



Designation: D 1561 – 92 (Reapproved 2005)

Standard Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor¹

This standard is issued under the fixed designation D 1561; 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 The practice covers the preparation of test specimens of bituminous paving mixtures by means of a mechanical compactor that imparts a kneading action to the test specimens by a series of individual impressions made with a ram.

1.2 *This standard does not purport to address all of the safety problems, 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.*

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

2. Referenced Documents

2.1 *ASTM Standards:*²

D 1560 Test Methods for Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus

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

3. Significance and Use

3.1 This practice can be used to prepare cylindrical specimens of bituminous mix for subsequent testing. The procedure incorporates the use of the California Kneading Compactor in an attempt to duplicate the kneading action that is provided by the equipment now being used for the compaction of asphalt concrete pavement.

¹ This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.20 on Mechanical Tests of Bituminous Mixes.

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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.

4. Apparatus

4.1 *California Kneading Compactor*—Mechanical kneading compactor, as shown in Fig. 1,³ for consolidating test specimens.

NOTE 1—Kneading compactors, which on calibration develop a trace curve similar to that of the California kneading compactor, shall be considered acceptable under this test method. Alternatively, any kneading compactor capable of fabricating specimens that will show stabilometer values equivalent to those obtained from the California kneading compactor shall be acceptable for use under this test method. The supplier has the responsibility of furnishing those substantiating data for his device.

NOTE 2—Curves are considered within calibration when they show the same peak pressure and dwell time in load time tract obtained in the calibration procedure.

NOTE 3—This compactor shall be considered in calibration when the peak momentary load applied to a test specimen is held within $\pm 5\%$ of the intended foot pressure (within the range from 2.4 to 3.4 MPa) (350 to 500 psi).

NOTE 4—The stabilometer values from replicate specimens fabricated by this Practice D 1561 and tested in accordance with Test Methods D 1560, shall fall within a range of 3 units for all dense-graded bituminous mixtures containing aggregates not larger than 12.7 mm ($\frac{1}{2}$ in.) and within a range of 4 units for coarser graded bituminous mixtures containing up to 25.4-mm (1-in.) maximum size aggregates.

4.2 *Compactor Foot*—A ram having a face shaped as shown in Fig. 2, and having an area of approximately 20.059 cm² (3.1 in.²).

4.3 *Mold Holder, Funnel, and Feeder Trough*, as shown in Fig. 3.

4.4 *Molds*—Molding cylinders, 101.6 \pm 0.13 mm (4 \pm 0.005 in.) in inside diameter by 127 mm (5 in.) in height. A minimum of three such compaction molds is recommended.

4.5 *Rod*—Round-nose steel rod, 9.5 mm ($\frac{3}{8}$ in.) in diameter by 406.4 mm (16 in.) long.

4.6 *Paper Disks*—Heavy paper disks, 101.6 mm (4 in.) in diameter.

4.7 *Shim*—Steel shim, 6.4 mm ($\frac{1}{4}$ in.) thick, 19.1 mm ($\frac{3}{4}$ in.) wide, and 63.5 mm (2 $\frac{1}{2}$ in.) long.

³ Blueprints of detailed drawings of the apparatus illustrated in Fig. 1 are available at a nominal cost from the American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103. Request Adjunct No. ADJD1561.

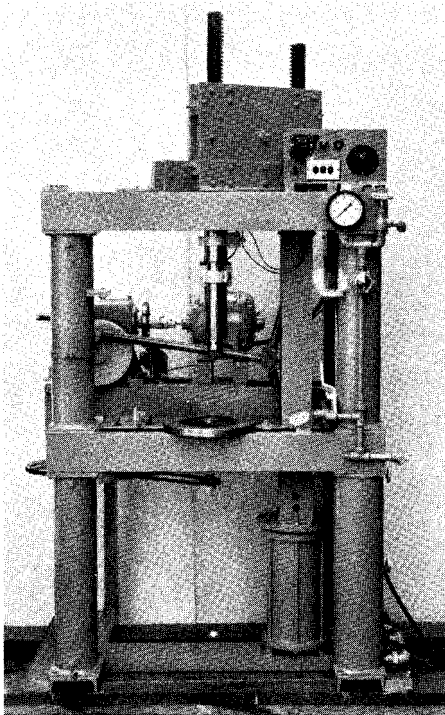


FIG. 1 California Kneading Compactor

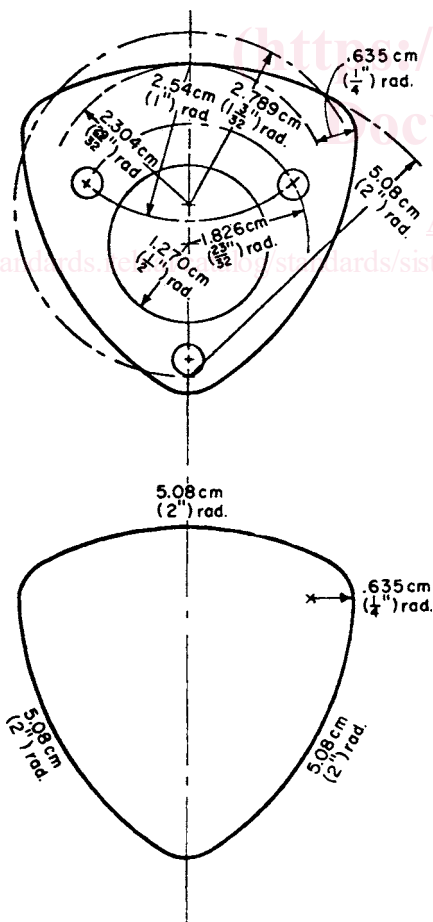


FIG. 2 Face of Compactor Ram

4.8 *Metal Followers*—Two metal followers, 101.2 mm (3.985 in.) in diameter; one 139.7 mm (5.5 in.) high, the other 38.1 mm (1.5 in.) high.

4.9 *Testing Machine*—A compression testing machine having a minimum capacity of 22 kN (50 000 lbf).

4.10 *Ovens*—Electric ovens capable of maintaining temperatures of up to 163°C (325°F).

4.11 *Balance*—A balance having a minimum capacity of 5 kg and meeting the requirements of Specification D 4753 for a balance with 0.01-g readability.

4.12 *Sample Splitter*, riffle-type, or equivalent.

4.13 *Sample Mixing Apparatus*—Use suitable equipment. Hand mixing is permissible, but mechanical mixing is recommended.

4.14 *Miscellaneous Apparatus*—Thermometers, trowels, pans, spatulas, scoops, gloves, and metal pans.

5. Test Specimens

5.1 *Selection of Bitumen Content for Specimens*—The optimum amount of bitumen for the aggregate may be determined by the method commonly employed by the laboratory.

5.2 Preparation of Mixtures:

5.2.1 Obtain a sieve analysis on the fine and coarse aggregate (aggregate shall be separated by means of a 4.75-mm (No. 4) sieve). Separate the aggregate into the various size fractions necessary for accurately recombining into test mixtures conforming to specified grading requirements.

5.2.2 Combine the moisture-free aggregates into batches weighing 1200 g. (Every effort should be made to fabricate test specimens 64 ± 3 mm (2.5 ± 0.1 in.) in height. Heat the aggregate to the proper mixing temperature; then weigh the required amount of bitumen at the proper temperature into the aggregate mixture. For mixes employing asphalt cement, the temperature of the aggregate and asphalt at the time mixing begins shall be in accordance with the following:

Grade	Temperature Range, °C (°F)	
	min	max
AC-2.5, AR1000, or 200–300 Pen	99(210)	121(250)
AC-5, AR2000, or 120–150 Pen	110(230)	135(275)
AC-10, AR4000, or 85–100 Pen	121(250)	149(300)
AC-20, AR8000, or 60–70 Pen	132(270)	163(325)
AC-40, AR16000, or 40–50 Pen	132(270)	163(325)

Mixtures containing liquid asphalts do not require heat for mixing. For tar mixtures, heat the aggregates and tar to the desired temperatures, not to exceed 107°C (225°F). Mixing of the aggregate and bitumen shall be as thorough and rapid as possible; mechanical mixing is recommended.

5.2.3 When mixing is completed, transfer the mix to a suitable flat pan approximately 279 by 178 by 25 mm (11 by 7 by 1 in.) and cure this mixture for 2 to 3 h at a temperature of $146 \pm 3^\circ\text{C}$ ($295 \pm 5^\circ\text{F}$).

NOTE 5—Another procedure that has been used is to cure this mixture for 15 to 18 h at a temperature of $60 \pm 3^\circ\text{C}$ ($140 \pm 5^\circ\text{F}$) in an oven equipped with air circulation.

NOTE 6—Bituminous mixtures may also be prepared in accordance with requirements of other test methods for which it is desired to use the California kneading compactor.

5.3 Compaction of Specimens:

5.3.1 *Temperatures*—Use one of the three following specified temperatures when compacting the bituminous mixture.