

DETERMINING THE PERMEABILITY OF IN-PLACE HOT-MIX ASPHALT (HMA)
USING THE AIR-INDUCED PERMEAMETER (AIP)

1. SCOPE - This method describes the procedure for determining the in-place permeability of an HMA mat using the AIP. This method is applicable to all nominal-maximum aggregate sizes and gradations of HMA.
2. APPARATUS AND MATERIALS -
 - 2.1 AIP - Provide a device consisting of the following components:
 - 2.1.1 Vacuum chamber – Ensure the chamber is constructed of heavy-duty, transparent LEXAN[®] or its commercial equivalent and conforms to the dimensions in Figure 1. Ensure that a 3.00 ± 0.25 in. sealing ring is attached to the bottom of the chamber.
 - 2.1.2 Sealing ring – Provide a silicone sealing ring conforming to the dimensions in Figure 1. Ensure the vacuum chamber fits snugly in the ring opening and is tightly sealed to prevent air leakage.
 - 2.1.3 Multi-venturi vacuum cube – Provide a multi-venturi vacuum cube with an air compressor hose attachment. Ensure the cube attaches to the top of the vacuum chamber according to Figure 1. In addition, ensure the cube contains a valve to restrict airflow through the cube.
 - 2.1.4 Digital gage – Provide a digital vacuum gage mounted to the top of the vacuum chamber that is capable of reading from 0 to 700 mm Hg with less than a 0.01-percent error.
 - 2.2 Air compressor - Provide an air compressor capable of delivering a constant pressure of 68 ± 3 psi.
 - 2.3 Caulking gun - Provide a caulking gun capable of extruding material from commercially available caulking tubes.
 - 2.4 Caulk - Provide a silicone-based, commercially available, rubber caulk that can be purchased in tubes.
3. PROCEDURE -
 - 3.1 Setup -
 - 3.1.1 Connect the air compressor to the multi-venturi vacuum cube.
 - 3.1.2 Check the digital gage to ensure it is operating properly and is in the “mm Hg” mode.

- 3.1.3 Ensure all seams and orifices are in good condition.
- 3.1.4 “Zero” the gage according to the manufacturer’s instructions. This operation needs to be performed only once per day.
- 3.1.5 Ensure the sealing ring is free of debris.
- 3.2 Sealing and placement of AIP -
 - 3.2.1 Apply approximately a 0.5-in. bead of silicone rubber caulk approximately one inch inside the outer edge of the sealing ring.
 - 3.2.2 Place the AIP in the center of the area to be tested, using caution not to move the AIP laterally during or after placement.
 - 3.2.3 When placing the AIP, apply a downward force of no more than 50 lbf while twisting the AIP approximately one-eighth of a turn. It is important not to “over-twist” the device; this action may cause penetration of the silicone into the pavement voids, increasing the value recorded on the gage.
- 3.3 Obtaining readings -
 - 3.3.1 Open the valve on the multi-venturi vacuum cube to permit the flow of air.
 - 3.3.2 The reading on the digital vacuum will begin to increase. When this number reaches a peak, the test is finished, and the valve can be shut. The test time will vary depending on the permeability of the pavement, but the time should not exceed 15 s. It is important not to permit the AIP to run for an extended period of time. This practice may cause delamination or “humping” of the pavement. This point is especially important for hot, fresh-laid pavements. A “rule-of-thumb” is not to test any pavement above 130°F.
 - 3.3.3 Record the highest reading attained by the AIP by pressing the button marked “HI/LO.” It is necessary to obtain only one reading per site.

4. CALCULATIONS AND REPORTING -

- 4.1 Calculate the permeability of the HMA mat in ft/day from the following equation:

$$k = 25,757.53 * V^{-1.556}$$

where: k = permeability (ft/day); and
V = vacuum reading in mm Hg.

- 4.2 Record the permeability to the nearest 0.1 ft/day.

KM 449-05

Approved _____

Director
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Date 12/28/04

Kentucky Method 64-449-05
Dated 12/28/04

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Figure 1. AIP.

