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Standard Practice for Rapid Drying of Compacted Asphalt Mixture Specimens Using Vacuum Drying Apparatus[1]

This standard is issued under the fixed designation D7227/D7227M; 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 process of drying compacted asphalt mixture specimens using vacuum drying apparatus.

1.2 The specimens dried by this practice remain at room temperature, which helps in maintaining specimen integrity during the drying process.

1.3 This practice can be used for compacted cylindrical and cubical laboratory and field asphalt mixture specimens.

1.4 This practice can also be used for drying other construction materials such as concrete, soils, aggregates, and loose asphalt mixtures. Use the manufacturer's recommendations for drying other construction materials.

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

1.6 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.

1.7 *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 ~~requirements~~limitations prior to use.*

1.8 *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

D1188/D1188M Test Method for Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Coated Samples

[1] This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.21 on Specific Gravity and Density of Asphalt Mixtures.

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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.

D2726/D2726M Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures
D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
~~D5361~~D5361/D5361M Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
D6752/D6752M Test Method for Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method

3. Terminology

3.1 For definitions of terms used in this standard, refer to Terminology D8.

4. Significance and Use

4.1 Specimen dry weight is a critical measure in determination of accurate density and many other tests in the construction and raw materials industries. Drying specimens at room temperature is required for some tests and provides an advantage for other tests to ensure the integrity and to preserve the characteristics of specimens.

4.2 This practice covers drying compacted asphalt mixture specimens in a vacuum chamber that is capable of keeping the specimen at close to room temperature. A vacuum pump reduces the pressure inside the chamber, thus allowing water to evaporate at low temperature. Since the specimen naturally cools during the evaporation process, making water harder to evaporate, it is important to have proper temperature controls in the chamber to ensure the specimen remains at close to room temperature. Automatic controls within the unit allow the specimen to remain at close to room temperature by periodically allowing a flow of warm ~~air~~ and dry air, typically generated by an inline air heater, to enter the vacuum chamber. Cycling between vacuum and airflow conditions allows the specimen to dry in a short period of time. Completely saturated specimens with over 30 g [0.07 lb] of retained water can be dried in about 30 min. For most field cores that are not completely saturated, the drying time is generally less than 15 min.

NOTE 1—Cycle time (period) can depend on the material composition. Each cycle involves an alternating period of 30 to 180 s of vacuum operation and 30 to 120 s of ~~air flow.~~airflow.

4.3 This method can be used for 100 mm [4 in.] diameter, 150 mm [6 in.] diameter cylindrical, and cubical compacted asphalt mixture specimens.

4.4 This method can also be used for drying loose asphalt mixtures, aggregate samples, and other solid specimens. Follow the manufacturer's recommended procedures for drying specimens other than compacted asphalt mixture specimens.

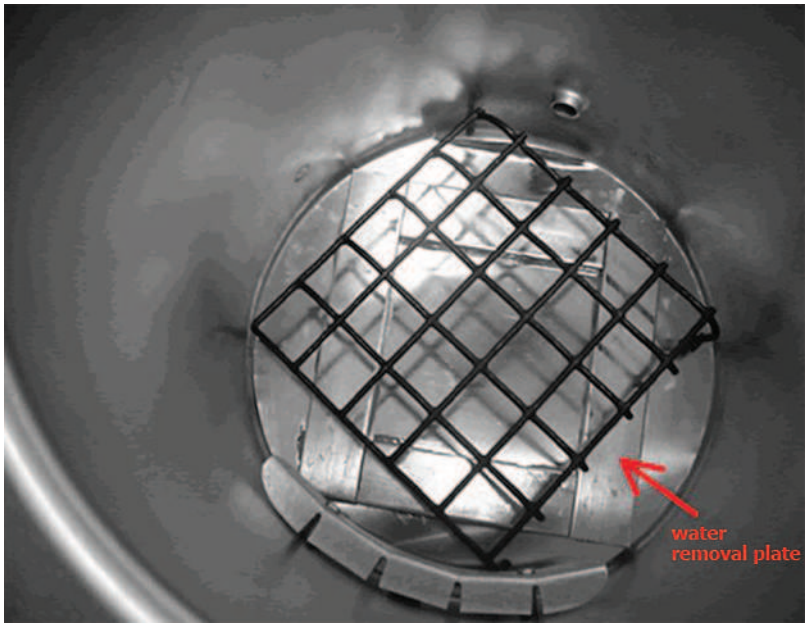

FIG. 1 Water Removal Plate and Sample Holder Installed in Sample Chamber

4.5 This method can be used to determine moisture content and amount of water loss during drying by weighing the sample before and after the drying operations.

NOTE 2—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 Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely 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.

5. Apparatus

5.1 *Absorptive Cloth or Paper Towels,* for drying water from surface of the specimens.

5.2 *Vacuum Chamber,* with a pump capable of evacuating a sealed and enclosed chamber to a pressure of 6 mm Hg [6 Torr], when at sea ~~level.~~ level, in less than 90 s. The chamber shall be large enough to accommodate specimens of 150 mm [6 in.] width or diameter and 180 mm [7 in.] in height. The device shall have an automatic vacuum, airflow, and temperature control features to ensure proper drying of the specimen at close to room temperatures. Automatic controls of the unit shall be calibrated by the manufacturer prior to initial use. The device shall have the capability to display vacuum readings in the chamber ~~and~~ or automatically indicate the completion of the test as well as the total number of cycles.

5.3 *Water Removable Plate,* used for removing free water from the bottom surface of the specimen chamber. See Fig. 1.

5.4 Electronic cold trap with an airflow divider plate, used for trapping water and stopping it from entering the vacuum pump.

5.5 A handheld infrared ~~temperature sensor~~ thermometer or a thermometer that is integrated in the unit accurate to ±5 °C [9 °F] for measuring surface temperature of the specimens. An infrared thermometer is a sensor that consists of a lens system to focus the infrared energy onto a detector, which converts the energy to an electrical signal that can be displayed in units of temperature after being compensated for ambient temperature variation.

6. Sampling

6.1 Test specimens may be molded from laboratory-prepared specimens or taken from the pavement in the field. Field specimens should be obtained in accordance with Practice ~~D5361~~ D5361/D5361M.

7. Test ~~Specimen~~ Specimens

7.1 To speed up the drying process, keep and maintain the specimens to be dried between 15 °C and 30 °C [60 °F and 85 °F].

7.2 If desired, specimens may be separated from other pavement layers in accordance with Practice ~~D5361~~ D5361/D5361M.

8. Procedure

8.1 *Turn On the Unit*—Plug the unit in a power outlet and turn on the ~~on/off~~ ON/OFF switch. Follow the manufacturer's recommendations for ~~warm up and self test~~ warm-up and self-test procedures.

8.2 *Daily Test*—Every day before starting the testing operation, dry the cold trap and the specimen chamber. Run the unit without any specimens. The pressure reading on the display should be 6 mm Hg [6 Torr] or less. If the indicated pressure is higher than 6 mm Hg [6 Torr], check the system for items that might need service, such as oil level and quality, seals, or water in the chamber. Refer to the manufacturer's troubleshooting instructions for obtaining a proper pressure reading in the chamber. For drying other construction materials, follow the manufacturer's recommendations for pressure requirements in the chamber.

8.3 *Drying Specimens*—Use a handheld infrared thermometer to ensure that the top or bottom surface temperature of the specimen is between 15 °C and 30 °C [60 °F and 85 °F]. Take the temperature measurement directly over the sample at approximately the center of the specimen. If the specimen is below 15 °C [60 °F] or above 30 °C [85 °F], place the specimens in a room temperature environment 22 ± 2 °C [72 ± 4 °F] until the surface temperature approaches the required testing temperature of 15 °C to 30 °C [60 °F and 85 °F].