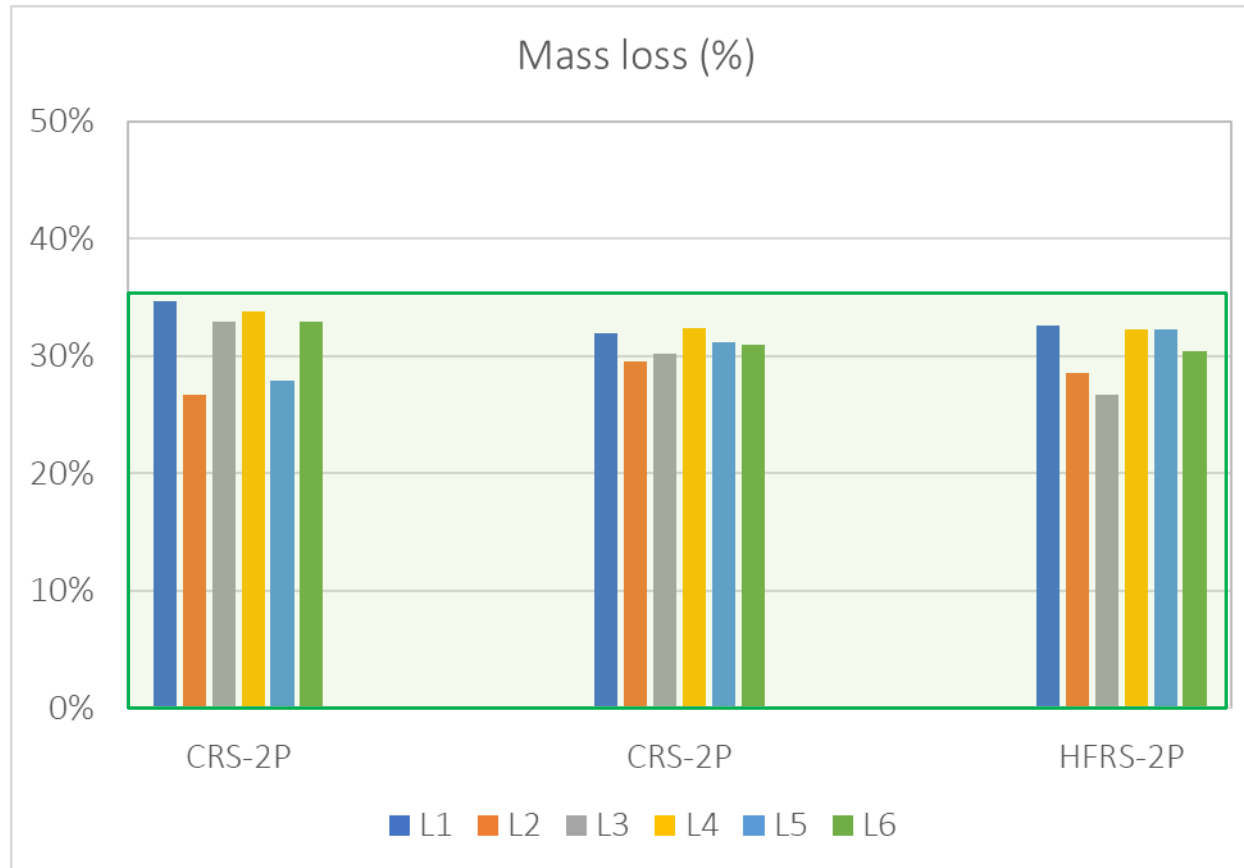


Proposed Max Mass Loss:

RC-250	26%
MC-30	44%
RC-800	21% (not used)
RC-3000	15% (not used)
MC-250	28% (not used)
MC-800	21% (v low usage)
MC-3000	17% (v low usage)
MC-2400L	18% (not used)
SCM I	20% (v low usage)
SCM II	15% (not used)



Item 300 – Residue Recovery Track – Emulsion



Proposed Max Mass Loss: 35%



Scope – Item 300

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T316	T53				D412				Tex-540-C	
D2196					D471					T240
					Tex-238-F					

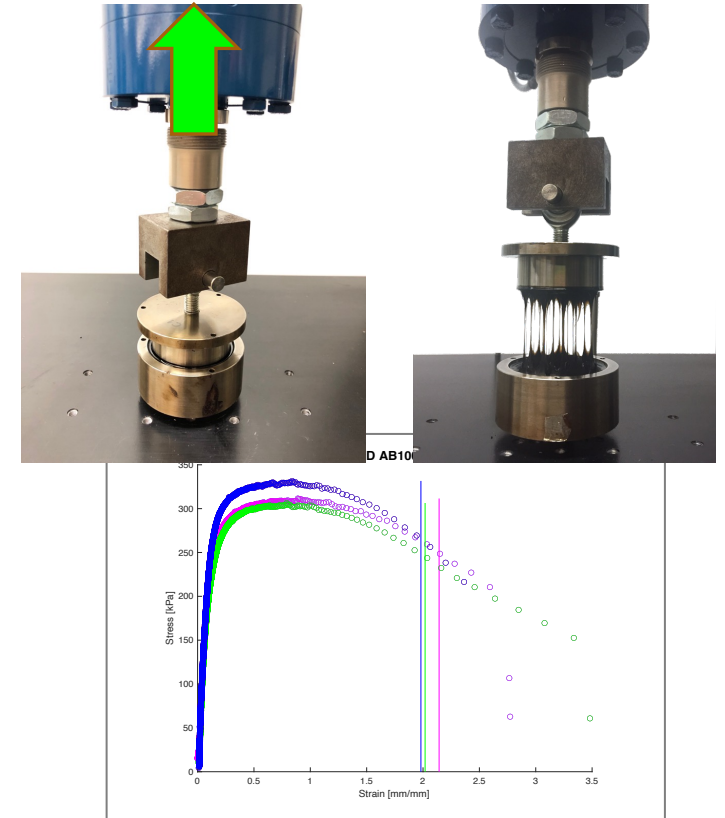
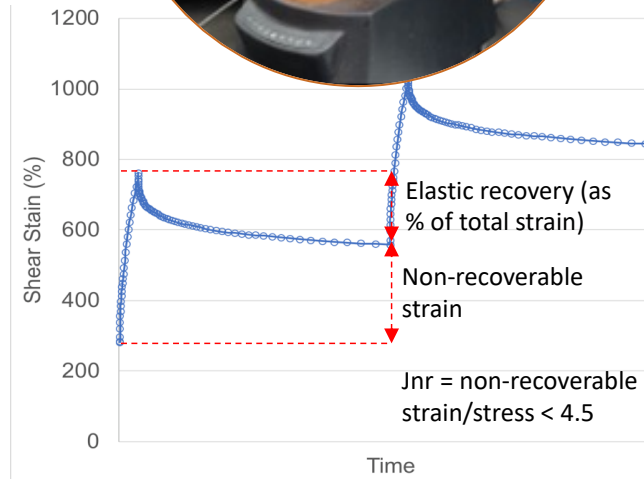
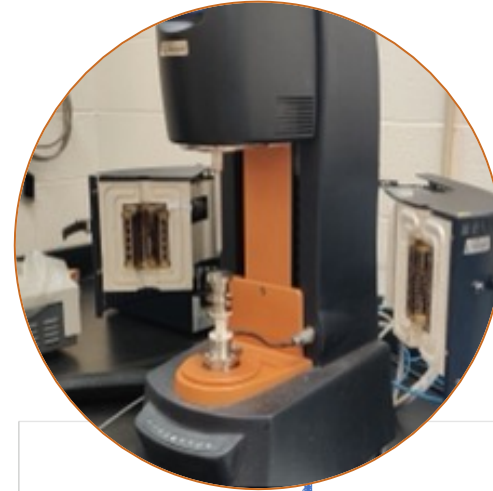
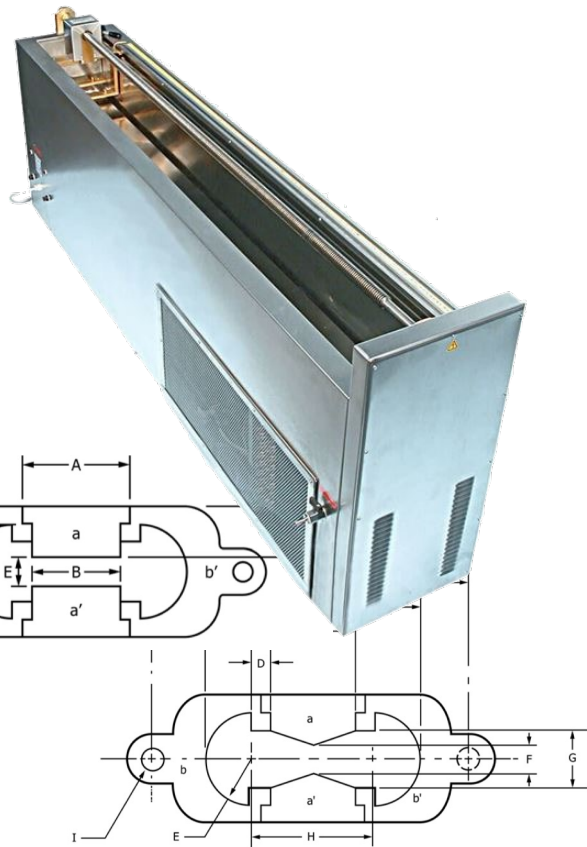


Item 300 – Ductility Track

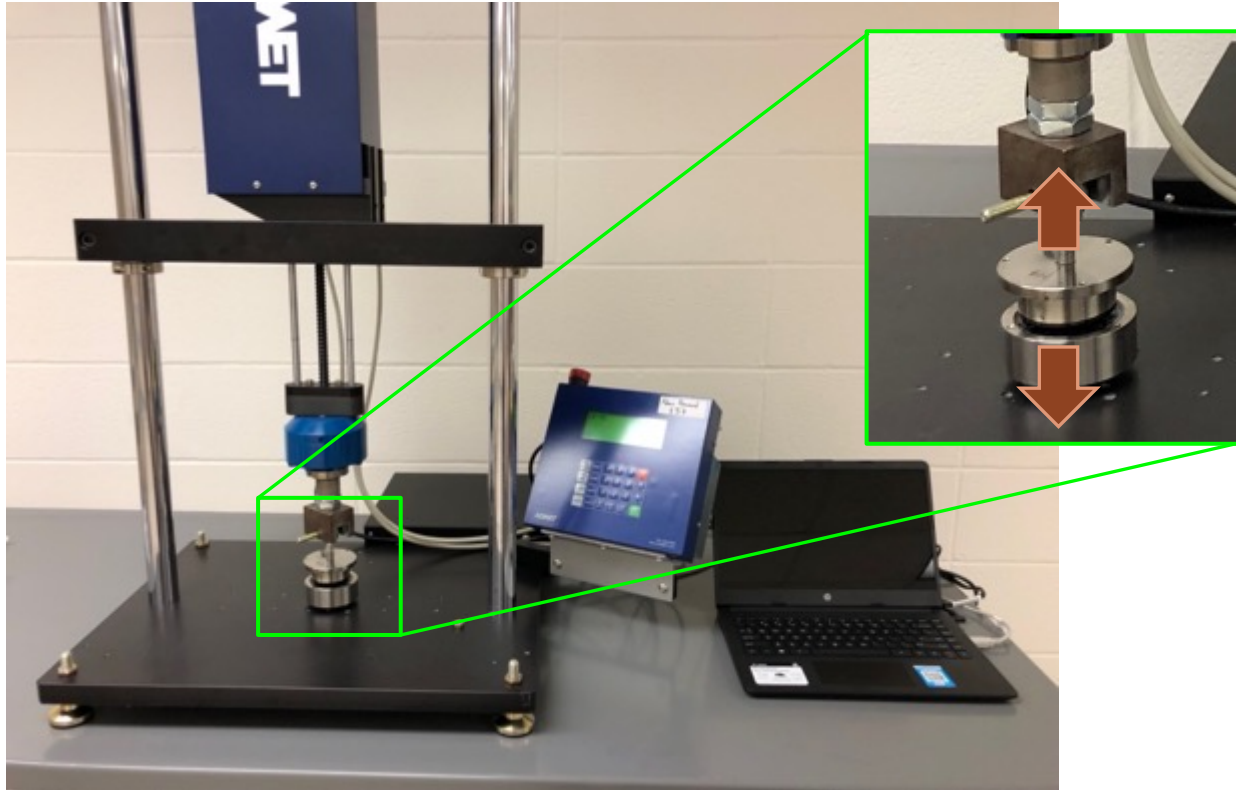
- Ductilometer (two variations) → Poker chip ductility
- MSCR Elastic recovery → currently being used as a surrogate



Item 300 – Ductility Track

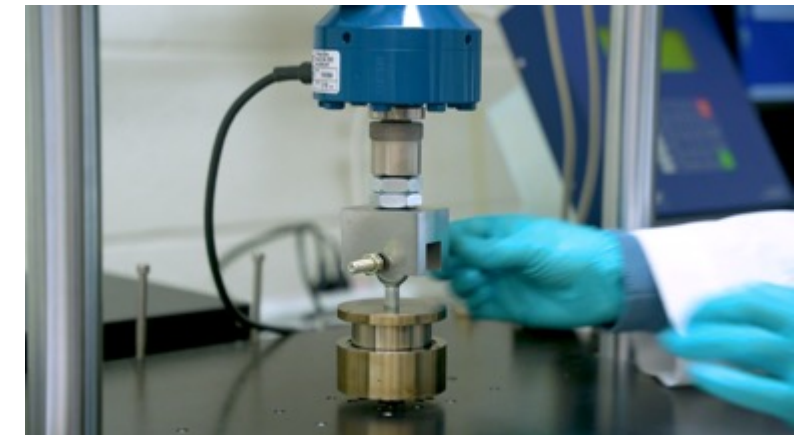


Item 300 – Ductility Track

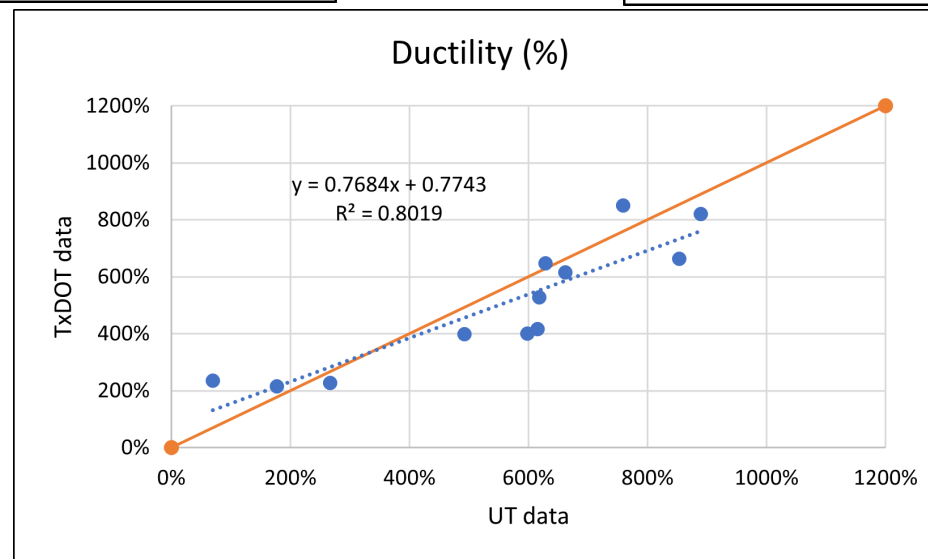
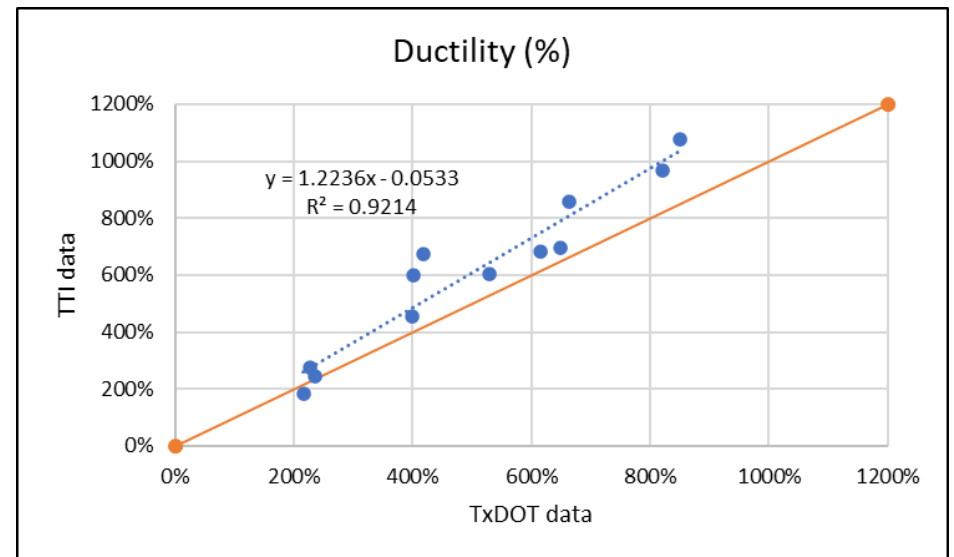
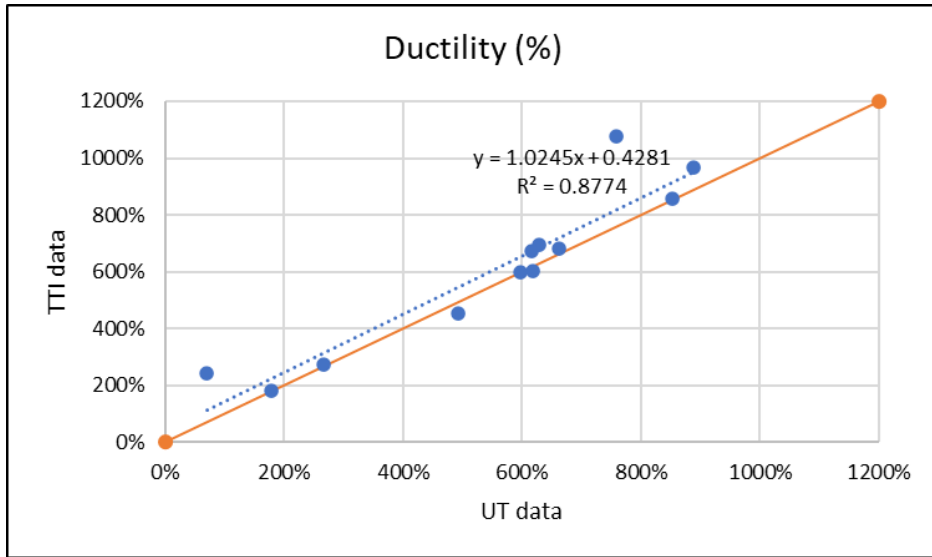


- Improve accuracy and speed
- Reduce equipment diversity
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Item 300 – Ductility Track



Item 300 – Ductility Track (round robin)

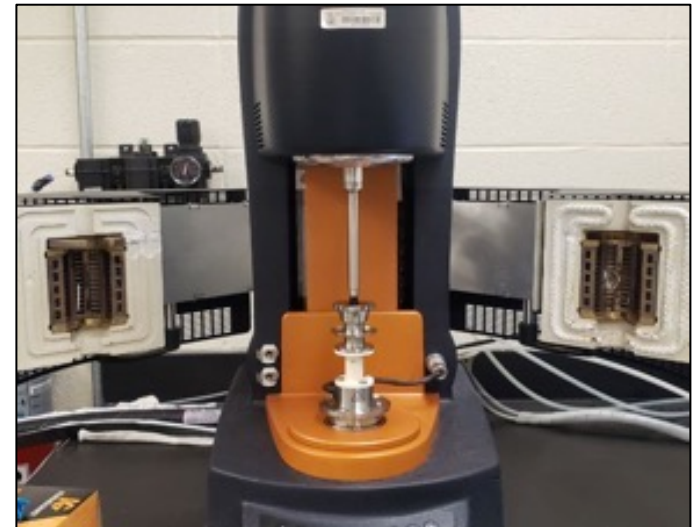


Scope – Item 300

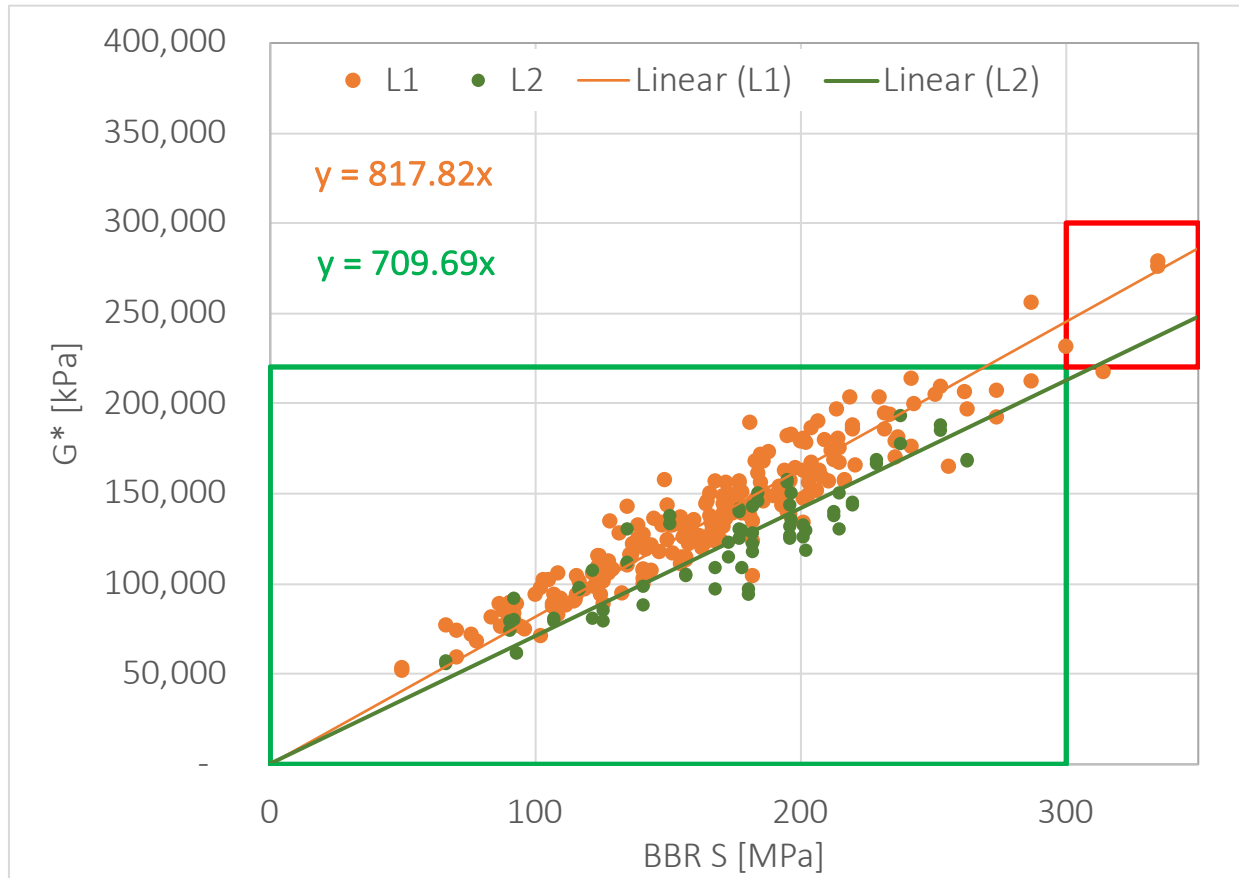
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T202		Tex-539-C			Tex-542-C		Tex-544-C	T314	Tex-541-C	Tex-541-C
T72		D6084	Tex-509-C	T79	D2007	T78	D5329	T315	Tex-540-C	R28
T316	T53				D412					T240
D2196					D471					
					Tex-238-F					

Item 300 – Low Temperature Properties Track

- Surrogate to Delta Tc (If $m < 0.32$, $S > 155$ MPa)
- BBR \rightarrow DSR



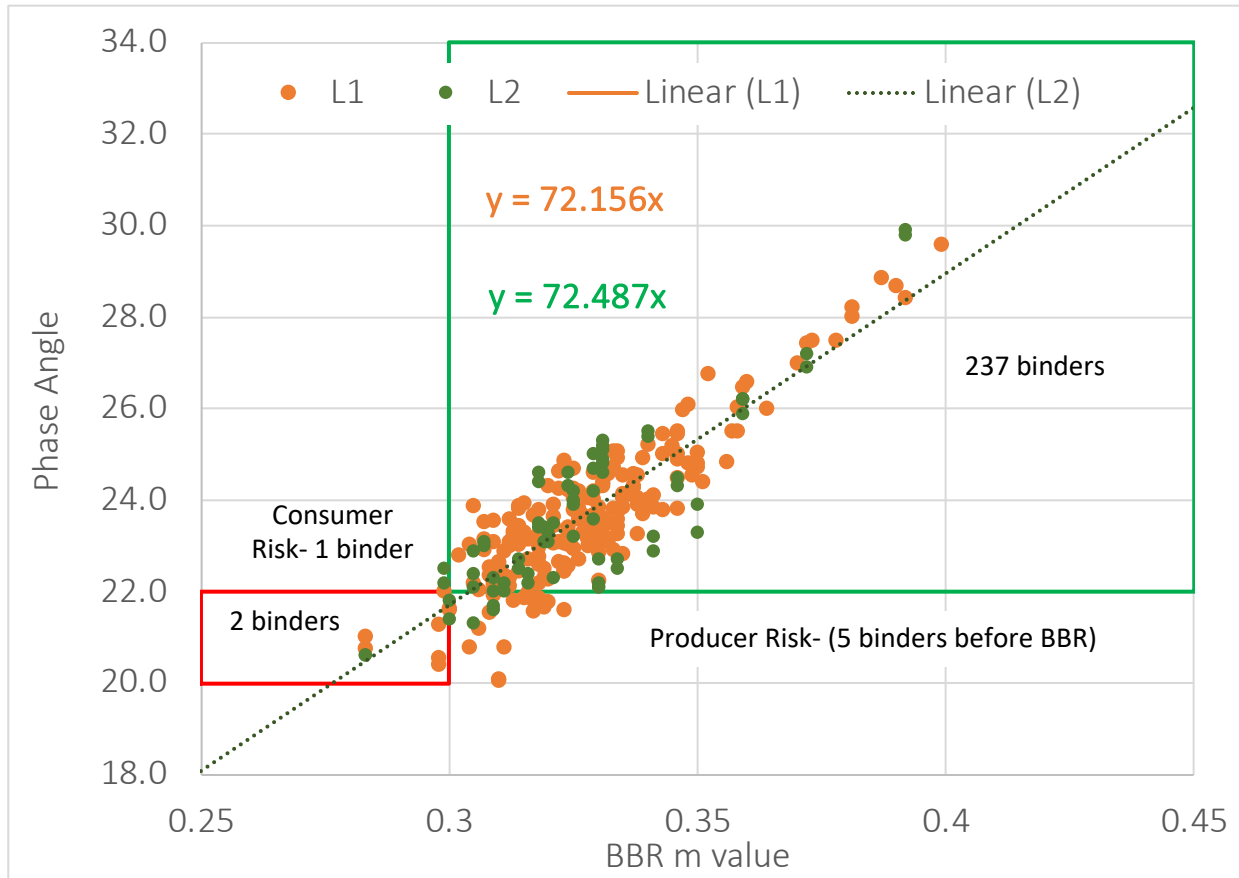
Item 300 – Low Temperature Properties Track



Proposed:
 $G^* < 220 \text{ MPa}$

8mm Intermediate Temperature → Low Temperature
Data of more than 200 asphalt binders

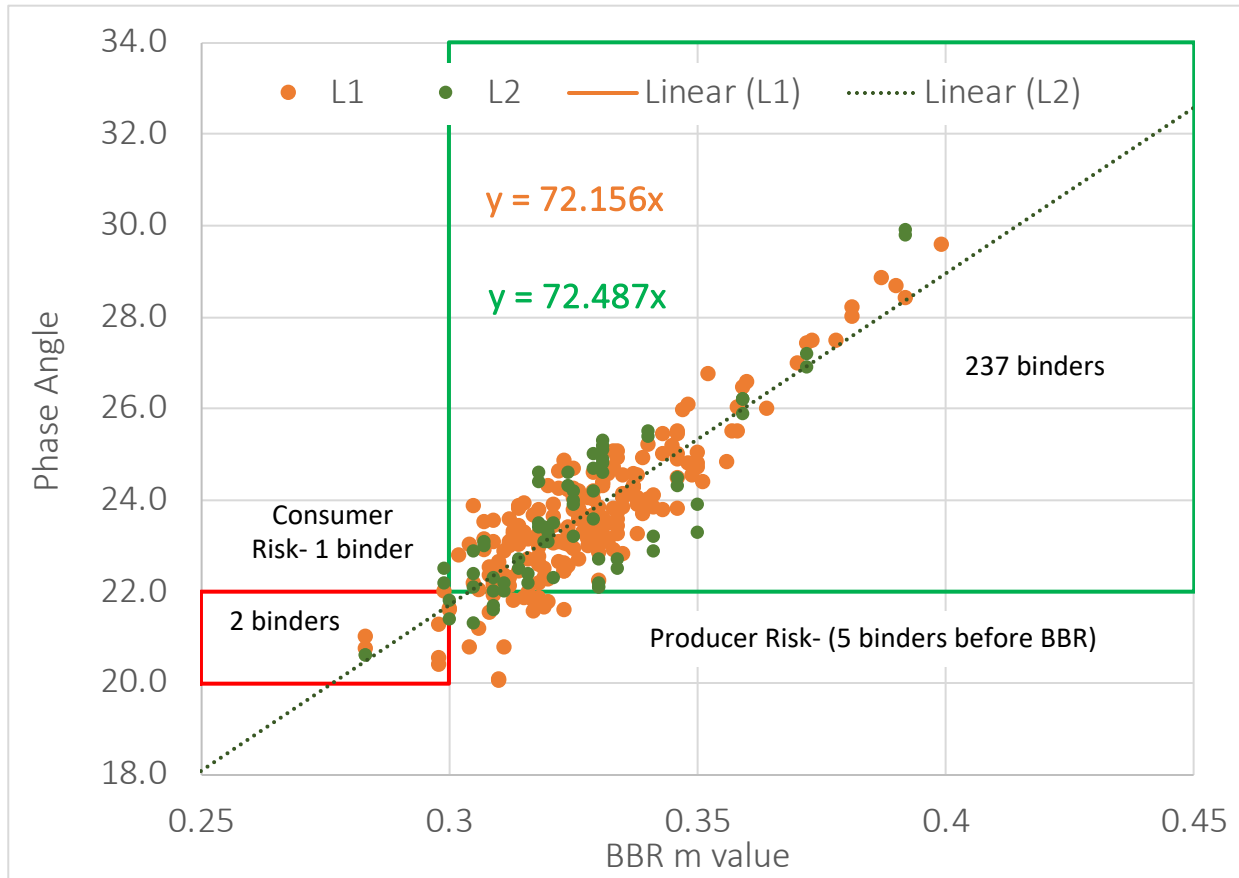
Item 300 – Low Temperature Properties Track



Proposed:
 $G^* < 220 \text{ MPa}$
AND
 $\delta > 22 \text{ degrees}$

8mm Intermediate Temperature → Low Temperature
Data of more than 200 asphalt binders

Item 300 – Low Temperature Properties Track



Proposed:
 $G^* < 220 \text{ MPa}$
 AND
 $\delta > 22 \text{ degrees}$

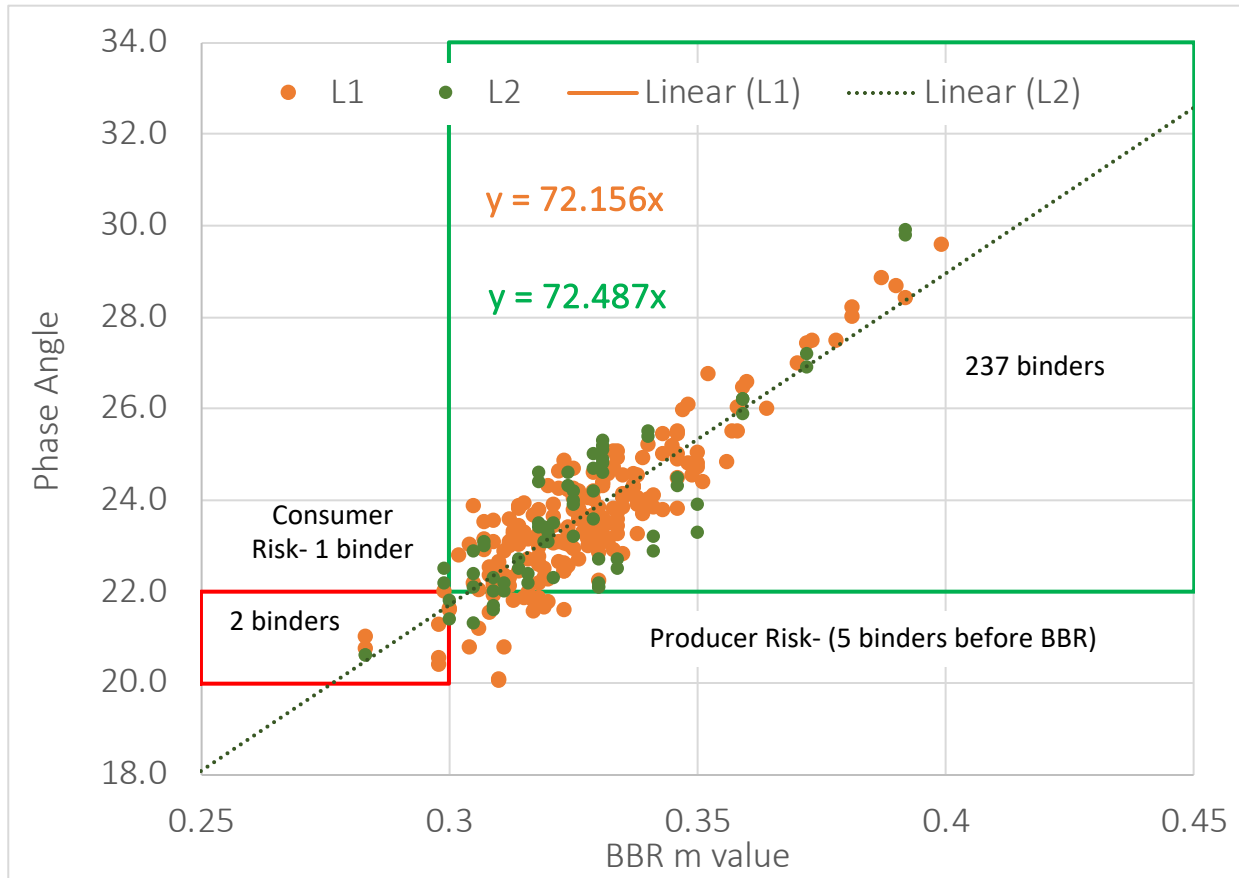
(If DSR fails, BBR S and m are admissible)

Note: 237 Binders cover different grades

58-28	13
64-22, -28	74, 12
70-22, -28	43, 21
76-22, -28	48, 16
82-22	1
HPG	9

8mm Intermediate Temperature → Low Temperature
 Data of more than 200 asphalt binders

Item 300 – Low Temperature Properties Track



Proposed:
 $G^* < 220 \text{ MPa}$
 AND
 $\delta > 22 \text{ degrees}$

(If DSR fails, BBR S and m are admissible)

- Improve accuracy and speed
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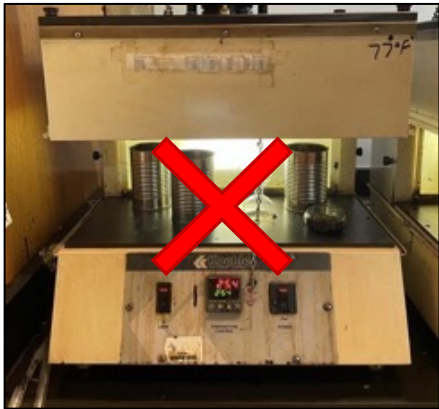
8mm Intermediate Temperature → Low Temperature
 Data of more than 200 asphalt binders

Scope – Item 300

	AC Binders	Emulsions	Cutbacks	Crack Sealers	AR Binders	Recycling Agents	PG Binders			
Viscosity Track										
	Stiffness Tests	Ductility & Elastic Recovery	Integrity Tests	Safety Tests	Emulsion Tests	Cutback Tests	Crack Sealer Tests	PG Tests	Polymer Tests	Aging
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		Tex-539-C			T59		Tex-544-C	T314	Tex-541-C	
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	T53				D2007	T78			T240	
					D412					
					D471					
					Tex-238-F					

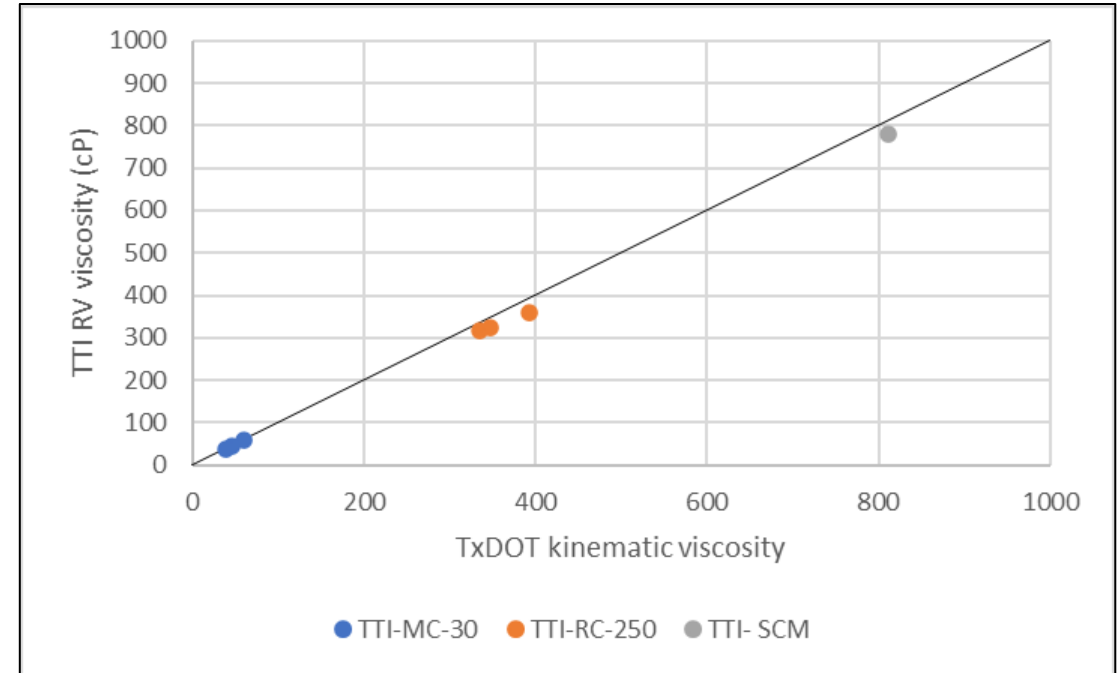
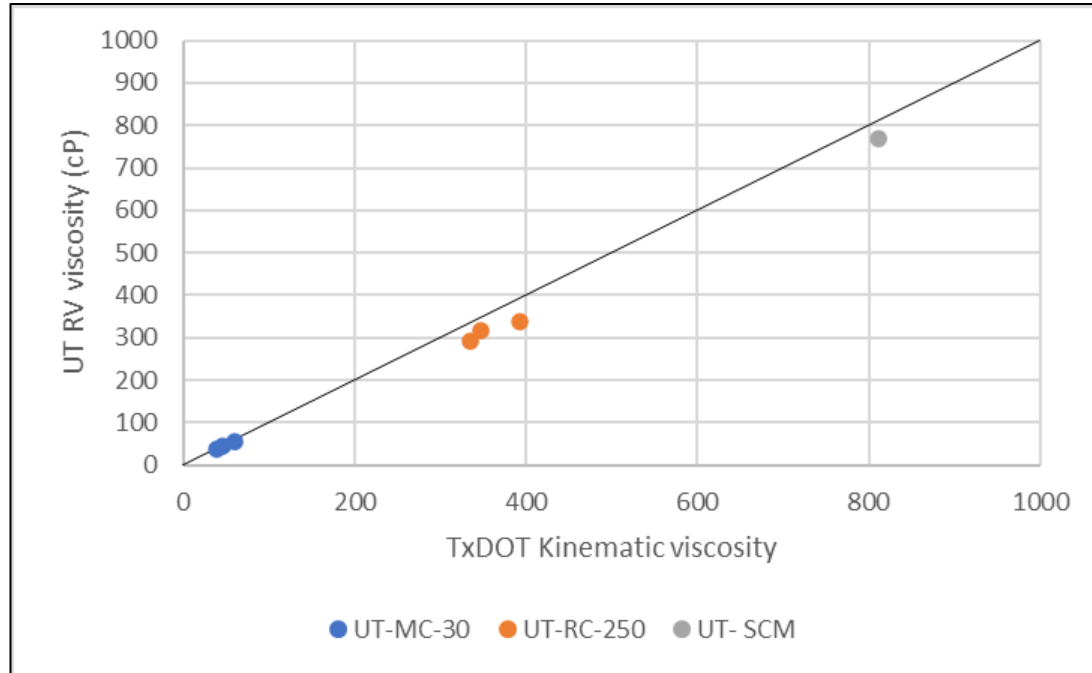
Item 300 – Viscosity Track

- T201 Kinematic viscosity → Rotational viscosity (for cutbacks)
- T72 Saybolt viscosity → Rotational viscosity (for emulsions)



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Item 300 – Viscosity Track (Cutbacks)



Scope – Item 300

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T72		D6084	Tex-509-C	T79	Tex-542-C		D5329	T315		R28
T316	T53				D2007	T78			Tex-540-C	
D2196					D412					T240
					D471					
					Tex-238-F					

Summary – Item 300

AC Binders	Emulsions	Cutbacks	Crack Sealers	AR Binders	Recycling Agents	PG Binders				
<p>Viscosity Tests</p> <p>T201 → T316</p> <p>T202</p> <p>T72 → T316</p> <p>T316</p> <p>D2196</p>	<p>Stiffness Tests</p> <p>T49</p> <p>T53</p>	<p>Ductility & Elastic Recovery</p> <p>T51</p> <p>Tex-539-C</p> <p>D6084 → Poker Chip</p>	<p>Integrity Tests</p> <p>T44</p> <p>Tex-509-C</p>	<p>Safety Tests</p> <p>T48</p> <p>T79</p>	<p>Emulsion Tests</p> <p>T50</p> <p>T59 → VOR</p> <p>Tex-542-C</p> <p>D2007</p> <p>D412</p> <p>D471</p> <p>Tex-238-F</p>	<p>Cutback Tests</p> <p>D95</p> <p>T78 → VOR</p>	<p>Crack Sealer Tests</p> <p>Tex-543-C</p> <p>Tex-544-C</p> <p>D5329</p>	<p>PG Tests</p> <p>T313 → 8mm DSR</p> <p>T314</p> <p>T315</p>	<p>Polymer Tests</p> <p>Tex-533-C</p> <p>Tex-540-C → ASTM D7173 + DSR</p>	<p>Aging</p> <p>T179</p> <p>Tex-541-C</p> <p>R28</p> <p>T240</p>

