Walls and Slopes

Geosynthetic Reinforced Soil

Severn Valley Railway, Worcestershire, United Kingdom

Fortrac® and Fortrac 3D® Geogrids provide an economic and rapid rehabilitation for a rail embankment

Situation

Severn Valley Railway comprises a normal gauge, 16 mile track, operating rail carriages pulled by historic steam engines. The Railway runs along the Seven Valley from Kidderminster to Bridgnorth.

On the 19th June 2007, 166 mm of rain fell over Worcestershire in just a few hours. The abnormal amount of rainfall triggered nine major slope failures along the embankments of the route of Severn Valley Railway. The largest slope failures occurred at Highley Station and Fishermans Crossing. A large volume of surface water washed away the upper rail track embankment over a length of up to 50 m leaving the rails dramatically unsupported (see next page).

As the volunteer-run Severn Valley Railway relies heavily on income generated by ticket sales, and because the repairs required for additional public funding, an economic solution and the quick re-opening of the track were particularly important.

Solution

The quickest and most economic solution was deemed to comprise deep granular counterfort drains excavated to beyond the base of an existing shear zone and the reconstruction of the railway embankment with a reinforced soil block construction to create a 3.5 m high face slope (see above). The face of the slope was then covered with an erosion control geosynthetic (Fortrac 3D®-30) to aid vegetation growth and increase surface stability. Conventional options available would have been a contiguous bored pile wall, but these proved too expensive.

The design of the geogrid reinforced slopes included a 45° face angle along the 50 m length and a height of 3.5 m.
The reinforced soil embankment comprised layers of HUESKER’s Fortrac® geogrid, type 55/30-20, with a front face consisting of top soil and an erosion control geosynthetic Fortrac 3D®-30. Fortrac® geogrids provide a cost-effective alternative to more ‘conventional’ retaining solutions. The geogrid’s high-modulus, low-creep characteristics ensure slope deformations are minimised ensuring long-term structural performance.

Fortrac 3D® is a flexible, three dimensional reinforcement and erosion protection grid. It prevents scouring and erosion effects - especially of slopes with no established vegetation - and presents an anchor for roots which enhances the vegetation process and surface stability.

Upon completion, the reinforced soil embankment was hydro-seeded with a drought-tolerant seed mix to aid and promote vegetation and help the reconstructed slope blend into the scenic Severn Valley. The line between Bewdley and Bridgnorth was re-opened on schedule by early 2008.

Advantages

- Very flexible solution, in construction, engineering and landscaping
- Economic solution compared to original piled solution
- Environmental solution - Lower CO2 emissions compared to alternative construction solutions.
- Quick and easy allowing on-time project completion

Location: Severn Valley Railway, Worcestershire, England
Client: Severn Valley Railway
Consultant: David Symonds Associates and Ground Investigation & Piling Ltd.
Contractor: George Law Ltd.
Year of Construction: 2008
Products: Fortrac® 55/30-20 Geogrid, Fortrac 3D®-30 Geogrid