

Australian/New Zealand Standard™

Methods of sampling and testing asphalt

Method 2.1: Sample preparation—Mixing, quartering and conditioning of asphalt in the laboratory

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CE-006, Asphalt and Sprayed Surfacing, to supersede AS 2891.2.1—1995.

The objective of this Standard is to set out the method for the preparation and conditioning of asphalt mixtures in the laboratory. This revision reflects current practice and provides additional information on specified asphalt binder types and their mixing and conditioning temperatures.

METHOD

1 SCOPE

This Standard sets out a method for mixing, quartering and conditioning of asphalt mixes prepared in a laboratory.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

2008 Bitumen for pavements

AS/NZS

2891 Methods of sampling and testing asphalt

2891.1.1 Method 1: Sampling—loose asphalt

Austrroads

AGPT/T190 Specification framework for polymer modified binders and multigrade bitumens

New Zealand Transport Agency

NZTA M/1 Specification for roading bitumens

3 APPARATUS

The following apparatus is required:

- (a) *Mechanical mixer*—preferably with a planetary action capable of mixing sufficient quantities of asphalt for the tests required.
- (b) *Mixing bowls and beater.*

- (c) *Ovens*—forced draught, thermostatically controlled, capable of maintaining temperature up to 200°C within 3°C of the set temperature.
- (d) *Balance*—of sufficient capacity, with a limit of performance not exceeding ± 5 g.
- (e) *Thermometer*—or other suitable temperature-measuring device, readable and accurate to 1°C.
- (f) *Timer*—capable of measuring an elapsed time of at least 60 min to within 5 s.
- (g) *Quartering apparatus*—such as suitable metal plates.
- (h) *Trays or dishes*—of suitable size for holding the mixed aggregates during heating and for conditioning the mixed asphalt.
- (i) *Scoop and trowel*—for hand mixing asphalt and batching aggregate.
- (j) *Containers*—suitable for heating and pouring the binder.

4 MIXING AND CONDITIONING TEMPERATURES

Mixes shall be prepared using the conditioning temperatures shown in Table 1, 2 or 3:

TABLE 1
CONDITIONING TEMPERATURES FOR AS 2008 BINDERS

Class	Stone mastic asphalt	Dense graded asphalt	Open graded asphalt
C170	n/a	142 $\pm 5^\circ\text{C}$	n/a
C320	150 $\pm 5^\circ\text{C}$	150 $\pm 5^\circ\text{C}$	125 $\pm 5^\circ\text{C}$
C450	150 $\pm 5^\circ\text{C}$	150 $\pm 5^\circ\text{C}$	n/a
C600	n/a	155 $\pm 5^\circ\text{C}$	n/a
M1000	n/a	155 $\pm 5^\circ\text{C}$	n/a

TABLE 2
CONDITIONING TEMPERATURES FOR AUSTROADS AGPT/T190 BINDERS

Binder class	Stone mastic asphalt	Dense graded asphalt	Open graded asphalt
A10E	160 $\pm 5^\circ\text{C}$	160 $\pm 5^\circ\text{C}$	135 $\pm 5^\circ\text{C}$
A15E	160 $\pm 5^\circ\text{C}$	160 $\pm 5^\circ\text{C}$	135 $\pm 5^\circ\text{C}$
A20E	160 $\pm 5^\circ\text{C}$	160 $\pm 5^\circ\text{C}$	135 $\pm 5^\circ\text{C}$
A25E	n/a	160 $\pm 5^\circ\text{C}$	135 $\pm 5^\circ\text{C}$
A35P	n/a	160 $\pm 5^\circ\text{C}$	135 $\pm 5^\circ\text{C}$

TABLE 3
CONDITIONING TEMPERATURES FOR NZTA M/1 BINDERS

Bitumen grade	Stone mastic asphalt	Dense graded asphalt	Open graded asphalt
40–50	157 $\pm 5^\circ\text{C}$	157 $\pm 5^\circ\text{C}$	118 $\pm 5^\circ\text{C}$
60–70	150 $\pm 5^\circ\text{C}$	150 $\pm 5^\circ\text{C}$	113 $\pm 5^\circ\text{C}$
80–100	142 $\pm 5^\circ\text{C}$	142 $\pm 5^\circ\text{C}$	107 $\pm 5^\circ\text{C}$

5 PROCEDURE

The procedure shall be as follows:

- (a) Dry the separate components of the asphalt mix, other than the binder, to constant mass.

NOTE: Constant mass is reached when the difference between two successive determinations of mass of material after a drying period at the mixing temperature for not less than 30 min, differs by no more than 0.1% of the previous weighing.

- (b) Weigh each of the separate dry components, other than the binder, into the mixing bowl, dish or tray.

NOTE: The mixing of dry components by hand may be done after the aggregates have been heated.

- (c) Heat the dry components in the bowl, dish or tray, and the mixing bowl and beater, in the oven until they achieve a temperature greater than the required asphalt mixing temperature.

NOTES:

- 1 For dense graded mixes it has been found that the dry component temperature needs to be about 30°C greater than that of binder temperature to achieve a final mix temperature meeting the requirements of this method.
- 2 For other types of mix or modified binders it is recommended that a trial mix be done to establish an appropriate temperature for the dry component materials.
- 3 Alternative methods of heating the dry components may be utilised, such as gas burners, as long as it is shown that the method does not create hotspots or lead to overheating and degradation of the aggregates.

- (d) Place the binder in the oven and heat to a temperature not exceeding the conditioning temperature in Table 1, 2 or 3 for a maximum of 4 h.

NOTE: Maximum time of heating binder is the time permitted to keep the binder in an oven at the required temperature once it has achieved that temperature.

The binder shall be heated to the required temperature only once, and any binder remaining after completion of all mixing shall be discarded. This is particularly important where the mix is being prepared for performance related tests, and reheating of a binder might impact upon the mix properties.

- (e) Form a crater in the dry components and weigh in the required amount of binder.

- (f) Mix the binder and dry components together thoroughly in the mechanical mixer, ensuring that the components are covered with a film of binder and the asphalt mix is uniform in appearance. Mixing time shall not exceed 3 min.

NOTE: The mixing bowl and the beater may be coated with a thin film of binder to minimise loss of binder content. This may be achieved by making a batch of asphalt using the bowl and beater then scraping them clean, leaving a thin film of binder on their surfaces.

- (g) Measure the temperature of the mixed asphalt. The temperature shall be within 10°C of the conditioning temperature shown in Table 1, 2 or 3.

- (h) Immediately on the completion of mixing, place the mixed asphalt on the quartering tray and obtain representative test portions of asphalt for each scheduled test, as described in AS/NZS 2891.1.1.

NOTE: If the size of the batch is minimized to produce only single or duplicate test portions then quartering may not be required.

- (i) Place each test portion in a dish or in the compaction mould, and condition the test portion for 60 ± 10 min, at the required conditioning temperature in accordance with Table 1, 2 or 3.