
Standard Practice for

Mixture Conditioning of Hot Mix Asphalt (HMA)

AASHTO Designation: R 30-02 (2015)



1. SCOPE

- 1.1. This standard practice describes procedures for mixture conditioning of compacted and uncompact hot mix asphalt (HMA). Three types of conditioning are described: (1) mixture conditioning for volumetric mixture design; (2) short-term conditioning for mixture mechanical property testing (both of which simulate the precompaction phase of the construction process); and (3) long-term conditioning for mixture mechanical property testing to simulate the aging that occurs over the service life of a pavement. The procedures for long-term conditioning for mixture mechanical property testing are preceded by the procedure for short-term conditioning for mixture mechanical property testing.
- 1.2. *This standard practice may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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. *AASHTO Standards:*
- PP 3, Preparing Hot Mix Asphalt (HMA) Specimens by Means of the Rolling Wheel Compactor²
 - T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyrotory Compactor
 - T 316, Viscosity Determination of Asphalt Binder Using Rotational Viscometer

3. SUMMARY OF PRACTICE

For mixture conditioning for volumetric mixture design, a mixture of aggregate and binder is conditioned in a forced-draft oven for 2 h at the mixture's specified compaction temperature. For short-term mixture conditioning for mechanical property testing, a mixture of aggregate and binder is conditioned in a forced-draft oven for 4 h at 135°C. For long-term mixture conditioning for mechanical property testing, a compacted mixture of aggregate and binder is conditioned in a forced-draft oven for 5 days at 85°C.

4. SIGNIFICANCE AND USE

The properties and performance of HMA can be more accurately predicted by using conditioned test samples. The mixture conditioning for the volumetric mixture design procedure is designed to allow for binder absorption during the mixture design. The short-term mixture conditioning for the mechanical property testing procedure is designed to simulate the plant-mixing and construction effects on the mixture. The long-term mixture conditioning for the mechanical property testing

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procedure is designed to simulate the aging the compacted mixture will undergo during 7 to 10 years of service.

5. APPARATUS

- 5.1. *Oven*—A forced-draft oven, thermostatically controlled, capable of maintaining any desired temperature setting from room temperature to 176°C within $\pm 3^\circ\text{C}$.
- 5.2. *Thermometers*—Thermometers having a range from 50 to 260°C and readable to 1°C.
- 5.3. *Miscellaneous*—A metal pan for heating aggregates, a shallow metal pan for heating uncompacted HMA, a metal spatula or spoon, timer, and gloves for handling hot equipment.

6. HAZARDS

- 6.1. This standard involves the handling of hot binder, aggregate, and HMA, which can cause severe burns if allowed to contact skin. Follow standard safety precautions to avoid burns.

7. MIXTURE CONDITIONING PROCEDURES

7.1. *Mixture Conditioning for Volumetric Mixture Design:*

- 7.1.1. The mixture conditioning for the volumetric mixture design procedure applies to laboratory-prepared, loose mixture only. No mixture conditioning is required when conducting quality control or quality assurance testing on plant-produced mixture.

Note 1—The agency may identify the need to condition plant-produced mixture to be more representative of field conditions, particularly where absorptive aggregates are used.

- 7.1.2. Place the mixture in a pan, and spread it to an even thickness ranging between 25 and 50 mm. Place the mixture and pan in a forced-draft oven for $2\text{ h} \pm 5\text{ min}$ at a temperature equal to the mixture's compaction temperature $\pm 3^\circ\text{C}$. The compaction temperature range of a HMA mixture is defined as the range of temperatures where the unaged binder has a kinematic viscosity of $280 \pm 30\text{ mm}^2/\text{s}$ (approximately $0.28 \pm 0.03\text{ Pa}\cdot\text{s}$) measured in accordance with T 316 (Note 2). The target compaction temperature is generally the midpoint of this range.

Note 2—Modified binders may not adhere to the equiviscosity requirements noted. The agency should consider the manufacturer's recommendations when establishing the mixing and compaction temperatures for modified binders. Practically, the mixing temperature should not exceed 165°C and the compaction temperature should not be lower than 115°C.

- 7.1.3. Stir the mixture after $60 \pm 5\text{ min}$ to maintain uniform conditioning.
- 7.1.4. After $2\text{ h} \pm 5\text{ min}$, remove the mixture from the forced-draft oven. The conditioned mixture is now ready for compaction or testing.

7.2. *Short-Term Conditioning for Mixture Mechanical Property Testing:*

- 7.2.1. The short-term conditioning for the mixture mechanical property testing procedure applies to laboratory-prepared, loose mix only.

- 7.2.2. Place the mixture in a pan, and spread it to an even thickness ranging between 25 and 50 mm. Place the mixture and pan in the conditioning oven for $4\text{ h} \pm 5\text{ min}$ at a temperature of $135 \pm 3^\circ\text{C}$.

- 7.2.3. Stir the mixture every 60 ± 5 min to maintain uniform conditioning.
- 7.2.4. After $4 \text{ h} \pm 5$ min, remove the mixture from the forced-draft oven. The conditioned mixture is now ready for further conditioning or testing as required.
- 7.3. *Long-Term Conditioning for Mixture Mechanical Property Testing:*
- 7.3.1. The long-term conditioning for the mixture mechanical property testing procedure applies to laboratory-prepared mixtures that have been subjected to the short-term conditioning for the mixture mechanical property testing procedure described in Section 7.2, plant-mixed HMA, and compacted roadway specimens.
- 7.3.2. *Preparing Specimens from Loose HMA:*
- 7.3.2.1. *Specimens Compacted Using the Superpave Gyrotory Compactor:*
- 7.3.2.1.1. Compact the specimens in accordance with T 312. Cool the test specimen at room temperature for 16 ± 1 h.
- Note 3**—Extrude the specimen from the compaction mold after cooling for 2 to 3 h.
- Note 4**—Specimen cooling is usually scheduled as an overnight step. Cooling may be accelerated by placing the specimen in front of a fan.
- 7.3.2.2. *Specimens Compacted Using the Rolling Wheel Compactor:*
- 7.3.2.2.1. Compact the specimens in accordance with PP 3.
- 7.3.2.2.2. Cool the test specimen at room temperature for 16 ± 1 h.
- 7.3.2.2.3. Remove the slab from the mold, and saw or core the required specimens from the slab.
- 7.3.3. *Preparing Compacted Roadway Specimens:*
- 7.3.3.1. Cool test specimens at room temperature for 16 ± 1 h.
- 7.3.4. *Long-Term Conditioning of Prepared Test Specimens*—Place the compacted test specimens in the conditioning oven for 120 ± 0.5 h at a temperature of $85 \pm 3^\circ\text{C}$.
- 7.3.5. After 120 ± 0.5 h, turn the oven off; open the doors, and allow the test specimen to cool to room temperature. Do not touch or remove the specimen until it has cooled to room temperature.
- Note 5**—Cooling to room temperature will take approximately 16 h.
- 7.3.6. After cooling to room temperature, remove the test specimen from the oven. The long-term-conditioned specimen is now ready for testing as required.

8. REPORT

- 8.1. Report the binder grade, binder content (nearest 0.1 percent), and the aggregate type and gradation, if applicable.
- 8.2. Report the following mixture conditioning information for the volumetric mixture design conditions, if applicable:
- 8.2.1. Mixture conditioning temperature in laboratory (compaction temperature, nearest 1°C);

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- 8.2.2. Mixture conditioning duration in laboratory (nearest minute); and
- 8.2.3. Laboratory compaction temperature (nearest 1°C).
- 8.3. Report the following short-term conditioning information for the mixture mechanical property testing conditions, if applicable:
- 8.3.1. Short-term mixture conditioning temperature in laboratory (nearest 1°C);
- 8.3.2. Short-term mixture conditioning duration in laboratory (nearest minute); and
- 8.3.3. Laboratory compaction temperature (nearest 1°C).
- 8.4. Report the following long-term conditioning information for the mixture mechanical property testing conditions, if applicable:
- 8.4.1. Laboratory compaction temperature (nearest 1°C);
- 8.4.2. Long-term mixture conditioning temperature in laboratory (nearest 1°C); and
- 8.4.3. Long-term mixture conditioning duration in laboratory (nearest 5 min).

9. KEYWORDS

- 9.1. Conditioning; hot mix asphalt; long-term conditioning; short-term conditioning.