



Designation: D 6521 – 00

Standard Practice for Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)¹

This standard is issued under the fixed designation D 6521; 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

1.1 This practice covers the accelerated aging (oxidation) of asphalt binders by means of pressurized air and elevated temperature. This is intended to simulate the type of changes which occur in asphalt binders during in-service oxidative aging but may not accurately simulate the relative rates of aging. It is intended for use with residue from Test Method D 2872 (RTFOT) which is designed to simulate plant aging.

NOTE 1—Modified asphalt binders may phase separate or form skins during oven conditioning in Test Method D 2872 (RTFOT); the results from subsequent testing of this residue may not be representative of modified asphalts short-term aged under field conditions. Phase separation, or formation of skins, or both can also occur during PAV aging. Therefore, the practice may not be suitable for some modified asphalts.

NOTE 2—PAV has not been validated for materials containing particulate materials.

1.2 The aging of asphalt binders during service is affected by ambient temperature and air pressure and by mixture-associated variables such as the volumetric proportions of the mix, the permeability of the mix, properties of the aggregates, and possibly other factors. This conditioning process is intended to provide an evaluation of the relative resistance of different asphalt binders to oxidative aging at selected elevated aging temperatures and pressures but cannot account for mixture variables or provide the relative resistance to aging at in-service conditions.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *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:

¹ This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.46 on Durability and Distillation Test.

Current edition approved Jan. 10, 2000. Published April 2000.

D 8 Terminology Relating to Materials for Roads and Pavements²

D 1754 Test Method for Effect of Heat and Air on Asphalt Materials (Thin-Film Oven Test)²

D 2872 Test Method for Effect of Heat and Air on Rolling Film of Asphalt (Rolling Thin-Film Oven Test)²

D 4753 Specification for Evaluating, Selecting and Specifying Balances and Scales for Use in Soil, Rock and Construction Materials Testing³

E 220 Test Method for Calibration of Thermocouples by Comparison Techniques⁴

E 1137 Specification for Industrial Platinum Resistance Thermometers⁴

2.2 AASHTO Standards:

MP1 Provisional Standard Specification for Performance-Graded Asphalt Binder⁵

3. Terminology

3.1 Definitions:

3.1.1 Definitions of terms used in this practice may be found in Terminology D 8 determined from common English usage, or combinations of both.

4. Summary of Practice

4.1 Asphalt binder is first aged using Test Method D 2872 (RTFOT). A specified thickness of residue from the RTFOT is then placed in standard TFOT stainless steel pans and aged at the specified aging temperature for 20 h in a vessel pressurized with air to 2.10 MPa. Aging temperature is selected according to the grade of this asphalt binder. The residue is then vacuum degassed.

5. Significance and Use

5.1 This method is designed to simulate the type of in-service oxidative aging that occurs in asphalt binders during

² Annual Book of ASTM Standards, Vol 04.03.

³ Annual Book of ASTM Standards, Vol 04.08.

⁴ Annual Book of ASTM Standards, Vol 14.03.

⁵ Available from AASHTO, National Institute of Std. & Tech., Gaithersburg, MD 20899.

pavement service. Residue from this conditioning practice may be used to estimate the physical or chemical properties of asphalt binders after several years of in-service aging in the field.

5.2 Binders aged using this standard are used to determine specification properties in accordance AASHTO MP1. The binder is aged using the RTFOT test prior to this conditioning step. Unaged asphalt binders, RTFOT residues, and PAV residues are used to determine specification properties in accordance with MP1.

5.3 For asphalt binders of different grades or from different sources, there is no unique correlation between the aging time and temperature in this conditioning practice and in-service pavement age and temperature. Therefore, for a given set of in-service climatic conditions, it is not possible to select a single PAV aging time and elevated temperature and pressure that will predict the properties or the relative rankings of the properties of all asphalt binders after a specific set of in-service exposure conditions.

5.4 The relative degree of hardening of different asphalt binders varies with aging temperatures and pressures in the PAV. Therefore, two asphalt binders may age at a similar rate at one condition of temperature and pressure, but age differently at another condition. Hence, the relative rates of aging for

a set of asphalts at PAV conditions may differ significantly from the actual in-service relative rates at lower temperatures and pressures.

6. Apparatus

6.1 An equipment system consisting of a pressure vessel, pressure controlling devices, temperature controlling devices, pressure and temperature measuring devices, and a temperature and pressure recording system (see Fig. 1).

6.1.1 *Pressure Vessel*—A stainless steel pressure vessel designed to operate at 2.1 ± 0.1 MPa between 90 and 110°C with interior dimensions adequate to hold ten TFOT pans and a pan holder. The pressure vessel shall contain a pan holder capable of holding ten TFOT stainless steel pans in a horizontal (level) position such that the asphalt binder film thickness is reasonably uniform. The holder shall be designed for easy insertion and removal from the vessel when the holder, pans, and asphalt binder are at the aging temperature. A schematic showing a possible configuration of the vessel, pan holder and pans and specifying dimensional requirements is shown in Fig. 2.

NOTE 3—The vessel may be a separate unit to be placed in a forced draft oven for conditioning the asphalt binders or an integral part of the temperature control system (for example, by direct heating of the vessel or by surrounding the vessel with a permanently affixed heating unit, forced

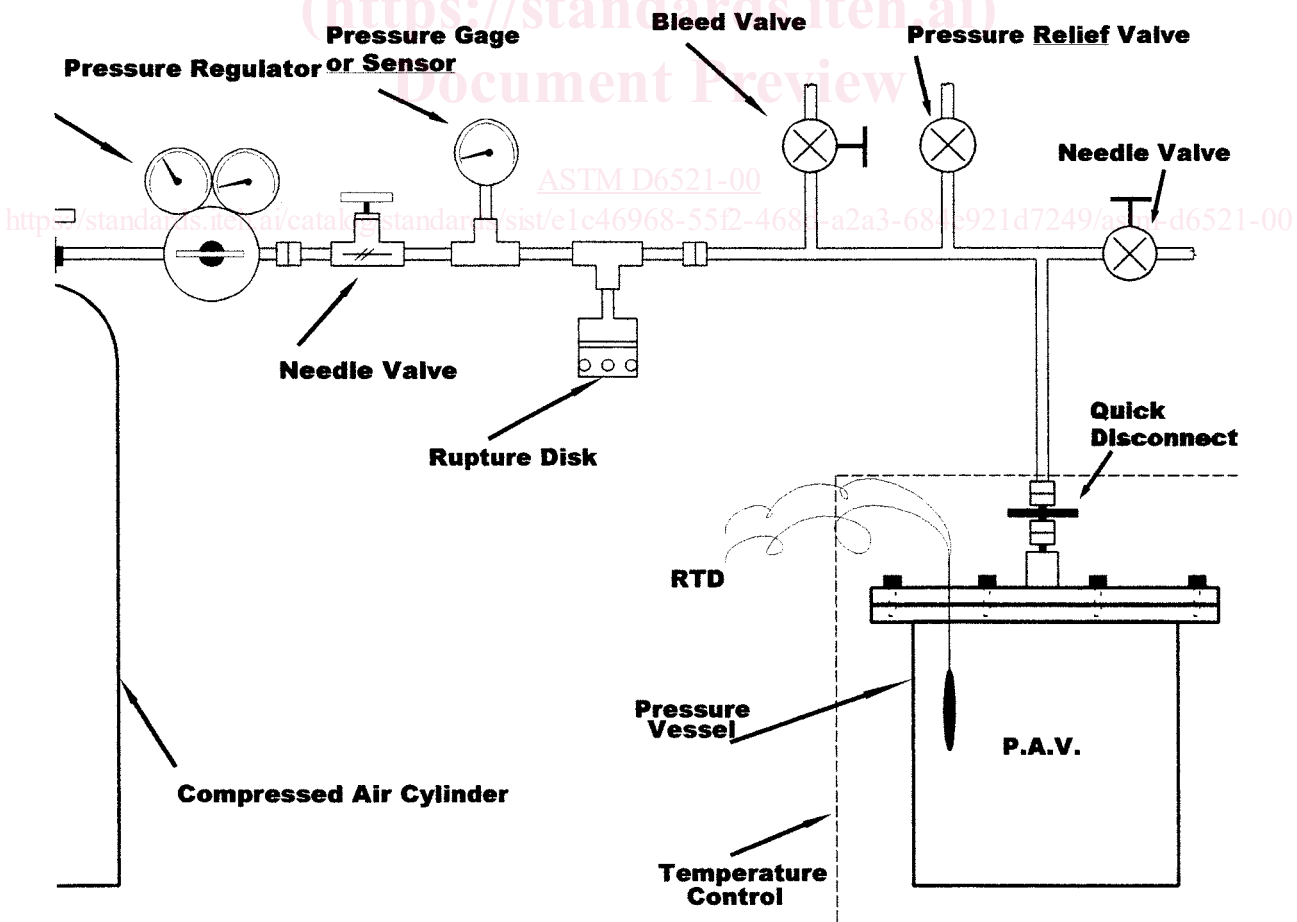


FIG. 1 Schematic of PAV Test System