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Designation: ~~D7870/D7870M – 13~~ D7870/D7870M – 20

Standard Practice for Moisture Conditioning Compacted Asphalt Mixture Specimens by Using Hydrostatic Pore Pressure[1]

This standard is issued under the fixed designation D7870/D7870M; 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 includes procedures for preparing compacted asphalt mixture specimens, exposing the specimens to hydrostatic pore pressure inside an enclosed chamber, and guidance on testing the specimens for the effect of water on the tensile strength or change in other properties of the asphalt mixture, such as density, modulus, etc.

1.2 Specimens conditioned according to this practice can be tested using methods and test procedures referenced in this document, and those results may provide information as to the effect of the moisture conditioning of this practice on the moisture sensitivity of those mixtures.

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 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system ~~are~~may not ~~necessarily~~be exact equivalents; therefore, ~~to ensure conformance with the standard,~~ each system shall be used independently of the ~~other, and~~other. Combining values from the two systems ~~shall not be combined.~~may result in nonconformance with the standard.

1.5 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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]

D8 Terminology Relating to Materials for Roads and Pavements

~~D979~~D979/D979M Practice for Sampling Bituminous Paving Mixtures

~~D1561~~D1561/D1561M Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor

~~D2726~~D2726/D2726M Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures

D3665 Practice for Random Sampling of Construction Materials

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D4013 Practice for Preparation of Test Specimens of Bituminous Mixtures by Means of Gyratory Shear Compactor (Withdrawn 2013)[3]

~~D4867~~D4867/D4867M Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures

~~D5361~~D5361/D5361M Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing

~~D6752~~D6752/D6752M Test Method for Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method

[1] This ~~test method~~ practice 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 ~~Bituminous~~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] The last approved version of this historical standard is referenced on www.astm.org.

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D6925 Test Method for Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means of the Superpave Gyratory Compactor
D6926 Practice for Preparation of Asphalt Mixture Specimens Using Marshall Apparatus
D6927 Test Method for Marshall Stability and Flow of Asphalt Mixtures
D6931 Test Method for Indirect Tensile (IDT) Strength of Asphalt Mixtures

2.2 *AASHTO ~~Standards:~~Standard:*[4]
AASHTO ~~TP 79~~T 378 Standard Method of Test for Determining the Dynamic Modulus and Flow Number for ~~Hot Mix~~ Asphalt ~~(HMA)~~Mixtures Using the Asphalt Mixture Performance Tester (AMPT)

3. Terminology

3.1 Refer to Terminology D8 for definitions relating to materials for roads and pavements.

4. Significance and Use

4.1 This practice provides an accelerated conditioning method under cyclic loading. This system is capable of operating at higher than normal temperatures and creating pore pressure within a compacted asphalt mixture to achieve an acceleration of the effects that a mixture would experience over time from traffic at normal temperatures and conditions. The accelerated conditioning in this practice is intended to simulate the stresses induced in a wet pavement by a passing vehicle tire. The pulse shape produced by this system approximates a Lorentzian function with a half peak width of approximately ~~1 s~~ 1 s at 276 kPa [40 psi].

4.2 The factors that influence the potential for moisture damage to occur include aggregate mineralogy, mixture air voids, water, cyclic applied stress, and elevated temperature. This practice provides a method and apparatus that is capable of producing three of these factors: water, stress, and high temperature. Aggregate mineralogy and air voids are mixture properties.

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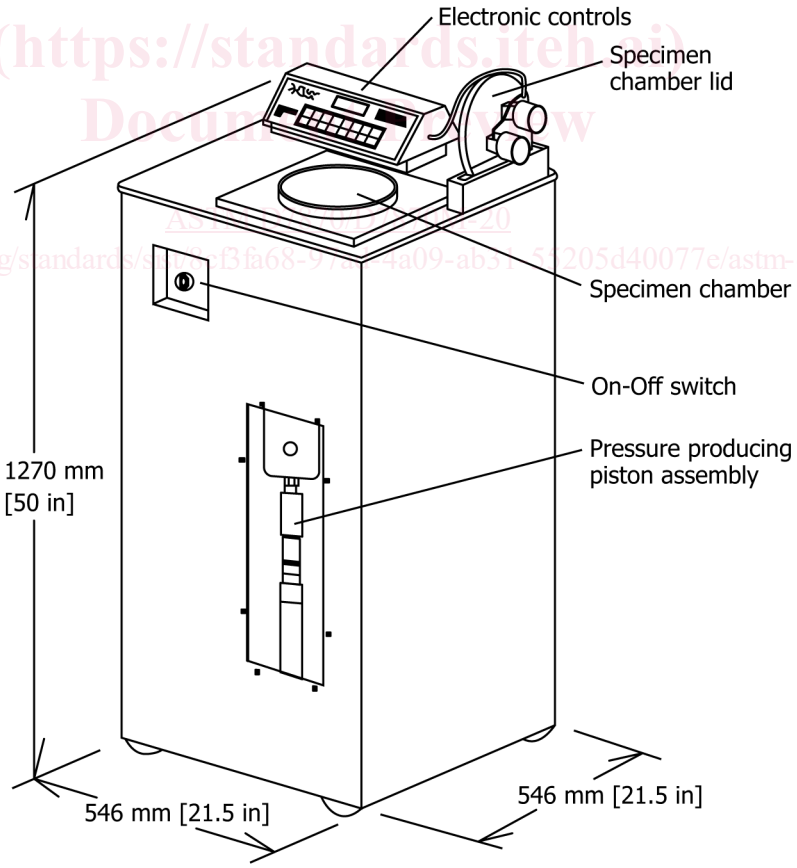

FIG. 1 Moisture Conditioning System

[4] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.

4.3 Specimens conditioned by this system can be tested using a variety of different ~~tests including,~~tests, including Test Method D6931, Test Method D6927, bulk specific gravity difference obtained by Test ~~Methods~~Method D6926 or ~~D6752~~D6752/D6752M for before and after conditioning, dynamic modulus, flow number, AASHTO ~~TP 79~~T 378, and visual inspection for stripped aggregates.

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 ~~Practice~~Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with ~~Practice~~Specification D3666 alone does not completely ~~assure~~ensure reliable results. Reliable results depend on many factors; following the suggestions of ~~Practice~~Specification D3666 or some similar acceptance guideline provides a means of evaluating and controlling some of those factors.

5. Apparatus[5]

5.1 Balance in accordance with Test Method ~~D2726~~D2726/D2726M.

5.2 Water bath capable of maintaining a temperature of 25 ± ~~1°C~~1 °C [77 ± ~~2°F~~].2 °F].

5.3 System (similar to Fig. 1) having a specimen chamber capable of testing one or more specimens with diameters of 150 mm [6 in.] or less. The system should be capable of applying a cyclic pressure peak of approximately Lorentzian function in shape with a peak pressure within ±30 kPa ~~[±4 psi]~~ [±4 psi] of the pressure set point and a width of the pressure peak at half maximum of 1 ± 0.5 s.

5.3.1 The system shall be equipped with appropriate valves for automatically purging (de-airing) and removing air from the specimen chamber and allowing replacement of the accessible air void spaces with water.

5.3.2 The specimen chamber shall be capable of withstanding pressures of up to 690 kPa [100 psi].

5.3.3 The system should be equipped with temperature controls to allow set point temperatures of between 30 and ~~60°C~~60 °C [86 to ~~140°F~~]140 °F] with measurements accurate to within ~~±1°C [±2°F].~~±1 °C [±2 °F].

5.3.4 The system shall be capable of producing and controlling cyclic pressures between 200 and 420 kPa [30 to 50 psi] with measurements accurate to within ±30 kPa [±4 psi].

5.3.5 The system should be capable of applying and controlling cyclic pressure and temperature and controlling the water temperature and pressure within the enclosed specimen chamber at a desired level.

5.4 One or more containers sufficient in size to hold water and specimen(s).

6. Preparation of Test Specimens

6.1 ~~*Preparation of Laboratory Test Specimens*~~*Preparation of Lab Mixed Lab Compacted (LMLC) Test Specimens:*

6.1.1 Prepare mixtures in batches of sufficient size to make at least three specimens for each test as specified in ~~5.1.2~~6.1.2.

6.1.2 Use specimens 100 mm [4 in.] in diameter and 63 ± 2 mm [2.5 ± 0.08 in.] high or 150 mm [6 in.] in diameter and 100 ± 5 mm [4 ± 0.2 in.] high. The percent air void of each sample used for conditioning shall be in the range of 6.5 to 7.5 %. If compacting to ~~an optimum~~a target percent air void to match compaction at the time of construction, all individual ~~sample~~samples conditioned shall not be more than ±0.5 % different from the ~~optimum~~target percent air void. Average the air voids of the specimens being conditioned at one time in order to get as close to the ~~optimum~~ air void value of 7 % or ~~optimum~~target void level measured or expected in the field at the time of construction. Follow the procedures in Test Method ~~D4867~~D4867/D4867M and Practice ~~D5361~~D5361/D5361M to prepare the samples. Compact the specimens by using any one of the following: Test Method D6925, or Practices ~~D1561~~D1561/D1561M, D4013, and D6926.

6.1.3 Extract the specimen from the mold and cool to room temperature.

6.2 ~~*Preparation of Field Specimens*~~*Preparation of Plant Mixed Lab Compacted (PMLC) Specimens:*

6.2.1 Select a truck to be sampled in accordance with Practice D3665.

6.2.2 Secure a specimen from the truck at the plant in accordance with Practice ~~D979~~D979/D979M.

6.2.3 Compact the specimens in accordance with ~~5.1.1~~6.1.1.

7. Procedure

7.1 Follow manufacturer's recommendation for setting up the moisture conditioning system. The system shall be capable of conditioning a total of three 100 mm [4 in.] in diameter and 63 ± 2 mm [2.5 ± 0.08 in.] high or two 150 mm [6 in.] in diameter and 100 ± 5 mm [4 ± 0.2 in.] high samples.

NOTE 2—Specimens with 100 mm [4 in.] diameter may saturate quicker and condition differently than specimens with 150 mm [6 in.] diameter. Specimen size variation should be considered when comparing results for different size specimens to each other for a given asphalt mixture.

7.2 Place the first specimen in the system and fill with sufficient water at 20 to ~~40°C~~40 °C [68 to ~~104°F] water~~ 104 °F] to cover the specimen.

[5] The sole source of supply of the apparatus known to the committee at this time is InstroTek, Inc., ~~5908~~1 Triangle Drive, ~~Raleigh, N.C.~~ Research Triangle Park, NC. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.