Secugrid®

Bridging of Mining Voids

Project name
Bridging of mining voids at Day-Care Centre
“Albrecht-Dürer-Straße”,
Halle (Saale), Germany

Designer
LA21 Landschaftsarchitektur, Nordhausen, Germany

Design geogrid reinforcement
BBG Bauberatung Geokunststoffe GmbH & Co. KG,
Espelkamp, Germany

Main contractor
Goldbeck Nordost GmbH, Leipzig, Germany

Geotechnical engineer and consulting
Baugrundbüro Klein, Beratende Ingenieure,
Halle (Saale), Germany

Detailed planning and structural analysis for geogrid installation
G.E.O.S. Ingenieurgesellschaft mbH,
NL Halle (Saale), Germany

Product
Secugrid® 200/40 R6

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Fig. 1: Installation of the 1st layer of Secugrid®

Fig. 2: Anchorage of 1st Secugrid® layer to the building foundation using terminal strip

Challenge

The new day-care centre “Albrecht-Dürer-Strasse” in Halle (Saale), Germany will provide room for 200 kids and is part of a municipal investment programme. The site is located on the edge of a 150-year-old mine. A special underground mining technique called “room and pillar caving” was used to extract brown coal. This method does not fill the created cavities after extraction of the coal. As a result, the overlying rock layers settle after the mining operations and fill the cavities. It can, however, not be precluded that residual cavities may cause subsidence at the surface of the terrain. Based on these findings, safety measures had to be taken in the area of the open space of the day-care centre.

Solution

During the previous use of the day-care centre‘s open space as a primary school sports field, repeated sinkholes appeared in the years 1989-2011, which indicated the described subsidence risks.

Based on ground investigations, mining voids with diameters of up to 3m had to be considered in the foundation design for the open space of the day-care centre.

For the entire outdoor area, a geogrid solution was recommended to bridge any future mining void safely.

The design of the required geogrid reinforcement was carried out using the BGE method according to the German (EBGEO) design guideline. Considering a soil coverage height of 1m above the reinforcement and a maximum surface deflection of 32cm, a biaxial spanning of the area at risk with a uniaxial Secugrid® geogrid was finally proposed. In the main stress direction (longitudinal direction), the geogrids were horizontally anchored with a length of 2.6m outside the potential subsidence area. In the transverse direction, a 50cm wide overlap of the geogrid panels was required. Since the area at risk of collapsing extended into a zone directly facing the buildings, horizontal anchorage of the geogrid with the required length was not possible. Alternatively, the 1st geogrid layer was anchored with its main stress direction to the building foundation using a terminal strip in combination with anchor bolts (see Fig. 2). After installing the longitudinal and transverse reinforcement layers, a 30cm cover of well-graded aggregate followed by a 50cm thick layer of fill and a final 20cm thick topsoil layer covered the Secugrid® geogrids. The chosen geosynthetic solution allowed a fast and cost-effective solution to protect the open area of the day-care centre against future sinkholes.

Fig. 3: Installation of 2nd layer of Secugrid®, crosswise to 1st layer