

Case Study

application	Reinforced Slope
location	Charleston, WV
product	Miramesh® GR, Miragrid® 10XT & 20XT, Mirafi® G200N

Job Owner	Yeager Airport
Engineer	Triad Engineering, Inc.
Contractor	Cast and Baker, Inc.
Supplier	JMD

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

Yeager Airport in Charleston, WV was constructed in the 1940's atop mountainous terrain. Due to the mountainous conditions, the ground surface around the airport slopes down steeply over 300 feet to the surrounding Elk and Kanawha Rivers, roadways, churches, houses and other structures. In order to meet recent FAA Safety Standards, updates to the airport runways had to be performed. These improvements included extending Runway 5 approximately 500 feet to create an emergency stopping apron for airplanes. The challenge for designers was how to extend the runway 500 feet outward on the side of a mountain.

THE DESIGN

Construction options for extending the runway past the existing hillside included evaluation of bridge structures, retaining walls and reinforced slopes. Engineering evaluation indicated the reinforced slope provided the most cost effective and easiest constructed option of the structures considered. In addition, the vegetated facing of the completed slope will provide a structure that will blend into the surrounding green hills of Charleston, WV. The final design was a 1H:1V reinforced steepened slope (RSS), 242 feet high, making it the tallest reinforced 1H:1V slope in North America. The design utilized Miragrid® 10XT and 20XT as the primary geosynthetic reinforcement with Miramesh® GR for erosion control at the slope face. The design also incorporated Mirafi® G200N drainage composite for drainage behind the reinforced mass.

THE CONSTRUCTION

Miragrid® 10XT and 20XT were selected as the primary reinforcement for the project and were installed in conjunction with the backfill material. The Miragrid® XT geogrids were installed as horizontal reinforcing elements into the slope. Embedment lengths of the Miragrid® 20XT were on the order of 195 feet in length. Mirafi® G200N drainage composite was installed along the back of the excavation to intercept and drain seepage water from the existing mountain side away from the reinforced mass. Miramesh® GR was installed on the face of the slope at 2 foot vertical intervals, with 3 foot embedded into the slope face and 2.5 feet down the face for facial stability and erosion protection. Miramesh® GR is an open mesh biaxial geosynthetic specifically designed as a face wrap material for RSS and MSEW applications.



Early construction at the bottom of the slope.



Slope face during construction.

THE PERFORMANCE

Extension of Runway 5 at Yeager Airport in Charleston, WV would have been extremely costly without a geosynthetic reinforcement solution. The RSS allowed for an economical solution and less complicated construction than the other, traditional methods that were considered. The reinforced slope was successfully completed and is performing as expected. Miragrid[®] XT geogrids provided the high strengths required for a structure of this size and Miramesh[®] GR allowed for facing stability and quick germination of surficial vegetation for improved stability. The structure allowed the airport to meet recent FAA Safety Standards while creating an engineered structure that blends into the scenic green hills of Charleston, WV.



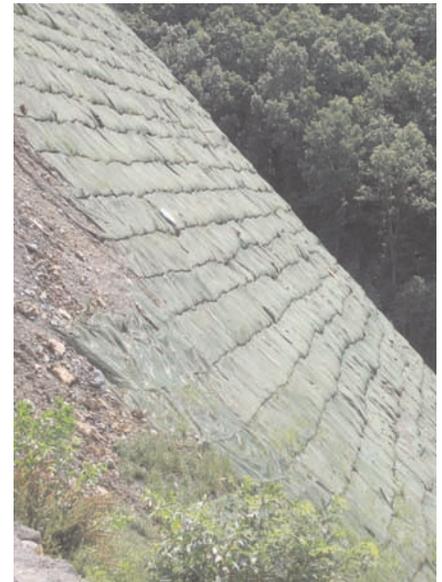
Completed 242 foot slope with good vegetation cover.



Aerial photo of slope during construction, approximately 80% complete.



Slope shortly after completion with early vegetation growth.



Miramesh[®] GR on slope face.

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