Embankments

Bridging of Sinkholes

Railway Junction Gröbers near Leipzig/Germany
High Strength Fortrac® Geogrids protect potential sinkholes

Problem

A railway junction with up to 7 tracks alongside each other is located on a former coal mining area where extraction took place at depths as shallow as 30 m up until the 1930s. The railway embankment, with two tracks for high speed (ICE) trains (up to 300 km/hr), needs to be protected from potential sinkholes and unacceptable settlements (max. 3 mm differential settlement over 1.5 m rail spacing).

Solution

All detected cavities were injected with cement grout. The embankment was then constructed with a special over-bridging system:

- Firstly, a cement stabilised base layer (0.4 m thick);
- Secondly, a mineral layer (0/16 and 0/32), including warning layer, and two Fortrac® Geogrid layers with strengths up to 1200 kN/m, reinforcing in two directions (0.95 m thick);
- Finally, an upper cement stabilised bearing layer.

Over the cement stabilised bearing layer, a nonwoven separation layer was placed before installing the frost protection mineral layer in accordance with German Railway regulations DS 836.

As soon as a sinkhole becomes active, the warning layer will register its exact location. Then the Fortrac® Geogrids, with aramid yarns longitudinally and polyvinylalcohol yarns in the cross direction, will be activated, reinforcing the...
embankment and upper cement stabilised bearing layer (the system having a design life of one month). Within the month, the sinkhole must, and can, be injected without the need to close the railway tracks.

This unique system provides a solution combining a geosynthetic bearing layer with a computer operated warning system, resulting in permanent control of the situation.

Location: Gröbers, between Halle and Leipzig, Germany

Client: German Rail (DB Projekt Verkehrsbau GmbH)

Design: VEPRO (tracks)

KuK (construction works)

HUESKER Synthetic (geosynthetics)

Glötzl GmbH (warning system)

Contractor: ARGE „Knoten Gröbers“

Year of construction: 2000 - 2002

Products: Fortrac® R 1200/100-10 AM including nonwoven composite warning layer