TENCATE Mirafi®

Research Bulletin #4

Research Type: Full Scale Accelerated Pavement Testing
Paved Road - Base Reinforcement

Research Entity: Kansas State University, Manhattan, KS

Products Tested: Mirafi® RS380*i*
Mirafi® RS580*i*

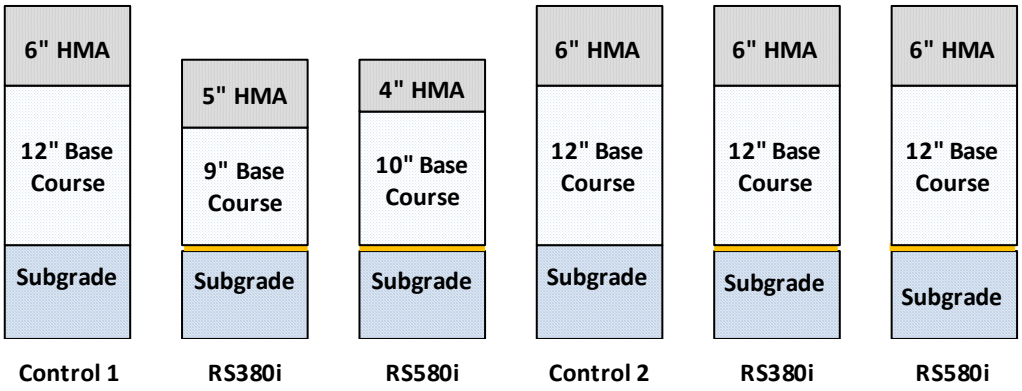
Test Parameters: Subgrade Soil CBR 2.6% AASHTO A-7-6 Clay
Well-Graded Crushed Limestone Aggregate Base Course (Kansas AB-3)

Research Purpose: Testing was performed by Kansas Sate University in their Civil Infrastructure Laboratory (CISL) that houses an accelerated testing machine. Full scale loading of numerous test sections were carried out to determine the benefit of Mirafi® RS380*i* and RS580*i* in asphalt paved roads. The test sections were constructed to evaluate traffic benefit ratios (TBR) and asphalt and base course aggregate reductions with Mirafi® RS380*i* and RS580*i* when compared to the control sections.

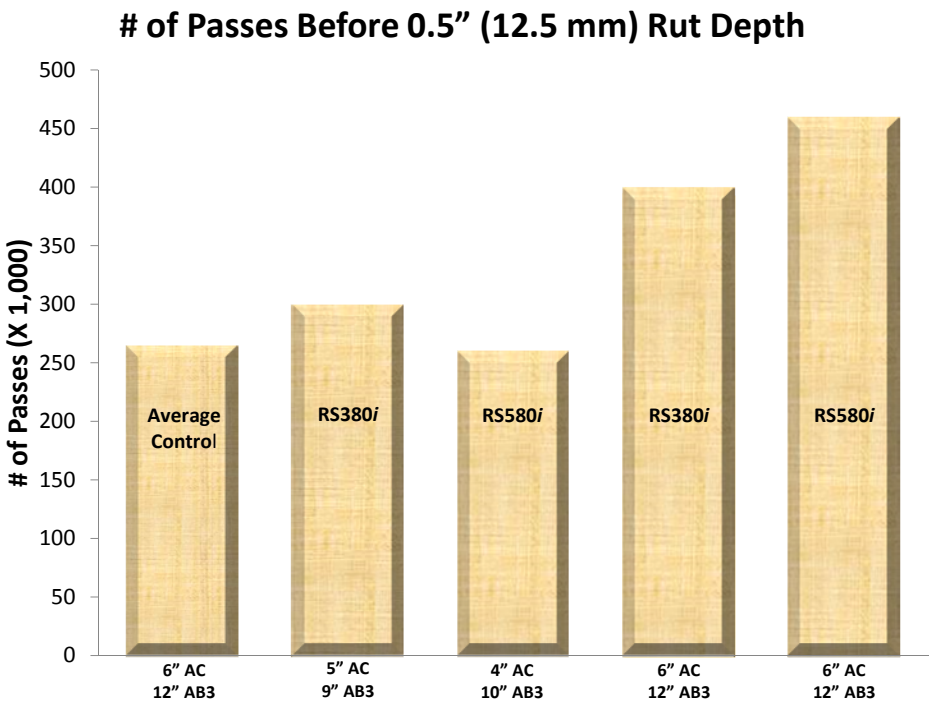
Procedure: Multiple test sections were constructed at the Civil Infrastructure Systems Laboratory at Kansas State University which is capable of testing large scale asphalt and concrete pavement sections under real world pavement loading scenarios. The test sections included two control sections, and four sections reinforced with either Mirafi® RS380*i* or RS580*i.* Two test pits were utilized for the test sections that measured 20' (6.1 M) X 16' (4.9 M). In each test lane, the clay subgrade was placed and compacted in five separate lifts. Dynamic Cone Penetrometer testing was done on each constructed lift to evaluate the subgrade strength to obtain a targeted CBR of 2.6%. The appropriate RS*i*-Series geosynthetics were then placed directly on the subgrade for the reinforced test sections. Next, base course aggregate was placed and compacted to the desired thickness and density followed by the hot-mix asphalt layer, also placed to the desired thickness and density. The asphalt layer was a 0.5" (12.5 mm) nominal maximum aggregate size.

Superpave mixture with a fine gradation and 25% of recycled asphalt pavement materials. A PG 58-28 binder was also used in the HMA layer. After construction was completed, the test sections were trafficked with the accelerated pavement testing machine. The testing apparatus had a 20 kip (89 kN) single axle load with dual tires exhibiting tire pressure of 90 psi (620 kPa) and travelling at a speed of 7 mph (11.3km/h). Rut measurements were taken and recorded for each test section after every 50,000 passes. The sections were loaded to a failure criteria of 0.5" (12.5 mm).

Test Sections



Results: Rut measurements were recorded after every 50,000 truck passes. Once the rut depth measurement met or exceeded 0.5" (12.5 mm), the section was considered to have met the failure criteria. Graphs were then plotted to show the actual rut depth recorded at each 50,000 pass interval. Then the actual truck passes at the rut depth of 0.5" (12.5 mm) were estimated from the curves in the graph. Both the Mirafi® RS380*i* and RS580*i* had a section thickness equivalent to the control sections, and a section that had a reduction in both the base course and asphalt. The two sections that included the Mirafi® RS380*i* and RS580*i* with an equivalent base course and asphalt thickness as the control sections showed significant improvement when compared to the control sections. In fact, the Mirafi® RS580*i* showed a 45% improvement, while the RS380*i* allowed 35% more passes before the failure criteria of 0.5" (12.5 mm). For the two sections with the reduced pavement thickness, the TenCate Miraspec Paved Roads Software was used to determine the base course and asphalt thicknesses needed to provide the same number of passes as a thicker control section. The results from the software showed that the section that included the RS380*i* and a reduction of 1" (25 mm) of asphalt and 3" (75 mm) of base course aggregate would be a functional equivalent to the thicker control section. On the other hand, the Miraspec software showed that the section with RS580*i* could be reduced by 2" (50 mm) of asphalt and 2" (50 mm) of base course aggregate. The reduced RS580*i* section had similar performance to the control sections, while the reduced RS380i section allowed approximately 10% more traffic before reaching 0.5" (12.5 mm) of rut depth.



Conclusions: The testing was performed to look at both a long term life cycle cost benefit and also a short term material and overall construction cost reduction benefit. The results indicate that the inclusion of either Mirafi® RS380*i* or RS580*i* can significantly decrease the cost and resources needed to build a road and/or significantly increase the life of a pavement while reducing long term maintenance costs.