



## Case Study

**application** Subgrade and Base Course Reinforcement  
**location** Natick Mall Expansion, Natick, MA  
**product** Mirafi® HP570 & BXG 11

**job owner** General Growth Properties, Inc  
**engineer** GZA GeoEnvironmental, Inc., Providence, RI  
**contractor** Marois Brothers, Inc., Worcester, MA

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

A major addition to the Natick Massachusetts Mall was started in early 2005. The site upon which the mall, condominiums and parking garages were being built was to be a deep excavation with high ground water levels. This would require extensive soil reinforcement, confinement and separation while allowing sufficient permeability of the geosynthetics being utilized.

### THE DESIGN

GZA GeoEnvironmental, Inc. was the geotechnical firm responsible for the design of a subgrade and stone base course reinforcement system under the extensive concrete footings, walls and slabs that would support the buildings and parking garages on the six acre site. GZA's initial design called for a two layer woven monofilament geotextile and geogrid system to be placed over the subgrade for separation and confinement of the base course and to allow sufficient filtration of the groundwater through the geotextile. The geogrid stabilized the subgrade and reinforced the stone base course. Mirafi® submitted a value-engineering proposal to the site contractor, Marois Brothers Inc. and the construction manager, Dimeo Construction to use one layer of Mirafi® HP570, a newer high strength, high permeability woven geotextile to replace the two layers originally specified. A side-by-side site field-test of both the single layer HP570 and the two layer geotextile and geogrid system was conducted.



Test section, HP570 VS FW700 & BXG 12 (Summer 2005).

The field test results showed that the single layer of HP570 out performed the two layer system for stabilization, confinement and filtration qualities and was approved.

### THE CONSTRUCTION

Construction began in the summer of 2005 and continued into the spring and summer of 2006. The HP570 geotextile was placed on the subgrade with a 2ft overlap between adjacent rolls, then 18in of 1 1/2" crushed stone was placed over the HP570 which would be used as a working mat. 12 to 18in of 3/4" crushed stone was

then placed on the working mat and incorporated into the under drain drainage system. Column footings walls and slabs were constructed at various elevations within and on top of the crushed stone working mat and the under drain system.

In several deep cut areas, where additional base course reinforcement was required, GZA specified HP570 on the subgrade and then several layers of a BXG 11, a biaxial polyester geogrid, equally spaced in the crushed stone base course for the additional reinforcement.

**THE PERFORMANCE**

During the initial stages of construction, the HP570 and the stone working mat performed extremely well, stabilizing some very soft sub-grade areas where a high water table required an extensive well point system with 24 hours a day pumping of the ground water so that the deep cut and site utilities could be completed.

The HP570 and BXG 11 system used in the deep cut areas has also performed as expected. The value engineering used on this project resulted in a high performance system with a lower overall cost for materials and installation.



Test section loading.



Left: HP570 & BXG 11 under deep cut areas.

Right: HP570 under working mat & drainage system (Spring 2006).



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