Use of Warm Mix Asphalt (WMA) and Paving Fabric Interlayer Systems

Executive Summary of the Clemson University Research

Geosynthetic pavement interlayers provide numerous benefits to new and rehabilitated pavement systems. When installed properly, these interlayers can virtually prevent water from infiltrating a pavement into the roadway base and also absorb pavement stresses retarding fatigue and reflective cracking, prolonging pavement service life. The most common geosynthetic interlayer system and the system investigated in this report is the widely used paving fabric interlayer system. The installation process includes an application of tack coat (generally 0.25 +/- gal. / sq.yd. of pure asphalt cement-neat asphalts) and the installation of a 4oz./sq.yd., paving fabric. This fabric system is then covered by the installation of hot mix asphalt (HMA) having a minimum compacted thickness of no less than 1.5 in. to ensure enough latent heat is present to soften and draw the asphalt tack coat into the paving fabric, ensuring saturation.

Recently, with a focus on more sustainable asphalt pavements, there has been a rapid rise in the use of warm mix asphalt (WMA). In contrast with HMA, WMA is produced at temperatures that are 50 to 100°F lower than these traditional HMA's. At some minimum threshold temperature of the WMA compacted over the paving fabric system, there would be insufficient heat to activate the binder tack coat to allow it to saturate the paving fabric and to fully bond all layers together.

Research was performed at Clemson University to specifically identify the minimum threshold that warm mix asphalt temperatures can successfully be used over paving fabric interlayer systems. The study tested the four most common performance grades of asphalt cement and examined a range of WMA temperatures from 300°F down to 200°F. The study was performed in two phases; in Phase 1, a binder tack coat and paving fabric were applied to laboratory pavement specimens. Above the paving fabric, an indicator paper was inserted and then blocks simulating the various temperatures of WMA were compacted to complete the pavement sections. Then the indicator paper was removed and used to measure the percentage of effective tack coat penetration through the paving fabric. As expected, the lower the temperature of WMA applied, the less penetration of the tack was absorbed into the paving fabric. The other variable studied was the number of compaction passes applied. One, three and five compactive passes were applied and, the more compactions, the higher the penetration of tack coat was absorbed into the paving fabric.

In Phase 2 of the study, actual warm mix overlays were placed directly on the paving fabric using different binder tack coats placed at the manufacturer's recommended application rates at various temperatures of warm mixes. Subsequently, the pavement columns were subjected to shear testing at the paving fabric interface. This was done to ensure that an adequate amount of shear resistance is attained by proper asphalt saturation. The test results indicated sufficient shear resistance present when the recommended minimum temperatures were achieved.

This research developed a comprehensive matrix of information showing the interaction of all the different variables. Analysis of the data allowed the selection of a minimum recommended WMA temperatures that may be used successfully over a paving fabric interlayer system.

It was determined that warm mix asphalt concrete (WMA) can successfully be placed over a paving fabric interlayer system with a minimum temperature, at the time of compaction, of no less than 250° F. This allows the very cost effective paving fabric interlayer system to be used in conjunction with warm mix asphalt concrete to greatly extend asphalt pavement life by creating a waterproofing pavement membrane and by absorbing stresses to minimize both fatigue and reflective cracking.

The research was jointly funded by: Propex Operating Company (www.propexplus.com) and TenCate Geosynthetics, NA (www.tencate.com). The full report is posted on the websites for these companies and this Executive Summary and the full report are also posted on the website for the Asphalt Interlayer Association at www.aia-us.org.