Designation: ~~D1074 – 09~~ D1074 – 17

Standard Test Method for Compressive Strength of ~~Bituminous~~Asphalt Mixtures[1]

This standard is issued under the fixed designation D1074; 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 test method provides a method for measuring the compressive strength of compacted ~~bituminous~~asphalt mixtures. It is for use with specimens weighed, batched, mixed, and fabricated in the laboratory, as well as for mixtures manufactured in a hot-mix plant.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of 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.*

1.5 *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]

C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
C702 Practice for Reducing Samples of Aggregate to Testing Size
D75 Practice for Sampling Aggregates
D140 Practice for Sampling Bituminous Materials
D979 Practice for Sampling Bituminous Paving Mixtures
D1075 Test Method for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures
D2041 Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
D2726 Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
D3203 Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing
E4 Practices for Force Verification of Testing Machines
E2251 Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

2.2 *Federal Specification:*

Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects[3]

[1] This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.22 on Effect of Water and Other Elements on Asphalt Coated Aggregates.

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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.

[3] "Asphaltic Concrete Mix Requirements," *Standard Specifications for Construction of Roads and Bridges on Federal Highway ~~Projects,~~Projects~~1996~~*, Federal Highway Administration, Washington, DC, 1996~~20590.~~, p. 233~~233.~~.

3. Significance and Use

3.1 The compressive strength of specimens prepared and tested by this test method along with density and voids properties are used for laboratory mix design of ~~bituminous~~asphalt mixtures. One approach is described in ASTM STP 252.[4]

3.1.1 This test method also describes the methods for molding, curing, and testing of specimens being evaluated by Test Method D1075.

3.1.2 When used in conjunction with other mixture physical properties, the compressive strength may contribute to the overall mixture characterization and is one factor determining its suitability for use under given loading conditions and environment as a highway paving material.

3.2 Typical values of minimum compressive strengths for design of ~~bituminous~~asphalt mixtures by this test method for different traffic densities are given in Table 401-1 of the ~~"Standard~~Standard Specifications for Construction of Roads and Bridges on Federal Highway ~~Projects."~~Projects.[3] Some state departments of transportation and federal agencies have specific requirements of their own based on their experience with this test method. The agencies should be consulted for their specific requirements if work is to meet their standards.

3.3 Reheated mixtures are permissible in this test method, but the resulting compressive strengths will be higher than for newly prepared mixtures due to the change in the binder viscosity, an element of the compressive strength as measured under these loading conditions and temperature.[5]

NOTE 1—The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of ~~Standard Practice~~ Specification D3666 are generally considered capable of competent and objective ~~testing/sampling/inspection/etc.~~ testing/sampling/inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely ~~assure~~ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification D3666 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

4. Apparatus

4.1 *Molds and Plungers*—The molds and plungers shall be in accordance with the following:

4.1.1 *Diameter Tolerances*—The mold shall have sufficient height to allow fabrication of a 4 by 4 in. (101.6 by 101.6 mm) specimen. It shall have an inside diameter of 4.000 to 4.005 in. (101.60 to 101.73 mm) and a nominal thickness of ¼ in. ~~(6.4 mm).~~(6.4 mm).

4.1.2 The plungers shall pass through the mold freely and shall have a diameter within 0.050 in. (1.27 mm) of the mold inside diameter. The plungers may be solid, hollow, or other structure so long as the ends are at least 0.50 in. (12.7 mm) thick and are at a right angle to the mold wall. The bottom plunger shall be 2 ± ⅛ in. (50 ± 4 mm) high but the top plunger may be any suitable height.

4.1.3 *Specimens Other ~~than~~Than 4 by 4 in. (101.6 by ~~101.6 mm)—~~101.6 mm)—*Molds and plungers for fabricating these size specimens are allowed in accordance with Section 6.

4.2 *Supports*—Temporary supports for specimen molds shall consist of two steel bars, 1 ± ⅛ in. (25.4 ± 3.1 mm) square and a minimum length of 3 in. (76.2 mm).

4.3 *Testing Machine*—The testing machine must be of any type of sufficient capacity that will provide a range of accurately controllable rates of vertical deformation. Since the rate of vertical deformation for the compression test is specified as 0.05 in./min·in. (0.05 mm/min·mm) of specimen height, and it may be necessary to test specimens ranging in size from 2 by 2 in. (50.8 by 50.8 mm) to perhaps 8 by 8 in. (203.2 by ~~203.2 mm)~~ 203.2 mm) in order to maintain the specified minimum ratio of specimen diameter to particle size, the testing machine should have a range of controlled speeds covering at least 0.1 in. ~~(2.5~~(2.5 mm) ~~mm)/min./~~min for 2-in. (50.8-mm) specimens to 0.4 in. ~~(10.2~~(10.2 mm) ~~mm)/min./~~min for 8-in. (203.2-mm) specimens. The testing machine shall conform to the requirements of ~~Practice~~Practices E4. The testing machine shall be equipped with two steel bearing blocks with hardened faces, one of which is spherically seated and the other plain. The spherically seated block shall be mounted to bear on the upper surface of the test specimen and the plain block shall rest on the platen of the testing machine to form a seat for the specimen. The bearing faces of the plates shall have a diameter slightly greater than that of the largest specimens to be tested. The bearing faces, when new, shall not depart from a true plane by more than 0.0005 in. (0.0127 mm) at any point and shall be maintained within a permissible variation limit of 0.001 in. (0.025 mm). In the spherically seated block, the center of the sphere shall coincide with the center of the bearing face. The movable portion of this block shall be held closely in the spherical seat, but the design shall be such that the bearing face can be rotated freely and tilted through small angles in any direction.

4.4 *Oven*—The oven used in the preparation of materials or reheating of mixtures shall be controllable within ~~±5°F (±3°C)~~±5 °F (±3 °C) of any specified temperature above ambient up to ~~392°F (200°C).~~392 °F (200 °C).

[4] Goode, J. F., "Use of the Immersion-Compression Test in Evaluating and Designing Paving Mixtures," ~~*ASTM STP 252*~~*Bituminous Paving Materials*, STP 252, ASTM International, West Conshohocken, PA, 1959, pp. 113–129.

[5] Welborn, J. Y., Halstead, W. J., and Olsen, R. E., "Relation of Absolute Viscosity of Asphalt Binders to Stability of Asphalt Mixtures," ~~*Public Roads*~~*Public Roads, Volume 32*, ~~Vol.~~Federal ~~32, No. 6, February~~Highway Administration, Washington, DC, 1963~~, FHWA, Washington, DC.~~. (Also *Symposium on Fundamental Viscosity of Bituminous Materials*~~"Symposium on Fundamental Viscosity of Bituminous Materials"~~, ASTM STP ~~No. 328.~~328.)