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Saudi Standards, Metrology and Quality Org (SASO)

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المواصفة القياسية للرابط الاسفلتي المصنف طبقاً لدرجة اللزوجة للاستخدام في

بناء الرصف

Standard Specification for
Viscosity-Graded Asphalt Binder for Use in Pavement
Construction

ICS: 93.080.20

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Foreword

Saudi Standards, Metrology and Quality Organization (SASO) has Updated the Saudi Standard No. SASO 1776:2000" Asphalt (Bituminous) materials used in pavement – Asphalt (Bituminous) materials classified according to viscosity grade " by adopting Standard No. ASTM D3381/D3381M:2018 "Standard Specification for Viscosity-Graded Asphalt Binder for Use in Pavement Construction" issued by ASTM which has been translated into Arabic.

This standard has been approved As a Saudi Standard without any technical Modifications. The approved Standard will replace and supersede the Saudi Standard No. SASO 1776:2000



Designation: D3381/D3381M – 18

Standard Specification for Viscosity-Graded Asphalt Binder for Use in Pavement Construction¹

This standard is issued under the fixed designation D3381/D3381M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers asphalt binders graded by viscosity at 60 °C [140 °F] for use in pavement construction. Four sets of limits are offered in this specification. The purchaser shall specify the applicable table of limits. In the event the purchaser does not specify limits, **Table 1** shall apply. For asphalt binders graded by penetration at 25 °C [77 °F], see Specification **D946/D946M**. If needed, volume corrections for asphalt binders should be made according to Practice **D4311/D4311M**.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D5/D5M Test Method for Penetration of Bituminous Materials

D36/D36M Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

D70 Test Method for Density of Semi-Solid Asphalt Binder (Pycnometer Method)

¹ This specification is under the jurisdiction of ASTM Committee **D04** on Road and Paving Materials and is the direct responsibility of Subcommittee **D04.40** on Asphalt Specifications.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

D95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation

D113 Test Method for Ductility of Asphalt Materials

D140/D140M Practice for Sampling Asphalt Materials

D946/D946M Specification for Penetration-Graded Asphalt Binder for Use in Pavement Construction

D1754/D1754M Test Method for Effects of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)

D2042 Test Method for Solubility of Asphalt Materials in Trichloroethylene

D2170/D2170M Test Method for Kinematic Viscosity of Asphalts

D2171/D2171M Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer

D2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)

D4311/D4311M Practice for Determining Asphalt Volume Correction to a Base Temperature

D7553 Test Method for Solubility of Asphalt Materials in N-Propyl Bromide

3. Manufacture

3.1 The asphalt binder shall be prepared from crude petroleum by suitable methods.

4. Physical Requirements

4.1 The asphalt binder shall be homogeneous, free from water, and shall not foam when heated to 177 °C [350 °F].

4.2 The asphalt binders shall conform to the requirements given in **Table 1**, **Table 2**, **Table 3**, or **Table 4**, as specified by the purchaser.

5. Methods of Sampling and Testing

5.1 Sample and test asphalt binders in accordance with the following methods:

5.1.1 *Sampling*—Practice **D140/D140M**.

5.1.2 *Water*—Test Method **D95**.

5.1.3 *Viscosity at 60 °C [140 °F]*—Test Method **D2171/D2171M**.

TABLE 1 Requirements for Asphalt Binder, Viscosity Graded at 60 °C [140 °F] Based on Original Asphalt

Test	Viscosity Grade					
	AC-2.5	AC-5	AC-10	AC-20	AC-30	AC-40
Viscosity, 60 °C [140 °F], Pa·s	25 ± 5	50 ± 10	100 ± 20	200 ± 40	300 ± 60	400 ± 80
Viscosity, 135 °C [275 °F], min, mm ² /s	80	110	150	210	250	300
Penetration, 25 °C [77 °F], 100 g, 5 s, min	200	120	70	40	30	20
Flash point, Cleveland open cup, min, °C [°F]	165 [325]	175 [350]	220 [425]	230 [450]	230 [450]	230 [450]
Solubility in trichloroethylene, ^A min, %	99.0	99.0	99.0	99.0	99.0	99.0
Tests on residue from thin-film oven test:						
Viscosity, 60 °C [140 °F], max, Pa·s	125	250	500	1000	1500	2000
Ductility, 25 °C [77 °F], 5 cm/min, min, cm	100 ^B	100	50	20	15	10

^A Solubility in N-Propyl Bromide can be an alternate method to solubility in TCE.

^B If ductility is less than 100, material will be accepted if ductility at 15 °C [60 °F] is 100 minimum at a pull rate of 5 cm/min.

TABLE 2 Requirements for Asphalt Binder, Viscosity Graded at 60 °C [140 °F] Based on Original Asphalt

NOTE 1—Table 2 specifies asphalts that are less temperature susceptible than those specified by Table 1. Asphalts that meet Table 2 requirements will also meet Table 1 requirements of the same grade.

Test	Viscosity Grade					
	AC-2.5	AC-5	AC-10	AC-20	AC-30	AC-40
Viscosity, 60 °C [140 °F], Pa·s	25 ± 5	50 ± 10	100 ± 20	200 ± 40	300 ± 60	400 ± 80
Viscosity, 135 °C [275 °F], min, mm ² /s	125	175	250	300	350	400
Penetration, 25 °C [77 °F], 100 g, 5 s, min	220	140	80	60	50	40
Flash point, Cleveland open cup, min, °C [°F]	165 [325]	175 [350]	220 [425]	230 [450]	230 [450]	230 [450]
Solubility in trichloroethylene, ^A min, %	99.0	99.0	99.0	99.0	99.0	99.0
Tests on residue from thin-film oven test:						
Viscosity, 60 °C [140 °F], max, Pa·s	125	250	500	1000	1500	2000
Ductility, ^B 25 °C [77 °F], 5 cm/min, min, cm	100 ^B	100	75	50	40	25

^A Solubility in N-Propyl Bromide can be an alternate method to solubility in TCE.

^B If ductility is less than 100, material will be accepted if ductility at 15 °C [60 °F] is 100 minimum at a pull rate of 5 cm/min.

TABLE 3 Requirements for Asphalt Binder, Viscosity Graded at 60 °C [140 °F] Based on Residue from Rolling Thin-Film Oven Test

Tests on Residue from Rolling Thin-Film Oven Test: ^A	Viscosity Grade				
	AR-1000	AR-2000	AR-4000	AR-8000	AR-16000
Viscosity, 60 °C [140 °F], Pa·s	100 ± 25	200 ± 50	400 ± 100	800 ± 200	1600 ± 400
Viscosity, 135 °C [275 °F], min, mm ² /s	140	200	275	400	550
Penetration, 25 °C [77 °F], 100 g, 5 s, min	65	40	25	20	20
% of original penetration, 25 °C [77 °F], min	...	40	45	50	52
Ductility, 25 °C [77 °F], 5 cm/min, min, cm	100 ^B	100 ^B	75	75	75
Tests on original asphalt:					
Flash point, Cleveland open cup, min, °C [°F]	205 [400]	220 [425]	225 [440]	230 [450]	240 [460]
Solubility in trichloroethylene, ^C min, %	99.0	99.0	99.0	99.0	99.0

^A Thin-film oven test may be used, but the rolling thin-film oven test shall be the referee method.

^B If ductility is less than 100, material will be accepted if ductility at 15 °C [60 °F] is 100 minimum at a pull rate of 5 cm/min.

^C Solubility in N-Propyl Bromide can be an alternate method to solubility in TCE.

5.1.4 *Viscosity at 135 °C [275 °F]*—Test Method **D2170/D2170M**.

5.1.5 *Penetration*—Test Method **D5/D5M**.

5.1.6 *Flash Point, Cleveland Open Cup*—Test Method **D92**.

5.1.7 *Solubility in Trichloroethylene*—Test Method **D2042**.

5.1.8 *Thin-Film Oven Test*—Test Method **D1754/D1754M** (see **Tables 1 and 2**).

5.1.9 *Rolling Thin-Film Oven Test*—Test Method **D2872** (see **Tables 3 and 4**).

5.1.10 *Ductility*—Test Method **D113**.

5.1.11 *Softening Point*—Test Method **D36/D36M**.

5.1.12 *Density*—Test Method **D70**.

5.1.13 *Solubility in N-propyl Bromide*—Test Method **D7553**.

6. Keywords

6.1 asphalt binder; bitumen; pavements; viscosity

TABLE 4 Requirements for Asphalt Binder, Viscosity Graded at 60 °C [140 °F] Based on Original Asphalt

NOTE 1—Table 4 shows the limits typically used in Mexico, Central, and South America

Test	Viscosity Grade				
	AC-6	AC-10	AC-20	AC-30	AC-42
Viscosity, 60 °C [140 °F], P	600 ± 200	1000 ± 200	2000 ± 400	3000 ± 600	4200 ± 600
Viscosity, 135 °C [275 °F], min, cSt	175	250	300	350	400
Flash point, Cleveland open cup, min, °C [°F]	177 [350]	219 [425]	232 [450]	232 [450]	232 [450]
Solubility in trichloroethylene, ^c min, %	99.0	99.0	99.0	99.0	99.0
Specific gravity 25 °C/25 °C [77 °F/77 °F]	Report	Report	Report	Report	Report
Penetration index ^b	-1.5 to +1	-1.5 to +1	-1.5 to +1	-1.5 to +1	-1.5 to +1
Tests on residue from rolling thin-film oven test:					
Mass Change, %w/w max	1.5	1.0	1.0	1.0	1.0
Viscosity, 60 °C [140 °F], max, P	3000	5000	8000	12 000	20 000
Ductility, ^a 25 °C [77 °F], 5 cm/min, min, cm	100	75	50	40	25

^a If ductility is less than 100, material will be accepted if ductility at 15.5 °C [60 °F] is 100 minimum at a pull rate of 5 cm/min.

$${}^b\text{Penetration Index} = \frac{1952 - 500 \log \text{pen} - 20SP}{50 \log \text{pen} - SP - 120}$$

where:

 pen = penetration at 25 °C [77 °F], 100g, 5s

 SP = softening point (°C)

^c Solubility in N-Propyl Bromide can be an alternate method to solubility in TCE.

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