State: Michigan	**Materials:** Re: Section 904 - Asphaltic Material
Date Last Reviewed: 04/25/2024	**Web Address:** www.michigan.gov/mdot
Materials Engineer: Tim Crook	**Contact Info:** crookt@michigan.gov

Asphalt Binder		
Section 904		
	PMA Notes	Standard PG binder will be provided except when polymer modified binders are identified by the suffix "P". Must be smooth, homogenous and comply with the requirements of Table 1 or Table 2. Polymer modified binders shall be pre-blended by addition an approved polymer to a base asphalt. Direct in-line blending of polymer at the hot mix plant is allowed if the Contractor is one of the approved manufacturers listed in the MDOT *Materials Source Guide*. Pre-approval required if polymers and modifiers other than SBS or SBR are used. Refer to Special Provision SP 12 904(A) for requirements for polymer modified asphalts
	Exclusions and Limits	Reclaimed Engine Oil Based Products.

Michigan		**Table 1: Requirements for Performance-Graded Asphalt Binders**									
Property		**Test Method: AASTHO (T), ASTM (D) or other**	**Requirements by Performance Grade**								
			46-34	**46-40**	**46-46**	**52-10**	**52-16**	**52-22**	**52-28**	**52-34**	**52-40**	**52-46**
ORIGINAL											
Flash Point, ° C		T48	230 min.								
Rotational Viscosity, Pa·s	135° C	T316	3.0 max.								
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec)	At Grade Temperature	T315	1.00 min.								
RTFO RESIDUE		T240									
Mass Change, %		T240	1.00 max.								
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec.)	At Grade Temperature	T315	2.20 min.								
PAV RESIDUE		R28	90° C 20 hrs, 300 psi								
Dynamic Shear, kPa (G* · sin δ, 10 rad./sec.) (1.)	At Test Temperature	T315	10° C	7° C	4° C	25° C	22° C	19° C	16° C	13° C	10° C	7° C
			5000 max.									
Creep Stiffness, MPa	At Test Temperature	T313	-24° C	-30° C	-36° C	0° C	-6° C	-12° C	-18° C	-24° C	-30° C	-36° C
			300 max.									
M-Value			0.300 min.									
NOTES		(1.) The maximum intermediate temperature stiffness, G* sinδ, is 5000 kPa. If the intermediate phase angle is greater than or equal to 42 degrees, the maximum intermediate temperature stiffness, G* sinδ, is 6000 kPa.									

Michigan		Table 1: Requirements for Performance-Graded Asphalt Binders (cont.)											
Property		**Test Method: AASTHO (T), ASTM (D) or other**	**Requirements by Performance Grade**										
			58-16	**58-22**	**58-28**	**58-34**	**58-40**	**64-10**	**64-16**	**64-22**	**64-28**	**64-34**	**64-40**
ORIGINAL													
Flash Point, ° C		T48	230 min.										
Rotational Viscosity, Pa·s	135° C	T316	3.0 max.										
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec)	At Grade Temperature	T315	1.00 min.										
RTFO RESIDUE		T240											
Mass Change, %		T240	1.00 max.										
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec.)	At Grade Temperature	T315	2.20 min.										
PAV RESIDUE		R28	100° C, 20 hrs, 300 psi										
Dynamic Shear, kPa (G* · sin δ, 10 rad./sec.) (1)	At Test Temperature	T315	25° C	22° C	19° C	16° C	13° C	31° C	28° C	25° C	22° C	19° C	16° C
			5000 max.										
Creep Stiffness, MPa	At Test Temperature	T313	-6° C	-12° C	-18° C	-24° C	-30° C	0° C	-6° C	-12° C	-18° C	-24° C	-30° C
			300 max.										
M-Value			0.300 min.										
NOTES		1. The maximum intermediate temperature stiffness, G* sinδ, is 5000 kPa. If the intermediate phase angle is greater than or equal to 42 degrees, the maximum intermediate temperature stiffness, G* sinδ, is 6000 kPa.											

Michigan		Table 1: Requirements for Performance-Graded Asphalt Binders (cont.)											
Property		**Test Method: AASTHO (T), ASTM (D) or other**	**Requirements by Performance Grade**										
			70-10	**70-16**	**70-22**	**70-28**	**70-34**	**70-40**	**76-10**	**76-16**	**76-22**	**76-28**	**76-34**
ORIGINAL													
Flash Point, ° C		T48	230 min.										
Rotational Viscosity, Pa·s	135° C	T316	3.0 max.										
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec)	At Grade Temperature	T315	1.00 min.										
RTFO RESIDUE		T240											
Mass Change, %		T240	1.00 max.										
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec.)	At Grade Temperature	T315	2.20 min.										
PAV RESIDUE		R28	100° C, 20 hrs, 300 psi						100° (110°) C, 20 hrs, 300 psi				
Dynamic Shear, kPa (G* · sin δ, 10 rad./sec.) (1)	At Test Temperature	T315	34° C	31° C	28° C	25° C	22° C	19° C	37° C	34° C	31° C	28° C	22° C
			5000 max.										
Creep Stiffness, MPa	At Test Temperature	T313	-0° C	-6° C	-12° C	-18° C	-24° C	-30° C	0° C	-6° C	-12° C	-18° C	-24° C
			300 max.										
M-Value			0.300 min.										
NOTES		1. The maximum intermediate temperature stiffness, G* sinδ, is 5000 kPa. If the intermediate phase angle is greater than or equal to 42 degrees, the maximum intermediate temperature stiffness, G* sinδ, is 6000 kPa.											

Michigan		Table 1: Requirements for Performance-Graded Asphalt Binders (cont.)					
Property		**Test Method: AASTHO (T), ASTM (D) or other**	**Requirements by Performance Grade**				
			82-10	**82-16**	**82-22**	**82-28**	**82-34**
ORIGINAL							
Flash Point, ° C		T48	230 min.				
Rotational Viscosity, Pa·s	135° C	T316	3.0 max.				
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec)	At Grade Temperature	T315	1.00 min.				
RTFO RESIDUE		T240					
Mass Change, %		T240	1.00 max.				
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec.)	At Grade Temperature	T315	2.20 min.				
PAV RESIDUE		R28	100° (110°) C, 20 hrs, 300 psi				
Dynamic Shear, kPa (G* · sin δ, 10 rad./sec.) (1)	At Test Temperature	T315	40° C	37° C	34° C	31° C	28° C
			5000 max.				
Creep Stiffness, MPa	At Test Temperature	T313	0° C	-6° C	-12° C	-18° C	-24° C
			300 max.				
M-Value			0.300 min.				
NOTES		1. The maximum intermediate temperature stiffness, G* sinδ, is 5000 kPa. If the intermediate phase angle is greater than or equal to 42 degrees, the maximum intermediate temperature stiffness, G* sinδ, is 6000 kPa.					

Michigan		Table 2: Requirements for Styrene-Butadiene-Styrene (SBS) Modified Binders (Note 1)							
Property		**Test Method:**	**Requirements by Performance Grade**						
			58-34 (P)	**64-28 (P)**	**64-34 (P)**	**70-22 (P)**	**70-28 (P)**	**76-22 (P)**	**76-28 (P)**
ORIGINAL (Note 2)									
Flash Point, ° C		T48	230 min.						
Rotational Viscosity, Pa·s	135° C	T316	3.0 max.						
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec)	At Grade Temp.	T315	1.00 min. (Note 2)						
Force Ductility, Force Ratio (3)	4° C	T300-95	0.30 min.		0.35 min.	0.30 min.		0.35 min.	
Separation of Polymer, ° C		D5976	2 max.						
Solubility, %		T44	99.0 min.						
RTFO RESIDUE (Note 2)		T240							
Mass Change, %		T240	1.00 max.						
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec.)	At Grade Temp.	T315	2.20 min.						
Elastic Recovery, % (4)	25° C	T301	60 min.		70 min.	60 min.		70 min.	
PAV RESIDUE		R28	100° (110°) C, 20 hrs, 300 psi						
Dynamic Shear, kPa (G* · sin δ, 10 rad./sec.) (5)	At Test Temp.	T315	16° C	22° C	19° C	16° C	28° C	31° C	28° C
			5000 max.						
Creep Stiffness, MPa	At Test Temp.	T313	-24° C	-18° C	-24° C	-12° C	-18° C	-12° C	-18° C
			300 max.						
M-Value			0.300 min.						
NOTES		1. Requirements in addition to M320 are shown in red. 2. Report DSR values for G*/sin, and the phase angle at the high-grade temperature on the original and RTFO residue for informational purposes. 3. Minimum 300 mm elongation required. 4. Pull 100 mm, cut immediately. 5. The maximum intermediate temperature stiffness, G* sinδ, is 5000 kPa. If the intermediate phase angle is greater than or equal to 42 degrees, the maximum intermediate temperature stiffness, G* sinδ, is 6000 kPa.							

To ensure the most accurate and current information, the specific agency should be contacted.

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Michigan		Table 3: Requirements for Styrene-Butadiene-Rubber (SBR) Modified Binders							
Property		**Test Method**	**Requirements by Performance Grade**						
			58-34 (P)	**64-28 (P)**	**64-34 (P)**	**70-22 (P)**	**70-28 (P)**	**76-22 (P)**	**76-28 (P)**
ORIGINAL									
Flash Point, ° C		T48	230 min.						
Rotational Viscosity, Pa·s	135° C	T316	3.0 max.						
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec)	At Grade Temp.	T315	1.00 min. (Note 2)						
Toughness and Tenacity	Toughness, N-m (in-lbs.)	D5801	12.5 (110)						
	Tenacity, N-m (in-lbs.)		8.5 (75)						
Separation of Polymer, ° C		D5976	2 max.						
Solubility, %		T44	99.0 min.						
RTFO RESIDUE		T240							
Mass Change, %		T240	1.00 max.						
Dynamic Shear, kPa (G*/sin δ, 10 rad./sec.)	At Grade Temp.	T315	2.20 min.						
Elastic Recovery, % (3)	25° C	T301	40 min.		50 min.	40 min.		50 min.	
PAV RESIDUE		R28	100° (110°) C, 20 hrs, 300 psi						
Dynamic Shear, kPa (G* · sin δ, 10 rad./sec.) (4)	At Test Temp.	T315	16° C	22° C	19° C	16° C	28° C	31° C	28° C
			5000 max.						
Creep Stiffness, MPa	At Test Temp.	T313	-24° C	-18° C	-24° C	-12° C	-18° C	-12° C	-18° C
			300 max.						
M-Value			0.300 min.						
NOTES			1. Requirements in addition to M320 are shown in red. 2. Report DSR values for G*/sin, and the phase angle at the high-grade temperature on the original and RTFO residue for informational purposes. 3. Pull 100 mm, cut immediately. 4. The maximum intermediate temperature stiffness, G* sinδ, is 5000 kPa. If the intermediate phase angle is greater than or equal to 42 degrees, the maximum intermediate temperature stiffness, G* sinδ, is 6000 kPa.						

To ensure the most accurate and current information, the specific agency should be contacted.

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