

Hot Mix Asphalt (HMA) Mixture Preparation Steps Checklist

Below is a checklist covering the steps required for preparing the HMA mixture for the gyration test when the sample is prepared in a laboratory. A note about plant preparation is also included.

Note that some specifications described in the following content may not be the same as the specifications followed by your agency. Always check with your State agency's standards and specifications when using these guidelines.

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Step 1

- Weigh each aggregate fraction into a separate pan and combine them to the desired batch weight
- Aggregate fractions are the percent of each graded aggregate that go into the overall aggregate batch for the mix
- The batch weight will vary based on the ultimate disposition of the test specimens

- If a target air void level is desired, as would be the case for Superpave mix analysis and performance specimens, batch weights will be adjusted to create a given density in a known volume
- If the specimens are to be used for the determination of volumetric properties, the batch weights will be adjusted to result in a compacted specimen having dimensions of 150 mm in diameter and 115 ± 5 mm in height at the desired number of gyrations
- It may be necessary to produce a trial specimen to achieve this height requirement
- Generally, 4,500 to 4,700 g of aggregate are required to achieve this height for aggregates with combined bulk specific gravities of 2.550 to 2.700, respectively

Step 2

- Place the aggregate and binder container in the oven and heat them to the required mixing temperature
- The mixing temperature range is defined as the range of temperatures where the unaged binder has a viscosity of 0.17 ± 0.02 Pa-s when measured in accordance with T 316
- Note that the temperature-viscosity is often provided by the asphalt supplier (see Table 4 below)

Table 4 Typical temperatures for placing and compacting dense-graded asphalt

Binder Class		Temperature (°C) ¹					
		Softening Point (typical) (1200 Pa.s)	Minimum for final rolling (100 Pa.s)	Minimum for effective compaction ² (10 Pa.s)	Maximum for Compaction (Cohesion) (0.25 Pa.s)	Maximum to avoid drainage in OG-A ³ (0.12 Pa.s)	Optimum Mixing ² (0.1 Pa.s)
Bitumen	C170	45	65	90	140	150	160
	C320	48	70	95	150	160	165
	C600	52	75	100	160	NA	170
Multi-grade	M500/170	55	75	100	165	165	170
	M1000/320	60	75	100	165	165	170
PMB	A10E	97	105	115	155	160	165 ⁴
	A15E	94	100	110	155	160	165 ⁴
	A20E	77	85	105	150	155	160
	A25E	58	80	100	150	155	160
	A30P	66	85	105	150	160	175

Notes:

1. Temperatures are typical of relevant binder classes around the midpoint on the classification range.
2. Polymer modified binders may be mixed and compacted at temperatures that represent a slightly higher viscosity than non modified binders.
3. Fibres can inhibit drainage at higher temperatures.
4. The AAPA Guide to the safe use of SBS permits a maximum of 165°C to avoid fuming.

- Use standard safety precautions and wear protective clothing when handling hot materials and preparing test specimens

Step 3

- Charge the mixing bowl with the heated aggregate from one pan and dry-mix thoroughly
- Form a crater in the dry-blended aggregate, and weigh the required amount of binder into the mix
- Immediately initiate mixing
- When you are pouring the asphalt binder, make sure that neither your gloves nor your beaker are touching the bowl, as that will throw the actual weight off

- When working with hot asphalt, be sure to wear the proper personal protection equipment (long gloves, long sleeves)
- If you pour too much asphalt, remove some material by dipping a paper towel into the pool of asphalt binder

Step 4

- Mix the aggregate and binder as quickly and thoroughly as possible to yield an asphalt mixture having a uniform distribution of binder
 - Mechanical mixing is typically used

Step 5

- After completing the mixture preparation, perform the required mixture conditioning in accordance with AASHTO R 30
- Mixture conditioning for the volumetric mixture design procedure applies to laboratory-prepared, loose mixture only
- The purpose is to allow for binder absorption during the mixture design
- No mixture conditioning is required when conducting quality assurance testing on a plant-produced mixture
- Place the mixture in a pan and spread it to an even thickness between 25 and 50 mm
- Place the mixture in a forced-draft oven for 2 hours \pm 5 minutes at the mixture's compaction temperature \pm 3 °C
- Stir the mixture after 60 \pm 5 minutes to maintain uniform conditioning
- Remove the mixture from the oven after 2 hours \pm 5 minutes

- See AASHTO R 30 for the conditioning procedures to be used when the specimens will be subjected to mechanical property testing

Step 6

- Place the compaction mold(s) and base plate(s) in an oven at the required compaction temperature for a minimum of 30 minutes prior to the estimated beginning of compaction
 - This should be done during the time the mixture is being conditioned in accordance with AASHTO R 30

Step 7

- Following the mixture conditioning period specified in AASHTO R 30, if the mixture is at the compaction temperature, proceed immediately with the compaction procedure
- If the compaction temperature is different from the mixture conditioning temperature used in accordance with AASHTO R 30, place the mix in another oven at the compaction temperature for a brief time (maximum of 30 minutes) to achieve the required temperature

Plant Preparation

- For plant produced samples, place the compaction mold(s) and base plates(s) in an oven at the required compaction temperature
 - Obtain the sample in accordance with AASHTO T 168
 - Reduce the sample in accordance with AASHTO R 47
 - Place the sample into a pan to a uniform thickness

- Bring the HMA to the compaction temperature range by careful, uniform heating in an oven immediately prior to molding