Infrastructure UK

HafenCity Hamburg - Safe foundations despite soft ground

Load transfer platform

- **Project name**
  Relocation of the Wilhelmsburger Reichsstraße B4 / B75
- **Client**
  Free and Hanseatic City of Hamburg, Germany
- **Owner's representative**
  DEGES Deutsche Einheit Fernstraßenplanungs- und -bau GmbH, Germany
- **Impl. planning LTP**
  BVT Dyniv GmbH, Seevetal, Germany
- **Product**
  Secugrid® HS 1200/100 R6

Naue

Fig. 1: Structure of the construction project (top view)

Fig. 2: Installation of the cover layer (above the geogrid)

Until 2019, approximately 55,000 vehicles - including 5,500 lorries per day - crossed the Wilhelmsburger Reichsstraße, one of Hamburg's most important north-south connections crossing river Elbe. The heavily congested route cut through the Wilhelmsburg district and hindered sustainable urban development. The Federal Government of Germany and the City of Hamburg therefore decided to relocate the road in a major project and combine it with a railway line to create a new traffic artery. One of the biggest challenges here was the difficult ground with soft organic layers, peaty subgrade, subsoils and transitions to structures with different foundations.

The transition area between a deeply founded bridge and the adjoining embankment section was particularly sensitive. Here, large differences in settlement had to be reliably avoided in order to create a solution that would be fit for purpose in the long term.

Pile-supported load transfer platforms (LTP) with Naue Secugrid® HS and unreinforced concrete columns

An innovative foundation system was used to transfer the traffic loads safely and permanently into bearing capacity soil layers. It combines:

- Vertical load-bearing elements as soil improvement made of unreinforced concrete columns, installed vibration-free and economically using the full displacement method.
- A high tensile strength, expansion-resistant Secugrid® HS 1200/100 R6 geogrid that distributes loads efficiently.
- A load-distributing sand cushion that acts as a vault and is stabilised by the geogrid.

Rigid inclusions and geogrids for stable load transfer – even at 7.6m fill height

The foundation pad rests on a grid-shaped ground improvement by rigid inclusions, consisting of hydraulically bonded, unreinforced, slender pile-like load-bearing elements (Ø 32cm, centre distance 1.5m), which is precisely matched to the orthogonal alignment of the geogrids. It safely transfers the dead loads of the embankment (up to 140 kN/m²) and traffic loads (52 kN/m²) into the bearing capacity of the subgrade, subsoil - even with a construction height of up to 7.6m above the foundation level.

The two geogrid layers were laid crosswise (lengthwise and crosswise to the route axis). Special attention was paid to deformation compatibility and long-term stability. The long-term elongation was designed to be well below 0.5% - a prerequisite for long-term serviceability.

Fast and safe construction

The system was installed efficiently despite the cramped conditions on site: Almost 32,000m² of the customised geogrid was delivered on time and laid quickly without creases. The high inherent rigidity of the Naue Secugrid® HS rolls made installation considerably easier - a clear advantage in complex construction conditions.

Ground improvement using rigid inclusions, in this case Controlled Modulus Columns CMC©, also proved to be economically and ecologically advantageous: there is no excavation that needs to be disposed of and the ground is improved through displacement and compaction.

Result: Lasting performance and bearing capacity

After commissioning in 2019, around 67,000 vehicles have used the new route every day. The particularly critical transition area between the bridge and embankment will remain serviceable in the long term thanks to the optimised and consistently planned system.

A project that shows how geosynthetics and innovative foundation technologies can work together to create high-performance infrastructures.