

## Case 12-05

### Modifications to MAG 711-1 table

We still showed a typo in the math nomenclature on the original binder section. I have added PG64-16 that is used extensively as a both regular binder and asphalt base for asphalt rubber. I deleted the PG82 grade. This has never been used and is not recommended for use.

The PG76-16 is included because ADOT uses it in desert climates. This product is not expected to be used regularly. It is expensive and is usually a special order product. I have changed all of the AASHTO tests to ASTM this also eliminates the temporary test methods that were indicated before.

I have also taken the direct tension test out. The test is still used for modified asphalts but the standard Bending Beam Rheometer is used to determine low temperature qualities in neat paving asphalt. The direct tension can be specified for modified asphalt tests.

## PAVING ASPHALT

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### 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.

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 ~~AASHTO M-320~~ ASTM D6376 with the PAV temperature changes noted herein this table.

TABLE 711-1				
PERFORMANCE GRADING SYSTEM				
	PG 58-22	<del>1064-16</del> PG 70-10	<del>1070-10</del> PG 76-10	<del>1076-16</del> PG 82-16
<b>Original Asphalt</b>				
Viscosity, ASTM D4402 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
Dynamic Shear <del>TP5</del> <u>ASTM D7175</u> (Note 2) G*/Sin δ, Min., 1.0 kPa Test Temp. @ 10 rad/s, °C	58	<del>7064</del>	<del>7670</del>	<del>8276</del>
Rolling Thin Film Oven Residue ( <del>AASHTO T-240</del> <u>ASTM D2872</u> )				
Mass Loss, Maximum % Dynamic Shear <del>TP5</del> <u>ASTM D7175</u> G*/Sin δ, Min., 2.20 kPa Test Temp. @ 10 rad/s, °C	1.0 58	1.0 <del>7064</del>	1.0 <del>7670</del>	1.0 <del>8276</del>
Pressure Aging Vessel Residue ( <del>AASHTO R-28</del> <u>ASTM D6521</u> )				
PAV Aging Temperature, °C	100	100	110	110
Dynamic Shear <del>TP5</del> <u>ASTM D7175</u> G*/Sin δ, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	28	<del>3734</del>	<del>3434</del>
Creep Stiffness, <del>TP1</del> <u>ASTM D6648</u> (Note 3) S, Maximum, 300.0 Mpa m-value, Minimum, 0.300 Test Temp. @60s, °C	-12	-6	0	-6
Direct Tension, <del>TP3</del> <u>ASTM D6723</u> (Note 3) Failure Strain, Minimum 1.0% Test Temp. @ 1.0 mm/min. °C	-12	-6	0	-6

Comment [JB2]: Work horse grade for all of Maricopa County agencies

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Comment [JB1]: This is used in desert climates as the base asphalt for rubber projects

Comment [JB3]: A very stiff and expensive binder that is used occasionally. A typical ADOT grade.

Comment [JB4]: This should be same as the RTFO: G\*/Sin δ, Min

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Comment [JB5]: This test is only used for modified asphalts. The table is restored.

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

#### NOTES:

- (1) This requirement may be waved 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 viscometry (~~T210 or T202~~ASTM D4402).

(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.

**Comment [JB6]:** This language is inserted for clarity.

## PAVING ASPHALT

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### 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 with the PAV temperature changes noted herein in this table.

<b>TABLE 711-1</b>				
<b>PERFORMANCE GRADING SYSTEM</b>				
	<b>PG 58-22</b>	<b>PG 64-16</b>	<b>PG-70-10</b>	<b>PG 76-16</b>
<b>Original Asphalt</b>				
Viscosity, ASTM D4402 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
Dynamic Shear ASTM D7175 (Note 2) G*/Sin δ, Min., 1.0 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
<b>Rolling Thin Film Oven Residue (ASTM D2872)</b>				
Mass Loss, Maximum % Dynamic Shear ASTM D7175 G*/Sin δ, Min., 2.20 kPa Test Temp. @ 10 rad/s, °C	1.0	1.0	1.0	1.0
PAV Aging Temperature, °C	100	100	110	110
Dynamic Shear ASTM D7175 G**Sin δ, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	28	34	34
Creep Stiffness, ASTM D6648 (Note 3) S, Maximum, 300.0 Mpa m-value, Minimum, 0.300 Test Temp. @ 60s, °C	-12	-6	0	-6
Direct Tension, ASTM D6723 (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: Minimum 230 °C and Mass Loss, Maximum 1.00 percent.

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#### NOTES:

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(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.