Modernization of historical constructions for the New Silesian Museum construction

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Presentation plan

- General information
- Design problems
- Geotechnical conditions
- MS-8 building part of the project
- Summary
General information

- Situated on the site of former Katowice coal-mine
- The modern new construction located below the ground level (up to 16m in depth)
- Substantial renovation of the old post-industrial 19th and the early 20th century buildings including creating the new underground floor
Design challenges

- Support of the deep excavation walls (permanent and temporary)
- Stabilization of the mass movement area
- Preservation of historic buildings located by the edge of the excavation
- Designing the geotechnical support for adaptation works in MS-8
- Strengthening the foundation of old shaft hoisting tower MS-79 and MS-15
- Additional constraints: highly tight schedule and logistical problems
Geotechnical and hydrogeological conditions

- Quaternary formations (anthropogenic and glaciofluvial) and carboniferous (weathered mudstone and sandstone with carbon interbeddings)
- No contiguous water level, seepage and subsurface water
- Tectonic disorders (faults and minor quasi-continuous disturbances)
- Post-mine cavities, cracks, loosened zones, old stamps → adopting of observational method of design
Building of the shaft hoisting machine MS-8

- Reducing the influence of the excavation on the sensitive structure
- Supporting the existing structure for the adaptation including creating of a new underground floor and a tunnel below the construction
- Stabilization of the deep excavation directly next to the existing buildings
- Micropile technology suitable for the ground conditions
Building of the shaft hoisting machine MS-8
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Section A-A
- Existing wall
- New filling wall
- Existing foundation level -1.81
  - New level -1 -3.77
- I anchoring level -4.30
  - 40/18 L=13.5 m, spacing 1.60 m
- II anchoring level -7.30
  - 40/18 L=10.5 m, spacing 1.60 m
- III anchoring level -10.30
  - 50/11 L=10.5 m, spacing 0.80 m
- Temporary excavation -12.19
- DFF piles ø400mm
  - L= 15 m, spacing 0.4m
  - Underpinning with micropile 73/53 L= 15 m

Section E-E
- Existing wall
- New filling wall
- Existing foundation level +1.31
- P.I. +0.58
- Detail D
- II anchoring level -7.20
  - 30/14 L=9.0 m, spacing 0.80 m
  - II anchoring level -9.30
  - 30/11 L=10.5 m, spacing 0.80 m
  - Micropile wall TITAN 103/78
  - L= 10.5 m, spacing 0.20 m

G4
G2
G5
G6
Building of the shaft hoisting machine MS-8

→ Underpinning of the walls with micropiles 73/53 and 73/56 L=15m to reduce the settlements
→ Underpinning of the original walls with micropiles 73/53 L=15m and 52/26 L=9m (as filling micropiles) to enable excavation inside the building at one step
→ Connected to the upper structure with concrete beam braced with prestressed tie rods
Building of the shaft hoisting machine MS-8
Building of the shaft hoisting machine MS-8

→ Installation of micropile as a temporary retaining wall of 9m depth trench for the elevator shaft and the tunnel
→ Micropile wall used as a sacrificial scaffolding
→ TITAN 103/78 micropiles L=10.5m
Building of the shaft hoisting machine MS-8

- External excavation stabilized with DFF pile wall in conjunction with anchor piles:
- Excavation depth up to 13m
- Piles L=15m
- TITAN anchors length up to 13.5m, spacing each 2 or 4 piles
Building of the shaft hoisting machine MS-8
Building of the shaft hoisting machine MS-8 and the tower MS-79
Building of the clothing store MS-15
General view on the construction site
Multi-factor monitoring system

- Theoretical settlements of walls - 6mm
- Measured - 3mm
- Theoretical horizontal displacement - 36mm
- Measured - 7mm

- Theoretical settlements of walls - 6mm
- Measured - 3mm
- Theoretical horizontal displacement - 45mm
- Measured - 26mm
The demanding project successfully completed
Works lasted 12 months
Self-drilling injection micropiles in total length of 1,400 running meters were used for underpinning the renovated historical buildings nearly 15,000 running meters of TITAN 30/11 and 40/16 soil nails were installed.
Over the 9,000 m of self-drilling injection micropiles were used as the retaining walls and the stabilization system of anchored micropile barriers in the area of dynamically active rock mass.
Over 15,000 m of soil nails installed
Over 3,800 m of anchors for pile walls
Close cooperation of the geotechnical engineers, the designer and the contractor was the key to the success.
THANK YOU FOR YOUR ATTENTION