



Transport
Roads & Maritime
Services

Test method T511

Loss on heating of bitumen
(Thin film oven test)

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Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
Ed 1/ Rev 0	All	Reformatted and Revision Summary Added.	D Dash	Sep 1999
Ed 2/Rev 0	All	New Issue. Title changed. Default is 1.5 mm film.	J Friedrich	November 2012
Ed 3/ Rev 0	All	Reformatted RMS template	J Friedrich	November 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T511 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T511

Loss on heating of bitumen (Thin film oven test)

1. Scope

This Test Method sets out the procedure to determine the change in mass of bitumen when heated in air under standard conditions.

NOTE: The method is based on AS A10 and ASTM D1754.

2. General

- (a) The test is used to detect and quantify the presence of cutter and is applicable to residual bitumen, polymer modified binder (PMB) and multigrade, certain flux oils and other bitumen additives
- (b) The 1.5 mm film test requires 25 ± 0.5 g sub-samples. The 3 mm film test requires 50 ± 0.5 g sub-samples. Unless otherwise specified, the 1.5 mm film is tested

NOTE: Depending on subsequent testing, up to 6 subsamples may be run concurrently.

- (c) The test includes the following steps:
 - (i) Heating sub-sample in air at 163°C for a period of 5 h
 - (ii) Determining the gain or loss in mass caused by the treatment
 - (iii) Where required, carrying out subsequent testing on the treated bitumen
- (d) The following documents are referred to in this Test Method:
 - (i) AS/NZS 2341.21 Methods of testing bitumen and related road making products - Sample preparation
 - (ii) AG:PT/T102 Protocol for handling polymer modified binders in the laboratory.
http://www.austrroads.com.au/pdf/TestMethod/T102_Handling.pdf

3. Apparatus

- (a) A thermostatically controlled oven with good air circulation, which can be maintained at $163^\circ \pm 1^\circ\text{C}$. The oven must contain the following:
 - (i) A circular shelf that rotates in a horizontal plane at 6 to 7 rpm with a maximum allowable tilt during rotation of 3° from the horizontal
 - (ii) Viewing window and internal light
 - (iii) A thermometer conforming to the Institute of Petroleum Standard IP 47C or equivalent. To be supported vertically in the oven about 20 mm inside the periphery of the shelf with the bottom of the thermometer about 16 to 25 mm above the shelf. The position must allow readings to be taken through the window and without opening the oven door.
- (b) A thermostatically controlled oven with good air circulation, which can be maintained in the range 105° to 110°C
- (c) A heating device (e.g. hotplate) capable of heating the sample to the required temperature
- (d) A balance of at least 200 g capacity and a limit of performance of 0.001 g
- (e) A tinned metal container approximately 500 mL capacity with double crimped seams
- (f) Test containers constructed of aluminium or stainless steel approximately 0.8 mm thick, and having a diameter of 140 ± 1 mm and internal depth of 9.5 ± 0.1 mm. The test containers must be free from dents or distortions with straight sides with a rolled edge and smooth and flat base
- (g) Timer readable in seconds
- (h) Spatula or putty knife

4. Preparation

- (a) Determine the mass (M_1) of each test container to the nearest 0.005g and record the result against the identifying mark on each dish
- (b) Prepare the binder for testing according to AS/NZS 2341.21 except that AG:PT/T102 may be used for PMB. Do not heat the binder hotter or longer than necessary otherwise volatile components may be lost before the test. A sample of about 200 g may be taken using the techniques in this Step
- (c) Without delay, reheat the sample on a hotplate and stir frequently to avoid overheating until it is sufficiently fluid to pour easily
- (d) Pour the molten sample into the required number of test containers (refer to Step 2(b))
- (e) Allow the sub-samples to cool in a dust free environment at a temperature of $23 \pm 3^\circ\text{C}$

5. Procedure

- (a) Preheat the oven equipped with rotating shelf to $163^\circ \pm 1^\circ\text{C}$
- (b) Determine the mass of each sub-sample plus test container (M_2) to the nearest 0.005 g
- (c) Quickly place the sub-samples plus test container on the shelf, close the oven door and set the shelf rotating. Begin the timer
- (d) When the temperature recovers to 162°C record the recovery time, and zero the timer and begin timing the heating period. For at least 5 h heat at $163^\circ \pm 1^\circ\text{C}$ but do not exceed a total of 5.25 h in the oven (i.e. recovery time + heating time)
- (e) Immediately after the heating period, remove the sub-samples from the oven, cool in a dust free atmosphere at a temperature of $23 \pm 3^\circ\text{C}$
- (f) Determine the mass of each sub-sample plus test container (M_3) to the nearest 0.005 g
- (g) Where further testing is required, carry out the following:
 - (i) Reheat each sub-sample for 15 ± 1 min in the oven maintained at a temperature of about 163°C
 - (ii) Remove the sub-samples and pour the molten material into a single 500 mL metal container. Remove any material remaining in the test container by scraping with a suitable spatula or putty knife and return to the 500 mL metal container
 - (iii) Heat the combined residue from all the test containers on the hot plate, taking care to avoid local overheating, until sufficiently fluid to permit thorough mixing and elimination of air bubbles
 - (iv) Carry out the required testing on the treated residue

6. Calculations

- (a) Calculate the change in mass of a sub-sample (δM) to the nearest 0.01% as follows:

$$\delta M = \left(\frac{M_3 - M_2}{M_2 - M_1} \right) \times 100\%$$

Where δM = Change in mass of sub-sample (%)

M_1 = Mass of test container (g)

M_2 = Initial mass of test container with sub-sample (g)

M_3 = Final mass of test container with sub-sample (g)

- (b) Where multiple sub-samples have been poured and their mass determined, calculate the average change in mass (ΔM) of the sub-samples to the nearest 0.01%

7. Reporting

Include the following results in the report:

- (a) The product identification, batch number and date of production
- (b) If moisture was present, the additional heat treatment given to the material
- (c) Nominal film thickness (i.e. 1.5 mm or 3 mm)
- (d) The change in mass (δM and ΔM) to the nearest 0.01% and whether “Mass Loss” (i.e. negative result), “No Change” or “Mass Gain” (i.e. positive result) as appropriate
- (e) Results of testing on the residue after the heat treatment and clearly identify these results as such.
- (f) Reference to this test method