MAXIMUM DENSITY OF ASPHALT - RICE METHOD

1 SCOPE

This method determines the maximum density of asphalt, i.e. the density of the asphalt mix in the loose state free from occluded air, by water displacement.

2 SAFETY

This method does not attempt to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this method to establish appropriate occupational health and safety practices that meet statutory regulations.

3 REFERENCED DOCUMENTS

Main Roads Western Australia

WA 701.1 Sampling and Storage of Asphalt

WA 705.1 Preparation of Asphalt for Testing

4 APPARATUS

a) 2 L flat bottom, thick walled glass **Buchner filter flask** with rubber stopper and side arm for vacuum tube and of sufficient strength to withstand a vacuum of at least 1 atmosphere.

b) **Balance** with bottom loading capacity of at least 3000 g, readable to at least 0.1 g with a Limit of Performance (F), not exceeding 0.5 g.

c) Constant level **water bath** of sufficient size to totally immerse the filter flask and in which a temperature of 25 ± 1.0 °C can be maintained.

NOTE: When immersed the edges of the flask should be no closer than 50 mm from the sides or bottom of the bath.

d) **Vacuum pump** capable of maintaining a vacuum of at least 90 kPa in the filter flask.

e) **Vacuum gauge** that indicates the amount by which the pressure is less than the pressure of the surrounding atmosphere graduated in 5 kPa divisions and with a measurement of uncertainty not exceeding ± 3 kPa.

f) **Thermometer** readable to 0.1°C and with a measurement of uncertainty of not more than 0.3°C.

g) **Detergent solution** (5 mL of commercial grade concentrate diluted to 1000 mL with water).

5 PROCEDURE

a) Obtain a test sample in accordance with WA 701.1.

b) Prepare a test portion in accordance with WA 705.1, of sufficient mass to satisfy the requirements of Table 1.

NOTE: The test sample may be heated to 100°C for a short period not exceeding 30 minutes to facilitate sample division.

TABLE 1
MINIMUM MASS OF TEST PORTION

Nominal Max Size of Asphalt (mm)	Minimum Test Portion Size (g)
20, 14	1 500
10, 7, 5	1 000

c) Manually separate the particles of the test portion so that no aggregations of fine particles are larger than approximately 5 mm.

d) Record the mass to the nearest 0.1 g of the Buchner flask immersed in water (m_1) at 25 ± 1.0°C by suspending it from the bottom loading balance into the water bath.

e) Partially fill the Buchner flask with water obtained from the water bath which has been maintained at 25 ± 1.0 °C and add approximately 2 mL of detergent solution to the water.

NOTES:

i. The quantity of water used should be sufficient to cover the sample.

ii. Empty, clean and recharge the water bath at regular intervals with potable water to ensure that the quality of the water within the temperature controlled water bath is not compromised due to contamination.

f) Place the test portion in to the Buchner flask and record the mass to the nearest 0.1 g (m_2).

g) Stopper the flask and connect to the vacuum pump.

h) Remove the entrapped air by subjecting the contents to a partial vacuum of at least 90 kPa for a period of at least 20 minutes. Agitate the flask and contents periodically to assist in the removal of air bubbles.

NOTE: Particular care must be taken in handling evacuated flasks to avoid breakage. Operators should wear safety glasses and gloves and locate the flask in a protective cage or behind a screen whenever possible. Impacting, scratching or damaging the flask must be avoided. The surface on which the flask is handled should consist of a resilient material such as rubber or vinyl.

i) Carefully disconnect the flask from the vacuum line, remove the stopper, then lower the flask and contents into the temperature controlled water bath in a manner to allow the water within the flask to mix with the water of the bath, taking care not to introduce air into the test portion. Verify that the temperature of the contents of the flask and the temperature of the water bath are both $25 \pm 1.0°C$. Suspend the flask and contents from the bottom-loading device of the balance and record the mass (m_3) to the nearest 0.1 g.

6 CALCULATON

Calculate the maximum density of the asphalt using the formula:

$$\rho_{max} = \frac{m_2}{m_2 - (m_3 - m_1)}\, \rho_w$$

Where;

ρ_{max} = maximum density of the asphalt in t/m^3

ρ_w = density of water at 25°C in t/m^3

m_1 = mass of Buchner flask in water in grams

m_2 = mass of test portion in air in grams

m_3 = mass of flask plus contents in water in grams

7 REPORTING

Report the maximum density of the asphalt to the nearest 0.001 t/m^3.

8 ISSUING AUTHORITY

Document Owner:
Bituminous Product Consultant

9 REVISION STATUS RECORD

Page No.	Section	Revision Description / Reference
2	8	Update Issuing Authority