



Case Study

application Subgrade Stabilization and Base Reinforcement
location Greensboro, NC
product Mirafi® HP570 & BXG12

job owner Windsor Commercial
engineer Geoscience and Technology
contractor Larco Construction

TenCate™ develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

THE CHALLENGE

The owner was expanding a business park in Greensboro by adding a new warehouse and required infrastructure for a national auto parts company's distribution center. While the initial geotechnical report completed in 2005, discussed the potential of poor soil conditions, there was no design criteria in place for pavement subgrade CBR's less than 8%. The pavement cross-section consisted of 8" of aggregate base course (ABC), 3.5" of asphalt intermediate course, and 2" of asphalt surface course as required by the City of Greensboro for roads they ultimately maintain. Since the pavement sections being installed for this addition were not going to be maintained publically, a section consisting of 8", 2" and 1" (8/2/1) was chosen.

This allowed the owner a more economical pavement while providing what they considered, an acceptable design life.

THE DESIGN

When construction started on the pavement areas surrounding the warehouse in the fall of 2008, the engineering firm conducting the Construction Materials Testing (CMT) determined that, based on moisture contents in the subgrade, the field CBR values appeared to fall below the assumed design value of 8%. In reviewing the original soils report, they determined the soils within the subgrade area were low plasticity silts prevalent in the Piedmont Region. These soils have a wide variation in strength based on the moisture content found in the soil. Because of this, soaked CBR tests were conducted to determine the actual values for the subgrade material. The results found a range of CBR values from 0.8 to 4%. It was decided that 2% was an acceptable value to assume in the pavement

areas. Based on this value, the anticipated truck loading conditions, and the pavement design life requested by the owner, a cross-section was developed using AASHTO Pavement Design calculations allowing for the geosynthetic benefits associated with Mirafi® HP570. Mirafi® HP570 was the product of choice due to its high tensile modulus and key separation benefits, providing filtration and drainage. The final design called for 12" of ABC over the Mirafi® HP570 with the proposed pavement thickness over that. This was approximately 11" less than the equivalent Structure Number (SN) unreinforced section.

THE CONSTRUCTION

Construction started with the area adjacent to the truck loading docks. This section of the installation went smoothly. When the construction proceeded to the East Road area, the subgrade conditions were significantly worse than that in the truck loading area.



Subgrade conditions prior to the placement of Mirafi® HP570.



Starting placement of Mirafi® HP570 and base course under asphalt pavement adjacent to the concrete truck dock area.

A revised design was completed on this section using a CBR=1 and to minimize the excavation and stone, a two layer geosynthetic solution was used. Mirafi® HP570 was again used at the subgrade level to provide the required tensile strength and separation benefits with 12" of drainage stone (due to the high moisture content of the subgrade). TenCate's higher strength biaxial geogrid, Mirafi® BXG12, was then installed with 2" added thickness to the original base course. This reduced the overall aggregate thickness by almost 12" when compared to the same SN unreinforced section. The installation proceeded without problems, especially considering the entire site was completed by the spring without the benefit of temperatures that would have assisted in drying out the subgrade.

THE PERFORMANCE

The use of geosynthetics allowed the contractor to stay on schedule and save the owner money over the non-geosynthetic design requirements. By reducing the aggregate thickness required for an unreinforced section, the contractor saved time in additional undercut and haul off of poor materials as well as installation of additional aggregate. The geosynthetic costs were roughly 25% of what the additional aggregate costs would have been or a savings of over \$150,000 on the anticipated \$230,000 additional cost due to poorer than expected subgrade conditions.

An additional benefit seen by using the geosynthetics in construction of a flexible pavement is not accounted for in design calculations at this point in time. The geosynthetics provide a much more stable, durable, long-lasting platform for the roadway, reducing the potential tensile stress cracking that occurs in the lower level of the aggregate base courses. The stress cracks then allow the paths for subsurface water and soils to mix with the aggregate reducing the strength of it. The actual time to failure for a geosynthetic stabilized pavement will be longer than typical calculations show. The pavement has been in service for just over one year and subjected to daily truck traffic without any signs of distress.



East Road subgrade conditions prior to placement of geotextiles.



Above: Truck loading dock area completed
Below: East Road completed



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