

SECTION 711
PAVING ASPHALT

711.1 GENERAL:

The asphalt shall be produced from crude asphalt petroleum or a mixture of refined liquid asphalt and refined solid asphalt. It shall be free from ad-mixture with any residues obtained by the artificial distillation of coal, coal tar, or paraffin oil and shall be homogeneous and free from water.

Polymer modified asphalt cement shall be produced from crude asphalt petroleum and a polymer or blend of polymers mixed to produce a-homogeneous material free from water.

Asphalt shall not be heated during the process of its manufacture, storage, or during construction so as to cause injury as evidence by the formation of carbonized particles.

711.2 TESTING REQUIREMENTS:

Paving asphalt shall be classified by the Performance Grading System and shall conform to the requirements set forth in Table [711-1](#) and [ASTM-D6376-AASHTO M-320](#) with the PAV temperature changes noted herein this table.

On all Grades Flash Point Temperature AASHTO T48: Minimum 230 °C and Mass Loss, Maximum 1.00 percent.

TABLE 711-1				
PERFORMANCE GRADING SYSTEM				
	PG 58-22	PG 64-16	PG-70-10	PG 76-16
Original Asphalt				
Viscosity, ASTM-D4402-AASHTO T316 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
Dynamic Shear ASTM-D7175-AASHTO T315 (Note 2) G*/Sin δ, Min., 1.0 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
Rolling Thin Film Oven Residue (ASTM-D2872-AASHTO T240)				
Mass Loss, Maximum %	1.0	1.0	1.0	1.0
Dynamic Shear ASTM-D7175-AASHTO T315 G*/Sin δ, Min., 2.20 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
Pressure Aging Vessel Residue (ASTM-D6521-AASHTO R28)				
PAV Aging Temperature, °C	100	100	110	110
Dynamic Shear ASTM-D7175-AASHTO T315 G*·Sin δ, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	28	34	34

Creep Stiffness, ASTM D6648-AASHTO T313 (Note 3) S, Maximum, 300.0 Mpa m-value, Minimum, 0.300 Test Temp. @60s, °C	-12	-6	0	-6
Direct Tension, ASTM D6723-AASHTO T314 (Note 3) Failure Strain, Minimum 1.0% Test Temp. @ 1.0 mm/min. °C	-12	-6	0	-6

~~On all Grades Flash Point Temperature ASTM D92/AASHTO T48: Minimum 230 °C and Mass Loss, Maximum 1.00 percent.~~

NOTES:

(1) This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

(2) For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of $G^*/\sin(d)$ at test temperatures when the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometer ([ASTM D4402-AASHTO T210 or AASHTO T202](#)).

(3) If the Creep Stiffness is below 300 MPa, the direct tension test is not required. If the Creep Stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used in lieu of the Creep Stiffness requirement. Direct tension test is recommended for polymer modified asphalt binders. The m-value requirement must be satisfied in all cases.

Polymer modified paving asphalt shall be classified by the Performance Grading System and shall conform to the requirements set forth in Table 711-2 and AASHTO M320 with the PAV temperature changes noted herein this table.

On all Grades Flash Point Temperature AASHTO T48: Minimum 230 °C and Mass Loss, Maximum 1.00 percent.

<u>TABLE 711-2</u>				
<u>PERFORMANCE GRADING SYSTEM</u>				
	<u>PG 64-28P</u>	<u>PG-76-22P</u>	<u>PG76-22TR Type 1 (Note 4)</u>	<u>PG76-22TR Type 2 (Note 4)</u>
<u>Viscosity ,AASHTO T316 (Note 1)</u> <u>Max. 3 Pa-s, Test Temp, °C</u>	<u>135</u>	<u>135</u>	<u>135</u>	<u>135</u>
<u>Dynamic Shear AASHTO T315 (Note 2)</u> <u>G*/Sin δ, Min., 1.0 kPa</u> <u>Test Temp. @ 10 rad/s, °C</u>	<u>64</u>	<u>76</u>	<u>76</u>	<u>76</u>
<u>Elastic recovery D-6084 procedure</u> <u>"B" @ 25°C</u> <u>"B" @ 10°C</u>	<u>65</u>	<u>65</u>	<u>55</u>	<u>55</u>
<u>Phase Angle, Max</u>	<u>75</u>	<u>75</u>	<u>75</u>	<u>75</u>
<u>Separation test, Texas 540 % Max</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>
<u>Rolling Thin Film Oven Residue (AASHTO T-240)</u>				

<u>Mass Loss, Maximum %</u>	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>
<u>Dynamic Shear AASHTO T315</u> <u>G*/sin δ, Min., 2.20 kPa</u> <u>Test Temp. @ 10 rad/s, °C</u>	<u>64</u>	<u>76</u>	<u>76</u>	<u>76</u>
<u>PAV Aging Residue Temperature, °C</u>	<u>100</u>	<u>110</u>	<u>110</u>	<u>110</u>
<u>Tests from PAV Residue:</u>				
<u>Dynamic Shear AASHTO T315</u> <u>G* sin δ, Max., 5000 kPa</u> <u>Test Temp. @ 10 rad/s, °C</u>	<u>22</u>	<u>31</u>	<u>31</u>	<u>31</u>
<u>Mass Loss, AASHTO T240 Weight % Max</u>	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>
<u>M -value AASHTO T313 0300 Min</u>	<u>-18</u>	<u>-12</u>	<u>-12</u>	<u>-12</u>
<u>Creep Stiffness, AASHTO T313</u> <u>S, Maximum, 300-Mpa</u> <u>m-value, Minimum, 0.300</u> <u>Test Temp. @60s, °C</u>	<u>-18</u>	<u>-12</u>	<u>-12</u>	<u>-12</u>
<u>Direct Tension, AASHTO T314 (Note 3)</u> <u>Failure Strain, Minimum 1.0%</u> <u>Test Temp. @ 1.0 mm/min. °C</u>	<u>-18</u>	<u>-12</u>	<u>-12</u>	<u>-12</u>
<u>Solubility in Trichloroethylene % minimum</u> <u>ASTM D 2042</u>	<u>=</u>	<u>=</u>	<u>97.5</u>	<u>=</u>

~~On all Grades Flash Point Temperature AASHTO T48: Minimum 230 °C and Mass Loss, Maximum 1.00 percent.~~

NOTES:

(1) This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

(2) For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of $G^*/\sin(\delta)$ $G^*/\sin \delta$, at test temperatures when the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometer (AASHTO T210 or AASHTO T202).

(3) If the Creep Stiffness is below 300 MPa, the direct tension test is not required. If the Creep Stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used in lieu of the Creep Stiffness requirement. Direct tension test is recommended for polymer modified asphalt binders. The m-value requirement must be satisfied in all cases.

(4) "TR" binders shall have 9% to 11% reclaimed tire rubber and enough virgin polymer to meet all performance grade criteria specified. The blend percentages shall be listed on the Certificate of Compliance by the manufacturer. Type 1 shall meet solubility limits.

~~Design Note: Performance Grade Asphalts are selected for certain reliabilities with respect to high and low pavement temperatures. The specified characteristics are based upon a loading frequency that approximates vehicle speeds of approximately 90 km/hr. Since all binders are frequency dependent, the designer may consider increasing the high temperature requirement for slow transient and standing loads, such as intersection loading. The high temperature requirement may also be increased for excessive numbers of equivalent single axle loads.~~

711.3 TEST REPORT AND CERTIFICATION:

At the time of delivery of each shipment of asphalt, the supplier supplying the material shall deliver to the purchaser 3 certified copies of the test report which shall indicate the name of the refinery and supplier, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and results of the above specified tests. The test report shall be signed by an authorized representative of the supplier certifying that the product delivered conforms to the specifications for the type and grade indicated.

Until the certified test reports and samples of the material have been checked by the Engineer, that material will be only tentatively accepted by the Contracting Agency. Final acceptance will be dependent upon the determination of the Engineer that the material involved fulfills the requirements prescribed. The certified test reports and the testing required in connection with the reports shall be at no additional cost to the Contracting Agency.

711.4 TEMPERATURES:

Paving asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the paving asphalt during heating.

711.5 CONVERSION OF QUANTITIES:

When pay quantities of paving asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F. in accordance with ASTM D-1250. In converting volume to weight, the computations shall be based on Table 711-3.

TABLE 711-3		
ASPHALT CEMENT QUANTITY CONVERSION		
Grade of Material	Gals. Per Ton of 60 °F.	Lbs. Per Gal at 60 °F.
PG 58-22	236	8.47
PG 64-16	235	8. <u>5150</u>
PG 70-10	235	8. <u>5150</u>
<u>PG 64-28P</u>	<u>236</u>	<u>8.47</u>
<u>PG 76-22P,TR</u>	<u>236</u>	<u>8.47</u>
PG 76-16	233	8. <u>5860</u>

- End of Section -

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TABLE 711-1				
PERFORMANCE GRADING SYSTEM				
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Original Asphalt				
Viscosity, AASHTO T316 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
Dynamic Shear AASHTO T315 (Note 2) G*/Sin δ, Min., 1.0 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
Rolling Thin Film Oven Residue (AASHTO T240)				
Mass Loss, Maximum %	1.0	1.0	1.0	1.0
Dynamic Shear AASHTO T315 G*/Sin δ, Min., 2.20 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
Pressure Aging Vessel Residue (AASHTO R28)				
PAV Aging Temperature, °C	100	100	110	110
Dynamic Shear AASHTO T315 G*·Sin δ, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	28	34	34
Creep Stiffness, AASHTO T313 (Note 3) S, Maximum, 300.0 Mpa m-value, Minimum, 0.300 Test Temp. @ 60s, °C	-12	-6	0	-6
Direct Tension, AASHTO T314 (Note 3) Failure Strain, Minimum 1.0% Test Temp. @ 1.0 mm/min. °C	-12	-6	0	-6

NOTES:

(1) This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

(2) For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of $G^*/\sin(\delta)$ at test temperatures when the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometer (AASHTO T210 or AASHTO T202).

(3) If the Creep Stiffness is below 300 MPa, the direct tension test is not required. If the Creep Stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used in lieu of the Creep Stiffness requirement. Direct tension test is recommended for polymer modified asphalt binders. The m-value requirement must be satisfied in all cases.

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Viscosity ,AASHTO T316 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
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Elastic recovery D-6084 procedure "B" @ 25°C "B" @ 10°C	65	65	55	55
Phase Angle, Max	75	75	75	75
Separation test, Texas 540 % Max	4	4	4	4
Rolling Thin Film Oven Residue (AASHTO T-240)				
Mass Loss, Maximum %	1.0	1.0	1.0	1.0
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PAV Aging Residue Temperature, °C	100	110	110	110
Tests from PAV Residue:				
Dynamic Shear AASHTO T315 $G^*\sin \delta$, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	31	31	31
Mass Loss, AASHTO T240 Weight % Max	1.0	1.0	1.0	1.0
M -value AASHTO T313 0300 Min	-18	-12	-12	-12

Creep Stiffness, AASHTO T313 S, Maximum, .300 Mpa m-value, Minimum, 0.300 Test Temp. @60s, °C	-18	-12	-12	-12
Direct Tension, AASHTO T314 (Note 3) Failure Strain, Minimum 1.0% Test Temp. @ 1.0 mm/min. °C	-18	-12	-12	-12
Solubility in Trichloroethylene % minimum ASTM D 2042	-	-	97.5	-

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ASPHALT CEMENT QUANTITY CONVERSION		
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PG 64-16	235	8.51
PG 70-10	235	8.51
PG 64-28P	236	8.47
PG 76-22P,TR	236	8.47
PG 76-16	233	8.58

- End of Section -