



Test method T656

Water permeability of bituminous pavements (Method 1 – Low flow falling head field permeameter)

NOVEMBER 2012



Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		New Issue – Adapted from Test Method Q707A by Craig Brady	Gavin Donald	Nov 2006
Ed 2/ 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 T656 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T656

Water permeability of bituminous pavements (Method 1 – Low flow falling head field permeameter)

1. Scope

This method describes the procedure for the determination of the permeability of pavement materials using the Low Flow Field Permeameter. It is applicable to bituminous materials (eg. sprayed seal, asphalt) having permeability values within the range 0.04 to 1500 $\mu\text{m/s}$. The method is based on Queensland Department of Main Roads Test Method No. Q707A.

2. Apparatus

- (a) Field permeameter (see Figure 1), consisting of an inverted clear plastic conical funnel attached to a rigid plastic base plate as follows:
 - (i) The base plate (see Figure 2) shall have a diameter of about 200 mm and a thickness of about 20 mm. It shall contain a centrally located circular hole of diameter 100 ± 1 mm. A circular groove shall be formed around the hole in the top surface of the base plate to locate the top edge of the inverted funnel centrally over the hole. The top surface of the base plate shall extend beyond the bottom surface by about 10 mm to enhance removal of the base plate from the pavement at the completion of the test
 - (ii) The funnel shall have a top internal diameter of about 150 mm and a height of about 230 mm. The stem of the funnel shall have an external diameter of about 14 mm and an internal diameter of about 12 mm
 - (iii) With the inverted funnel inserted into the groove on the base plate, silicone sealant shall be applied externally over the joint between the funnel and the base plate to secure the funnel. The funnel shall then be marked at heights of 100 mm, 150 mm and 200 mm above the bottom of the base plate
- (b) Small funnel, with a top internal diameter of about 65 mm and a ribbed stem to provide an air gap when fitted into the permeameter funnel. The length of the stem shall be reduced as required so that, when it is positioned in the permeameter funnel, the bottom of its stem is approximately 10 mm above the 200 mm mark on the stem of the permeameter funnel
- (c) Annular template, of diameter 190 mm and containing a centrally located hole of 110 mm diameter
- (d) Annular restraining weight, of mass about 4 kg and of suitable dimensions to allow it to be positioned over the permeameter funnel to rest on the base plate
- (e) Stop watch or other suitable timing device readable to 0.1 s
- (f) Measuring cylinder, plastic measuring cylinder of 100 mL capacity
- (g) Beakers, plastic beakers of appropriate capacity (e.g. 100 mL, 600 mL and 1000 mL)
- (h) Water container, having a capacity of at least 10 L
- (i) Ball Clay (same clay as used in PAFV testing)
- (j) Spatula, to aid application of the clay to the pavement or base of the permeameter
- (k) Marking crayon
- (l) Assorted implements, for cleaning of the pavement before and after testing (e.g. wire brush, broom, paint scraper)

3. Procedure

- (a) Remove any loose material from the pavement
- (b) Attach the permeameter to the pavement using the appropriate procedure as follows:
 - (i) For sprayed seal/asphalt material
 - Place the annular template on the pavement and use the crayon to mark two concentric circles of diameter 100 mm and 200 mm (see Note 6 (a))
 - Apply Ball Clay to the pavement between the two concentric circles and spread it out evenly to a final thickness of about 2 mm using a spatula (see Note 6 (b))
 - Align the base plate with the 200 mm diameter circle and press the permeameter firmly onto the pavement
- (c) Position the restraining weight onto the base plate
- (d) Place the small funnel into the stem of the permeameter funnel
- (e) Using a beaker of appropriate capacity, pour water into the small funnel to fill the permeameter funnel to the 100 mm mark
- (f) Check for leaks at the base of the permeameter. If any leakage is observed, caulk the area with additional clay
- (g) Continue adding water to the permeameter to maintain the water level above the 100 mm mark for 2 minutes or until 300 mL of water has passed through the pavement
- (h) Immediately add additional water as required to raise the water level to just above the 200 mm mark. Discontinue the additional of water and record the time taken for the water level to drop from the 200 mm mark to the 150 mm mark to the nearest 0.1 s
- i) Repeat Step 3(h) twice

4. Calculations

4.1 Falling Head Method

- (a) Calculate the average of the three time measurements to the nearest 0.1 s.
- (b) Calculate the volume of the stem of the permeameter funnel between the 150 mm and 200 mm marks to the nearest 0.1 mL using the formula (see Note 6.5):

$$V = \frac{\pi D^2}{80}$$

- (c) Calculate the permeability using the formula:

$$k_f = \frac{25.5V}{t_1}$$

Where:

- D = internal diameter of the stem at the 175 mm mark (mm)
 V = volume of stem between 150 mm and 200 mm marks (mL)
 t₁ = Average time for water to drop from 200 mm to 150 mm (s)
 k_f = permeability (µm/s) using the Falling Head Method

5. Reporting

Report the following:

- (a) Test location including a longitudinal (chainage) and a lateral (offset) reference
- (b) Test site description including pavement type and surface condition
- (c) Permeability to three significant figures (µm/s)

6. Notes on Method

- The dimensions of the annular template allow for a 5 mm gap between the line marked by the crayon and the edge of the template. If necessary, the marking technique should be adjusted to ensure that the internal diameter of the smaller circle is 100 mm
- The sealant should be applied in a manner which spreads the sealant to, but not inside, the 100 mm diameter circle when the permeameter is pressed into position on the pavement
- Alternatively, the stem end of the permeameter funnel can be stopped, the permeameter inverted and water added to the 200 mm mark. The volume of water between the 200 mm and 150 mm marks can then be measured directly to the nearest 0.1 mL using a burette

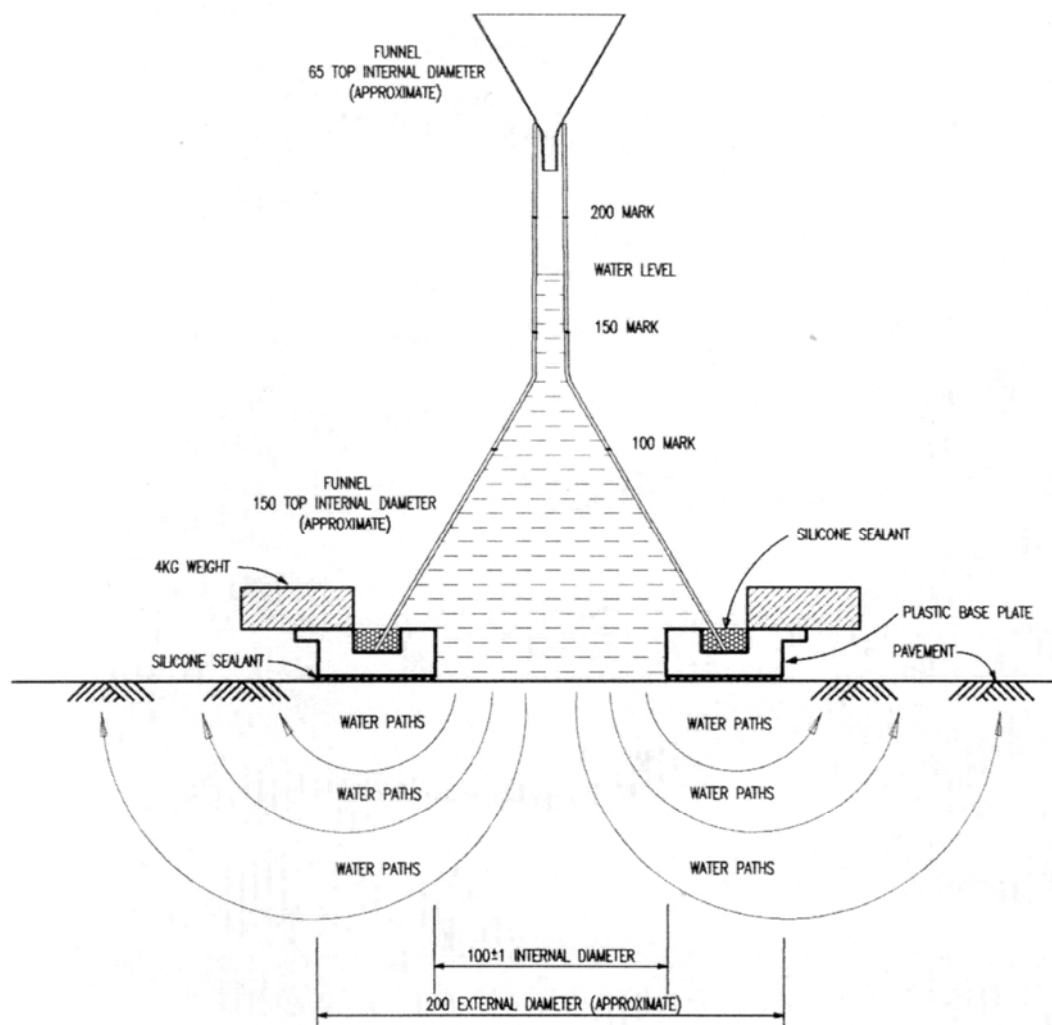


Figure 1 – Low Flow Field Permeameter

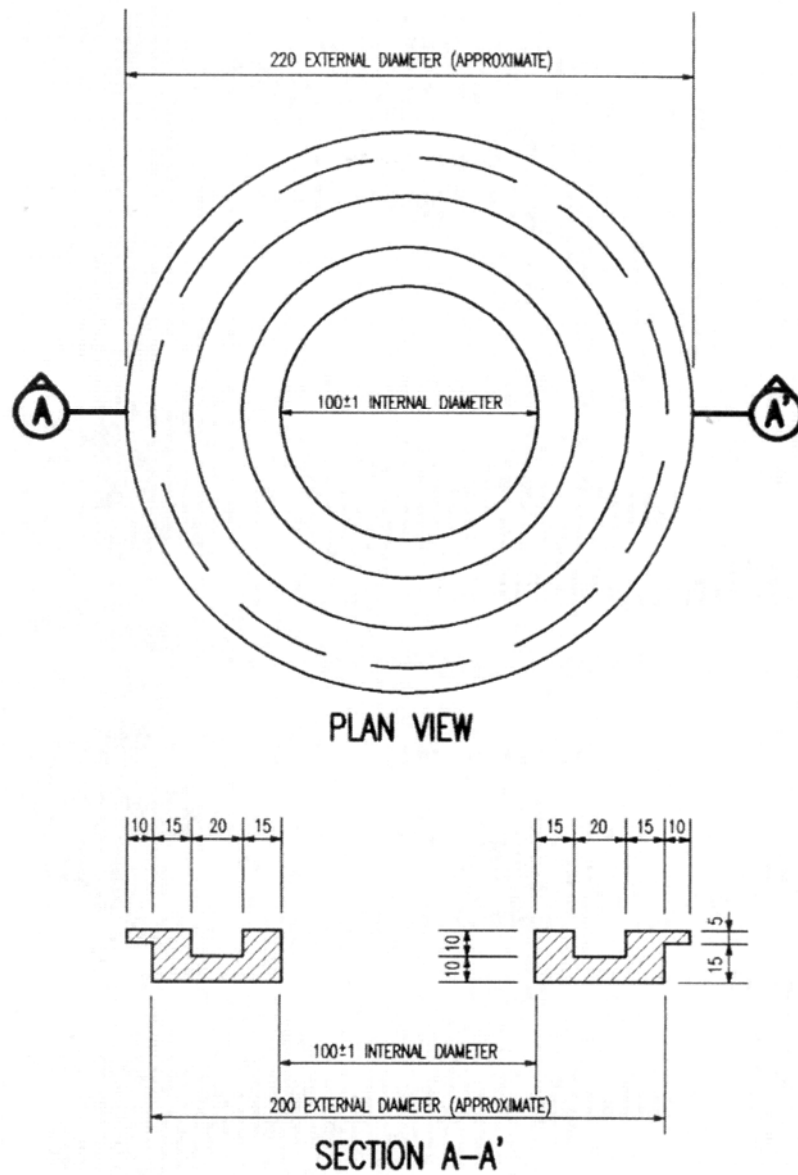


Figure 2 – Plastic Base Plate