

Recommend Approval: <u>Robert A. Verell</u> <u>1/28/13</u> Assistant Division Chief Date <u>Benjamin</u> <u>1/25/13</u> Division Chief Date	Maryland Department of Transportation State Highway Administration Office of Materials Technology MARYLAND STANDARD METHOD OF TESTS	
Approved: <u>Tom Amick</u> <u>02/01/13</u> Director Date	MEASUREMENT OF WATER PERMEABILITY OF COMPACTED ASPHALT PAVING MIXTURES	MSMT 408

SCOPE:

This test method provides a means of estimating water permeability of compacted asphalt paving mixtures. The procedure uses either laboratory compacted cylindrical specimens or field core samples obtained from existing pavements. This method may also be used to test in-place pavement areas.

SUMMARY OF METHOD:

A falling head permeability test is used to estimate the rate at which water flows into a compacted HMA pavement. Water from a graduated standpipe is allowed to flow into the pavement and the interval of time taken to reach a known change in head loss is recorded. The coefficient of permeability of a compacted HMA pavement is then estimated based on Darcy's Law.

MATERIALS AND EQUIPMENT:

1. **Hand broom** - A broom of sufficient stiffness to sweep a test location free of debris.
2. **Timing Device** - A stopwatch or other timing device graduated in divisions of 1.0 seconds.
3. **Sealant** – Plumber's putty or a silicone-rubber caulk to seal the permeameter to the pavement surface.
4. **Weights** – One piece or individual weights totaling 10 kg (20 lbs).
5. **Field Permeameter** - A field permeameter made to the dimensions and specifications shown in Figure 1 and Figure 2.
6. **Plastic Pipe and Funnel** – A length of plastic pipe that will fit through Tier a, to aid in filling the permeameter.
7. **Measuring Device** – A measuring stick having 0.1 cm increments to measure the beginning and ending head of water in the stand pipe. (This measurement device may be part of the permeameter).

PROCEDURE:

Pavement Surface Preparation

Use a broom to remove all debris from the pavement surface prior to conducting the test. Debris left on the pavement surface can hinder the sealing of the permeameter to the

pavement surface.

1. Permeameter Setup

- a) Ensure that both sides of the square, rubber base and the bottom of the square, metal base plate are free of debris.
- b) Apply sealant to one side of the square, rubber base.
- c) Place the side of the square, rubber base containing the sealant onto the pavement surface. Evenly apply pressure to the top of the square, rubber base with hand pressure to force the sealant into the surface voids.
- d) Apply sealant onto the bottom of the square, metal base plate.
- e) Place the base mold onto the square, rubber base ensuring that the hole within the square, metal base plate lines up with the hole in the square, rubber base. Apply hand pressure onto the top cap of the base mold to force adhesion between both sides.
- f) Place weight over standpipes and base mold onto square, metal base plate. Apply hand pressure to weight to finalize sealing.

2. Pavement Saturation

- a) Fill the standpipe to just above the top cap of the permeameter.
- b) Allow the water to remain in the bottom of the standpipe for not less than one minute. It may be necessary to add water to keep the water level above the top cap of the permeameter.
- c) Check for leaks through seal. If leaking is noted, apply additional hand pressure or repeat sealing process.

3. Permeability Test

- a) To start the test, introduce water into the standpipe to just above the desired initial head. (See Note 1).
- b) When the water level is at the desired initial head, start the timing device. (See Note 2) Stop the timing device when the water level within the standpipe reaches the desired final head. (Note 3) Record the initial head, final head, and time interval between the initial and final head.
- c) Repeat Steps 1 and 2 without removing the permeameter from the test area.

Note 1: For most applications, enough water should be added to bring the water level to the top of the top tier standpipe.

Note 2: For relatively impermeable pavements where the water level drops very slowly within the top tier standpipe; read the initial head from the top tier standpipe.

For pavements of medium permeability where the water level drops quickly through the top tier standpipe; read the initial head from the middle tier standpipe.

For very permeable pavements where the water level drops very quickly through the top and middle tier standpipes but slows down when it reaches the bottom tier standpipe; read the initial head from the bottom tier standpipe.

Note 3: The initial and final head determinations should be made within the same standpipe tier.

CALCULATIONS:

1. The coefficient of permeability, k, is determined using the following equation:

$$k = \frac{eaL}{At} \cdot \ln \frac{h_1}{h_2} \cdot 2835$$

Where:

k = coefficient of permeability, ft/day;

a = inside cross-sectional area of the standpipe, cm² ;

L = average thickness of the test area, cm;

A = average cross-sectional area of the test area, cm² ;

t = elapsed time between h₁ and h₂, s;

h₁ = initial head across the test specimen, cm;

h₂ = final head across the test specimen, cm:

2835 = 1 x 10⁻⁵ cm/sec.

REPORT:

1. Report the average result for k (to the nearest tenth) in feet per day.

Figure 1

Water Permeability Testing Apparatus
(Elevation View – Approximate dimensions)

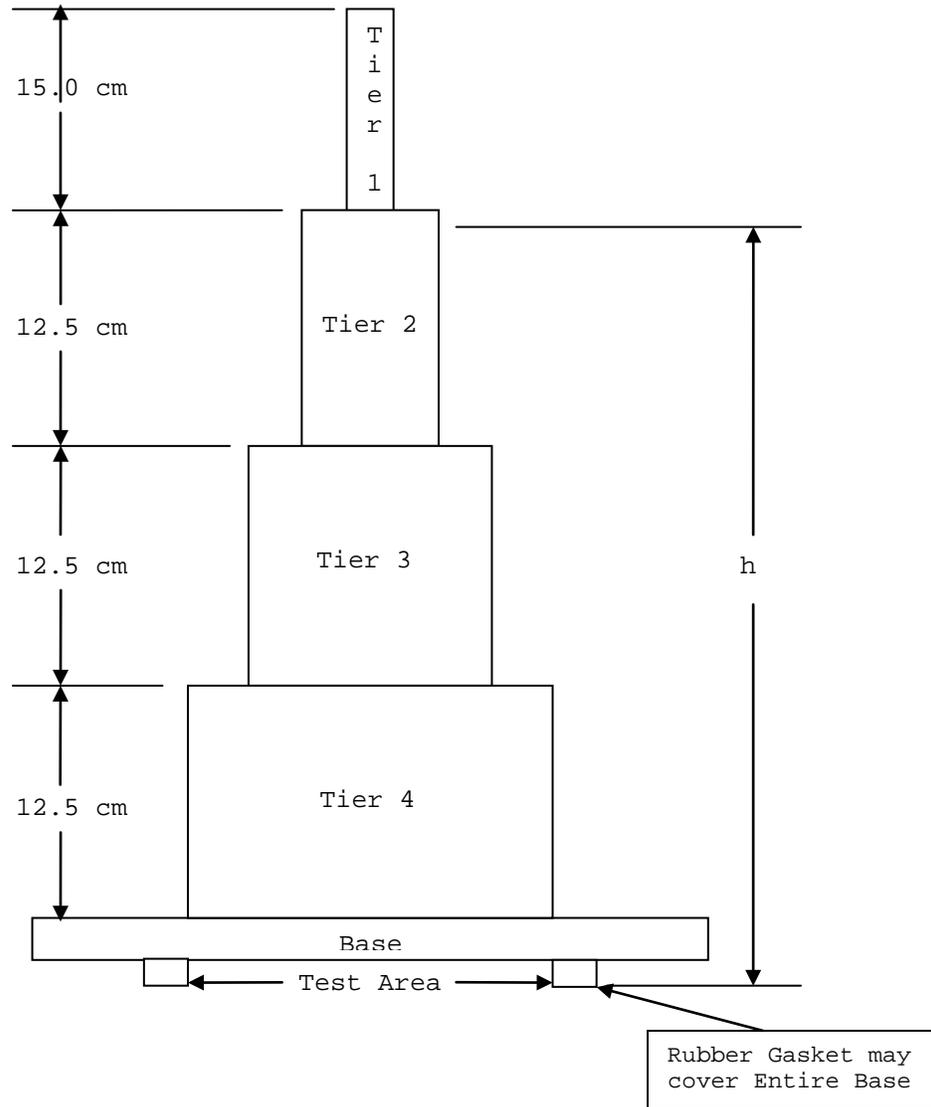


Figure 2

Water Permeability Testing Apparatus
(Plan View - Approximate dimensions and inside diameters of stand pipes)

