Designation: D 6648 – 01

Standard Test Method for Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)[1]

This standard is issued under the fixed designation D 6648; 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.

1. Scope [2]

1.1 This test method covers the determination of the flexural-creep stiffness or compliance and m-value of asphalt binders by means of a bending-beam rheometer. It is applicable to material having flexural-creep stiffness values in the range of 20 MPa to 1 GPa (creep compliance values in the range of 50 nPa^{-1} to 1 nPa^{-1}) and can be used with unaged material or with materials aged using aging procedures such as Test Method D 2872, Test Method D 1754, or Practice D 6521. The test apparatus may be operated within the temperature range from -36°C to 0°C.

1.2 Test results are not valid for test specimens that deflect more than 4 mm or less than 0.08 mm when tested in accordance with this test method.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 802 Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials[3]

D 140 Practice for Sampling Bituminous Materials[4]

D 1754 Test Method for Effect of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)[4]

D 2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)[4]

D 6521 Practice for Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)[4]

E 77 Test Method for Inspection and Verification of Thermometers[5]

2.2 *AASHTO Standard:*

AASHTO MP1 Standard Specification for Performance Graded Binder[6]

2.3 *DIN Standard:*[7]

43760

3. Terminology

3.1 *Definitions:*

3.1.1 *asphalt binder*, *n*—an asphalt-based cement that is produced from petroleum residue either with or without the addition of modifiers.

3.1.2 *physical hardening*, *n*—a time-dependent, reversible stiffening of asphalt binder that typically occurs when the binder is stored below room temperature.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *contact load*, *n*—the load, P_c, required to maintain positive contact between the test specimen, supports, and the loading shaft; 35 ± 10 mN.

3.2.2 *flexural creep compliance*, *D(t)*, *n*—the ratio obtained by dividing the maximum bending strain (see Eq X1.5) in a beam by the maximum bending stress (Eq X1.4). The flexural creep stiffness is the inverse of the flexural creep compliance.

3.2.3 *flexural creep stiffness*, *S(t)*, *n*—the creep stiffness obtained by fitting a second order polynomial to the logarithm of the measured stiffness at 8.0, 15.0, 30.0 60.0, 120.0, and 240.0 s and the logarithm of time (see Eq 4, section 14.4).

3.2.4 *measured flexural creep stiffness*, S_m *(t)*, *n*—the ratio (see Eq 3, section 14.2) obtained by dividing the measured maximum bending stress (see X1.4) by the measured maximum bending strain (see Eq X1.5). Flexural creep stiffness has been used historically in asphalt technology while creep compliance is commonly used in studies of viscoelasticity.

3.2.5 *m-value*, *n*—the absolute value of the slope of the logarithm of the stiffness curve versus the logarithm of time (see Eq 5, section 14.5).

3.2.6 *test load*, *n*—the load, P_t, of 240-s duration used to determine the stiffness of the asphalt binder being tested; 980 ± 50 mN.

4. Summary of Test Method

4.1 The bending beam rheometer is used to measure the

[1] This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.44 on Rheological Tests.

Current edition approved June 10, 2001. Published August 2001.

[2] This standard is based on SHRP Product 1002 and AASHTO TPI.

[3] *Annual Book of ASTM Standards*, Vol 04.02.

[4] *Annual Book of ASTM Standards*, Vol 04.03.

[5] *Annual Book of ASTM Standards*, Vol 14.03.

[6] Available from the American Association of State Highway and Transportation Officials, 444 N. Capitol St. NW, Washington, DC 20001.

[7] Deutsches Institut fuer Normung (German Standards Institute), Beuth Verlag GmbH, Burggrafenstrasse 6, 1000 Berlin 30, Germany.

Copyright © ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, United States.