STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard METHODS OF TESTING BITUMEN AND RELATED ROADMAKING PRODUCTS

AS 2341.7

DETERMINATION OF DENSITY USING A DENSITY BOTTLE

1 SCOPE. This standard sets out two procedures for the determination of density of bituminous materials using a density bottle. These procedures are known as the total filling method and the partial filling method.

2 REFERENCES. This standard requires reference to the following standards:

ASTM E1	ASTM Thermometers
BS 733	Density Bottles
IP Standard Thermometers	

3 APPLICATION. The total filling method is applicable to materials which are sufficiently fluid at 25°C to press the bottle stopper into position when the bottle is filled.

The partial filling method is applicable to materials which are too viscous for the total filling method.

The two methods cover all bitumen and related products for roadmaking.

4 APPARATUS. The following items of apparatus are required:

(a) A wide-necked density bottle of borosilicate glass complying with BS 733.

(b) A waterbath thermostatically controlled to maintain a temperature of 25 ± 0.1°C.

(c) Thermometers complying with designations IP 64C or ASTM 12C.

(d) Analytical balance accurate to 0.001 g.

5 CALIBRATION. The procedure for calibration of the density bottle shall be as follows:

(a) Select a clean, dry bottle and weigh to the nearest 0.001 g.

(b) Use sufficient cooled, freshly boiled distilled water at a temperature slightly below 25°C, to fill the bottle to the lower part of the ground glass neck.

(c) Insert the stopper carefully so that no bubbles are trapped in the neck and the excess water is expelled through the stopper's capillary.

(d) Totally immerse the bottle in the water bath and leave for a period of 30 min.

(e) Raise the bottle carefully so that the stopper protrudes from the water and wipe the top of the stopper with a non-absorbent material.

(f) Remove the bottle from the bath, making sure that the temperature to which the bottle is exposed is below 25°C. Dry the bottle carefully and leave to reach equilibrium with room temperature; then weigh to the nearest 0.001 g.

(g) Calculate the mass of water in the bottle, m_{WB}.

(h) Calculate the volume of the bottle at 25°C, V_w, in millilitres, as follows:

$$V_w = m_{WB} (1/0.997)$$

where

m_{WB} = mass of distilled water in the bottle at 25°C, in grams.

(The density of distilled water at 25°C is taken as 0.997 kg/L.)

6 PROCEDURE.

6.1 Total Filling Method. Follow the procedure described in Clause 5(a) to (g) but substitute the sample for the distilled water.

NOTES:

1. To avoid too much discharge of sample from the filled bottle when it is brought to temperature in the water bath, the filled and stoppered bottle should be only slightly below 25°C when it is immersed.
2. The level of the water in the bath should be about 5 mm below the top of the bottle.

6.2 Partial Filling Method.

(a) Thoroughly clean, dry and then weigh the bottle to the nearest 0.001 g.

(b) Warm the viscous material sufficiently for it to be poured or, for solid material, break the sample into pieces small enough to be inserted easily into the bottle, making sure that no bubbles are present in the solid material.

(c) Part fill the bottle with the sample, using a small funnel if necessary to prevent contamination of the neck of the bottle. Replace the stopper.

(d) If the sample has been poured, maintain the bottle and its contents at the pouring temperature for 30 min to permit air bubbles to escape, then allow it to cool to below 25°C.