



Designation: ~~D3381/D3381M~~ – ~~13~~ D3381/D3381M – ~~18~~

Standard Specification for Viscosity-Graded Asphalt Cement 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 ~~elements~~binders graded by viscosity at ~~60°C [140°F]~~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 ~~elements~~binders graded by penetration at ~~25°C [77°F]~~25 °C [77 °F], see Specification ~~D946/D946M~~D946M. If needed, volume corrections for asphalt ~~elements~~binders should be made according to Practice ~~D431/D431M~~D431M.

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 ~~non-conformance~~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~~D5M Test Method for Penetration of Bituminous Materials

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

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

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

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

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

D113 Test Method for Ductility of Asphalt Materials

~~D140/D140M~~D140M Practice for Sampling Asphalt Materials

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

~~D1754/D1754M~~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~~D2170M Test Method for Kinematic Viscosity of Asphalts

~~D2171/D2171M~~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)

~~D431/D431M~~D431M 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 ~~element~~binder shall be prepared from crude petroleum by suitable methods.

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.



TABLE 1 Requirements for Asphalt Cement/Binder, Viscosity Graded at 60°C [140°F] 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, 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
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
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]
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
—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
—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.

4. Physical Requirements

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

4.2 The asphalt cements/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 cements/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]—60 °C [140 °F]—Test Method D217/D217M.

5.1.4 Viscosity at 135°C [275°F]—135 °C [275 °F]—Test Method D217/D217M.

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 Table 1 and Table 2).

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

5.1.10 Ductility—Test Method D113.

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

5.1.12 Density—Test Method D70.

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

TABLE 2 Requirements for Asphalt Cement/Binder, Viscosity Graded at 60°C [140°F] 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, 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
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
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]
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
—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
—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.