

GlasPave™25 Technical Note

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Water Proofing Claim

Whether an asphalt pavement interlayer is a paving fabric, paving mat or composite grid, water proofing of the pavement can be a desired feature and benefit of the product. Preventing water ingress into the lower layers of the pavement structure is a key to long-term performance of the pavement.

Traditionally, water proofing has been achieved by saturating a 4 oz polypropylene non-woven paving fabric or a fiberglass/polyester paving mat with hot asphalt cement binder (AC). Due to the thickness and porosity of these products, at least 0.18 – 0.20 gal/yd² of hot AC is required to fully saturate the interlayer, as measured in the ASTM D6140 asphalt retention test. Typically, paving fabric or mat suppliers then recommend an application rate of between 0.20 – 0.28 gal/yd², depending on the existing surface conditions and amount of AC binder likely to be absorbed by the pavement. Once the interlayer is fully saturated, it can become an impermeable layer and act as a water proof membrane.

In theory, there is no reason why a thinner, lower porosity interlayer can not act as an effective moisture barrier as long as the interlayer material is properly saturated with hot AC binder. Saint-Gobain Technical Fabrics, the manufacturers of GlasGrid®, created GlasPave™25 with this thought in mind. GlasPave™25 is a unique combination of fiberglass mesh embedded into high performance polyester mats. The result is an engineering paving mat that delivers the highest tensile strength in the market when compared to other paving mats or fabric.

Since GlasPave™25 is thinner and has a lower porosity; it soaks up less AC binder and quickly becomes saturated. GlasPave™25 only requires 0.10 gal/yd² of hot AC for saturation and 0.15 gal/yd² is recommended for application. This translates to between 25 and 40% less hot AC required compared to paving mat or paving fabric, which means significant petroleum conservation to the contractor and asset owner and an environmentally friendly smaller carbon foot print on the job site.

Critics have asked how an interlayer this thin and with such a low AC binder application rate can be considered a moisture barrier. The proof is in the testing.

Initially, the GlasPave™25 interlayer was 3rd-party tested against both paving fabric and paving mat using ASTM D5084, “Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter”. Samples of GlasPave™25 were first saturated with hot AC binder using the guidelines set out in ASTM D6140. A total of 0.15 gal/yd² of hot AC was applied to the GlasPave™25 samples in order to simulate recommended hot AC applications rates. Paving fabric and paving mat samples were also saturated to recommended application rates and measured to have AC binder rates of 0.32 and 0.23 gal/yd², respectively. The asphalt saturated materials were then tested in a permeameter, a tri-axial-type cell used for making hydraulic conductivity measurements. A confining pressure of 5 psi was used for the test. Results of the testing are shown in the table below.

Interlayer Type	Asphalt Retention Rate (gal/yd2)	Thickness (inches)	Coefficient of Permeability (cm/sec)
4 oz GlasPave™25	0.15	0.04	2.8×10^{-11}
4 oz Paving Mat	0.23	0.05	2.6×10^{-11}
4 oz Paving Fabric	0.32	0.08	2.6×10^{-11}

These results showed that all three of the AC saturated interlayers tested had extremely low water permeability rates and are essentially impermeable membranes. Based on literature cited, a membrane, tested in this manner, will greatly enhance the water proofing of a pavement if the measured water permeability is less than approx 1×10^{-3} cm/sec. (1) What is significant in this finding is that the GlasPave™25 saturated membrane exhibits the benefit of being a moisture barrier even though it only has half of the AC binder content and half of the thickness compared to paving fabric. Though these results were suggestive, they were based on lab prepared membrane samples only, rather than on interlayer material actually installed in an asphalt pavement.

To address this need, water permeability testing was recently completed on GlasPave™25 field cores. Six inch diameter cores were removed from a pavement overlay rehabilitation project installed in Stockton, CA back in Nov. 2007. GlasPave™25 had been installed over an existing asphalt pavement as well as on some micro-milled surfaces near the curbs, using an AC binder application rate of 0.15 gal/yd2. GlasPave™25 was then overlaid with 2" of HMA. Five, full depth cores were extracted from various locations on this project and sent to a 3rd-party lab in Florida for water permeability testing using FLDOT test method FM 5-565, "Measurement of Water Permeability of Compacted Asphalt Paving Mixtures". This test method was chosen as it is a well known test used by a number of state DOT's to measure asphalt pavement permeability. This test involved using a falling head permeability test apparatus, (see Figure 1) used to determine the flow rate of water through the core specimens. Each core was first trimmed by removing ¼" of asphalt from the surface to ensure a fresh surface for testing. A constant air pressure of 10 psi was used to hold the apparatus sealing membrane against the core specimens. A water head pressure of 63 cm was used and water permeability of each core sample was measured. The test results for these core specimens are shown in the table below.

Core Number	Surface Condition	Specific Gravity	Bulk Density	Water Permeability (cm/sec)
1	Existing	2.235	139.5	4.7×10^{-6}
2	Existing	2.309	144.1	3.0×10^{-9}
3	Micro-milled	2.393	149.3	4.5×10^{-8}
4	Existing	2.289	142.8	1.6×10^{-8}
5	Existing	2.270	141.6	4.8×10^{-8}

FLDOT spec limit for maximum allowable water permeability in an asphalt pavement is 1.25×10^{-3} cm/sec.

These test results, measured from actual field cores, suggest that when GlasPave™25 is used as an interlayer between lifts of pavement, the interlayer is effective at reducing the level of water permeability in the pavement by between 3 and 6 orders of magnitude compared to the FLDOT spec limit for pavement permeability. Previous testing on asphalt pavement cores containing paving fabric showed a reduction of one to two orders of magnitude over non-interlayer containing pavement. (2)

The low levels of water permeability measured on these field sample cores clearly demonstrates that even though GlasPave™25 is a thinner product, only requires 0.10 gal/yd² of hot AC to saturate the interlayer and has a recommended application rate of only 0.15 gal/yd² of hot AC, the material can still be an effective moisture barrier compared to other thicker, more porous paving mats and paving fabrics.

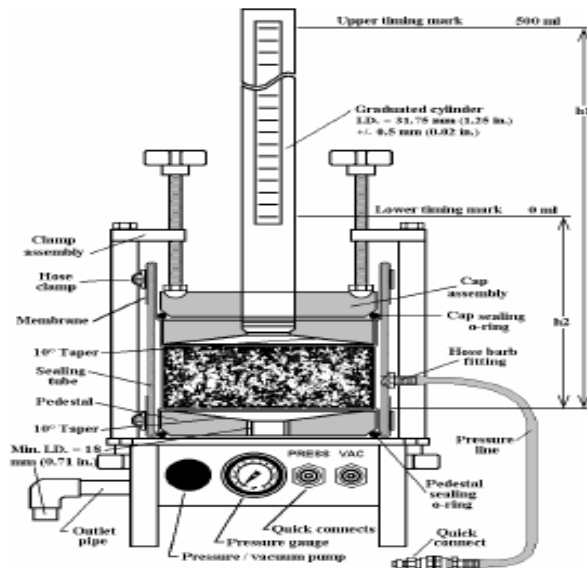


Figure 1 Water Permeability Test Apparatus

References

- (1) Baker, T.L., *Results of Melt Through Asphalt Absorption and Permeability Tests*, Internal Communication, Amoco Fabrics and Fibers Co., 1997.
- (2) Guram, S.S., *Evaluation of Petromat Membrane System as a Waterproof Membrane*, Internal Communication, Phillips Fibers Corp., 1983.