Bentofix® Secugrid® Naue Steel P - Shooting range of the shooting sports club (SSC) Schale - Germany

Olympic training centre: noise barrier wall for a shooting range

- **Project Name**
  Shooting range of the shooting sports club (SSC) Schale, Hopsten, Germany
- **Client**
  SSC Schale, Hopsten, Germany
- **Construction companies**
  GGS GmbH, Moritzburg, Germany
  Dallmann Straßen- und Tiefbau GmbH & Co. KG, Bramsche, Germany
- **Designer**
  pbh - Planungsbüro Hahm GmbH, Osnabrück, Germany
- **Product**
  Bentofix® NSP 4900
  Secugrid® 120/40 R6
  Secugrid® 80/20 R6
  Secugrid® 40/20 R6
  Naue Steel P (steep slope system with Secugrid®)

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Challenge

The “Schale Shooting Sports Club” (SSC Schale) in Hopsten, Germany, invested almost € 5 million in constructing two new skeet shooting ranges with the support of the federal government, the state, and the municipality. For noise protection, a 24m high wall was built, also collecting the shotgun pellets for recycling. The wall material is mainly from soil aggregate with „environmentally relevant substances“ (e.g., milled material from road shoulders), which was used as fill material for the geogrid reinforced soil structure.

Solution

The use of soil excavation and recycled construction materials in earthworks contributes to the conservation of resources and the currently necessary reduction of landfill volume. However, there is a particular need for construction measures when using soils and construction materials with environmentally relevant substances (so-called substitute construction materials) that would otherwise have to be deposited in a landfill.

The current version (2017) of the German „Merkblatt über Bauweisen für technische Sicherungsmaßnahmen bei der Verwendung von Böden und Baustoffen mit umweltrelevanten Inhaltsstoffen im Erdbau (M TS E)“ (Code of Practice on Construction Methods for Technical Safeguard Measures when using Soils and Construction Materials with Environmentally Relevant Substances in Earthworks) regulates various construction methods that can be used as protection measures in earthworks.

On 16 July 2021, the German “Mantelverordnung” (Directive on the Introduction of a Substitute Construction Materials Directive, on the Revision of the Federal Soil Protection and Contaminated Sites Ordinance and the Amendment of the Landfill Ordinance and the Commer-cial Waste Ordinance) was

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published in the Federal Law Journal. From August 1, 2023, the “Substitute Construction Materials Ordinance” (Mantelverordnung) is to be applied nationwide and, for the first time, regulates legally nationwide binding requirements for the recycling of mineral waste and its use in technical structures. It also refers to the construction methods of the German M TS E guideline.

For example, a geosynthetic clay liner (GCL), also called a bentonite mat, a multicomponent GCL or a geomembrane (GM) can be used as an equivalent and alternative sealing system to difficult and timeconsuming to build compacted clay liners for the protection of soil, groundwater, or surface water.

In the case of the geogrid reinforced noise barrier wall, the geosynthetic clay liner Bentofix® NSP 4900 with available verification of suitability for landfill class I and II from the LAGA (Federal Working Group “Waste”) for landfills was used as a sealing component to reduce the intrusion of precipitation water into the fill soil with environmentally relevant substances and thus to prevent leakage of environmentally sensitive pollutants. Particular importance was focused on the sealing system’s long service life (> 100 years), which is why this GCL with the LAGA verification of suitability was selected.

The facing system of the noise protection wall with the specified inclination of 70° is formed by a galvanised steel mesh with an integral erosion control mat. The laid and welded polyester geogrids with high tensile stiffness used in the system are anchored up to 11 m horizontally into the reinforced soil structure and thus enable the required stability for the steep retaining structure.

In addition, the facing system was designed, so that remains of clay disks and shotgun pellets can slide down the slope surface and can afterwards be picked up at regular intervals, professionally be disposed or recycled.

With a length of 475m and a height of 24m, the extended U-shaped noise barrier at the SSC Schale is one of the largest reinforced soil structures in Germany (Naue Steel P steep slope system) and, from a structural engineering point of view, pioneering the problem-free and safe sealing of the embankment core in steep slopes and retaining walls.

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