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Standard Specification for Performance Graded Trinidad Lake Modified Asphalt Binder[1]

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1. Scope

1.1 This specification covers performance graded Trinidad Lake modified asphalt binders. Grading designations are related to the average seven-day maximum pavement design temperature, °C, the intermediate pavement design temperature, °C, and minimum pavement design temperature, °C.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D8 Terminology Relating to Materials for Roads and Pavements

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

D140 Practice for Sampling Bituminous Materials

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

D2170 Test Method for Kinematic Viscosity of Asphalts (Bitumens)

D2171 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)

D4402 Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer

D6521 Practice for Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)

D6648 Test Method for Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)

D6723 Test Method for Determining the Fracture Properties of Asphalt Binder in Direct Tension (DT)

D7175 Test Method for Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer

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

3. Terminology

3.1 *Definitions:*

3.1.1 Definitions for many terms common to asphalt cement are found in Terminology D8.

4. Ordering Information

4.1 When ordering under this specification, include in the purchase order the grade of Trinidad Lake modified asphalt binder required from Table 1 (for example, TLG 52-16 or TLG 64-34).

5. Materials and Manufacture

5.1 Trinidad Lake modified asphalt binder shall be prepared by the addition of Trinidad Lake Asphalt modifier to base asphalt produced from the refining of petroleum crude, with or without the inclusion of organic or inorganic modifiers.

5.2 Modifiers may be any suitable form of Trinidad Lake Asphalt that may include also organic or inorganic modifiers of suitable manufacture and preparation, and that is dissolved, dispersed or reacted in asphalt cement to enhance its performance.

5.3 The base asphalt binder shall be homogeneous, free from water and deleterious materials, and shall not foam when heated to 175 °C.

5.4 The base asphalt binder shall be at least 99.0 % soluble in N-Propyl Bromide as determined by Test Method D7553.

5.5 The grades of asphalt binder shall conform to the requirements given in Table 1.

6. Sampling

6.1 The materials shall be sampled in accordance with Practice D140.

[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 Performance Graded Trinidad Lake Modified Asphalt Binder Specification

Performance Grade	TLG 46-	TLG 52-	TLG 58-	TLG 64-	TLG 70-	TLG 76-	TLG 82-
	34 40 46	10 16 22 28 34 40 46	16 22 28 34 40	10 16 22 28 34 40	10 16 22 28 34 40	10 16 22 28 34	10 16 22 28 34
Average 7-day maximum Pavement design Temperature, °C	<46	<52	<58	<64	<70	<76	<82
Intermediate Temperature, °C	10 7 4	25 22 19 16 13 10 7	25 22 19 16 13	31 28 25 22 19 26	34 31 28 25 22 19	37 34 31 28 25	40 37 34 31 28
Minimum Pavement Design Temperature, °C[A]	> -34 > -40 > -46	> -10 > -16 > -22 > -28 > -34 > -40 > -46	> -16 > -22 > -28 > -34 > -40	> -10 > -16 > -22 > -28 > -34 > -40	> -10 > -16 > -22 > -28 > -34 > -40	> -10 > -16 > -22 > -28 > -34	> -10 > -16 > -22 > -28 > -34
Original Modified Asphalt Binder							
Flash Point Temp, Test Method D92; min °C	230						
Solubility, Test Method D7553, %	77–90						
Viscosity, Test Method D4402:[B] max, 3 Pas, Test Temp, °C	135						
Dynamic Shear, D7175:[C] G*/sinδ, min, 1.00 kPa Test Temp at 10 rad/s, °C	46	52	58	64	70	76	82
Rolling Thin Film Oven (Test Method D2872)							
Mass loss, max, percent	1.00						
Dynamic Shear, D7175; G*/sinδ, min, 2.20 kPa Test Temp at 10 rad/s, °C	46	52	58	64	70	76	82
Pressure Aging Vessel Residue (Practice D6521)							
PAV Aging Temp, °C[D]	90	90	100	100	100 (110)	100 (110)	100 (110)
Dynamic Shear, D7175: G*sinδ, Maximum, 5000kPa Test Temp at 10rad/s, °C	10 7 4	25 22 19 16 13 10 7	25 22 19 16 13	31 28 25 22 19 16	34 31 28 25 22 19	37 34 31 28 25	40 37 34 31 28
Physical Hardening[E]	Report						
Creep Stiffness, D6648:[F] S, Maximum, 300 MPa m-value, min, 0.300 Test Temp at 60 s, °C	-24 -30 -36	0 -6 -12 -18 -24 -30 -36	-6 -12 -18 -24 -30	0 -6 -12 -18 -24 -30	0 -6 -12 -18 -24 -30	0 -6 -12 -18 -24	0 -6 -12 -18 -24
Direct Tension, D6723:[F] Failure Strain, min, 1% @ 1.0mm/min, °C	-24 -30 -36	0 -6 -12 -18 -24 -30 -36	-6 -12 -18 -24 -30	0 -6 -12 -18 -24 -30	0 -6 -12 -18 -24 -30	0 -6 -12 -18 -24	0 -6 -12 -18 -24

[A] Pavement temperatures are estimated from air temperatures using an algorithm contained in the SUPERPAVE software program, or are provided by the specifying agency.

[B] 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.

[C] 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*/sinδ at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometry (Test Method D2170 or D2171).

[D] The PAV Aging temperature is based on simulated climatic conditions and is one of the three temperatures 90°C, 100°C or 110°C. The PAV aging temperature is 100°C for TLG 64- and above except in desert climates, where it is 110°C.

[E] Physical Hardening—D6648 is performed on a set of asphalt beams according to section 13.1, except the conditioning time is extended to 24-h ± 10 min at 10 °C above the minimum performance temperature. The 24-h stiffness and *m*-value are reported for information purposes only.

[F] 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. The *m*-value requirement must be satisfied in both cases.

7. Test Methods

7.1 The properties outlined in 5.3 – 5.5 shall be determined in accordance with Test Methods D92, D95, D1754, D2872, D4402, D6521, D6648, D6723, D7175, and D7553.

8. Inspection and Certification

8.1 Inspection and certification of the material shall be agreed upon between the purchaser and the seller. Specific requirements shall be made part of the purchase contract.

9. Rejection and Rehearing

9.1 If the results of any test do not conform to the requirements of this specification, re-testing to determine conformity is performed as indicated in the purchase order or as otherwise agreed upon between the purchaser and the seller.

10. Keywords

10.1 asphalt binder; asphalt cement; direct tension; flash point; graded specifications; modifier; pressure aging; rheology; Trinidad lake asphalt