KRALOVOPOLSKY TUNNEL

Kralovopolsky Tunnel, Large City Circle Road (LCCR), Brno, Czech Republic

Basic road system of the LCCR of Brno to serve non-city, transit and interurban traffic. The city ring of Brno is part of subsection of the international road network (E461.)

Scope

- Length of tunnel tubes 2 x 1.258 m
- Underground section 2 x 1.053 m
- Cut-and-cover section 2 x 205 m
- Cross section: 130 m^2
- Excavation: Core method with tunnel excavator

Challenges

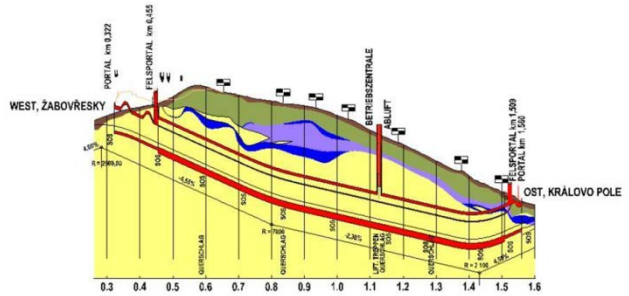
- Densely populated area
- Low overburden during excavation in built environment
- Highly complex analysis of settlement trough special design of a tri-level intersection near the west portal

Amberg Services

General planner responsible for:

- Preliminary design
- Design, Tendering
- Final design and project supervision

- Dobrovského Tunnel, part of large ring road LCCR



- Geological profile

- Completed tunnel near east portal

AMBERG FACTS

Contracted value JV
- Total 6.2 Mio. €

Contracted value Amberg
- Total 2.5 Mio. €

Project phases & duration
- Preliminary design 1999 – 2001
- Design, Tendering 2003 – 2006
- Realization 2006 – 2012
- Project supervision 2007 – 2012

Project details
Tunnel
- Max. overburden 21 m, lowest overburden 2,5 m between basement floor and vault of tunnel
- Elevation grouting of 26 houses

Ventilation centre
- Ventilation centre (7 subsurface floors plus ground floor) including 2 chimneys with 25m height

CLIENT FACTS

Overall costs
- Total Overall costs 288 Mio. €
- Total Tunnels only 138 Mio. €

Overview Project
- Road tunnel on the motorway E42 Brno, Urban tunnel at the city ring LCCR

Geology
- Clay in the entire underground section
- Anthropogenic deposits, occasionally layers with water bearing gravel terraces
- The subgrade of the terraces consists of neo-gene clay (so-called Brno Tegel). The consistency of the neo-gene clays is stiff to hard
- The Tegels are highly plastic and in connection with water sometimes heavily squeezing

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CHALLENGES

Excavation under densely populated surface

Densely Populated area, low overburden, difficult geological conditions with unstable sections

- Elevation grouting for 26 houses

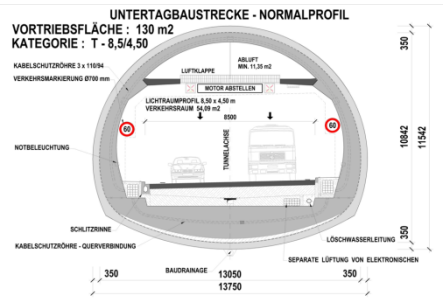
ENGINEERING APPROACH

Core bench heading, steel reinforcement/shotcrete

Core bench heading

- Supporting at face area
- Extensive surveying of settlements, vertical jet grouting
- Elevation grouting
- Supporting at tunnel face with partition walls

TECHNICAL SOLUTIONS



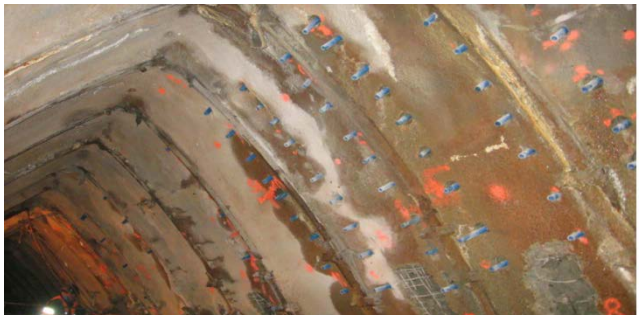
Profile road & fume extraction suspended ceiling

Safety and emergency scheme

- 4 accessible cross-passages
- Emergency exit from both tunnel tubes via ventilation centre to earth surface (stairs and escalator)
- Suspended ceiling with smoke extraction up to 280 m^3/s
- Video detection
- Hydrant pipes and hydrants
- Central traffic steering of all 4 tunnels as part of the city ring

CHALLENGES

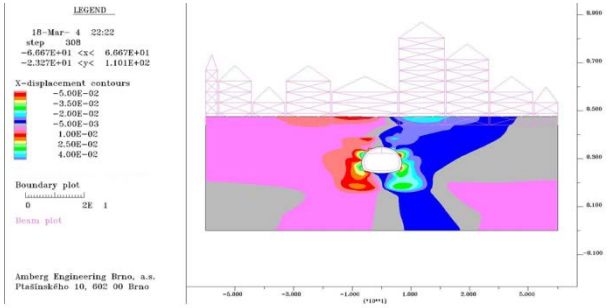
- Portal area showing dense urban development



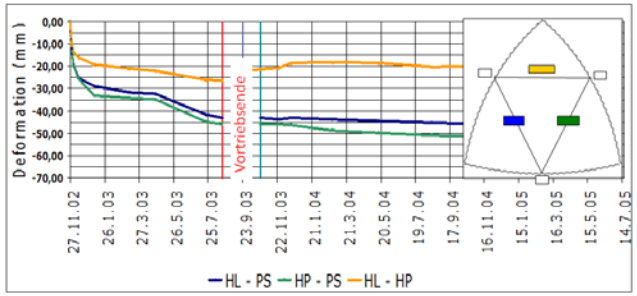
- Injections in the core bench area

- Specially developed steel arches for reinforcement

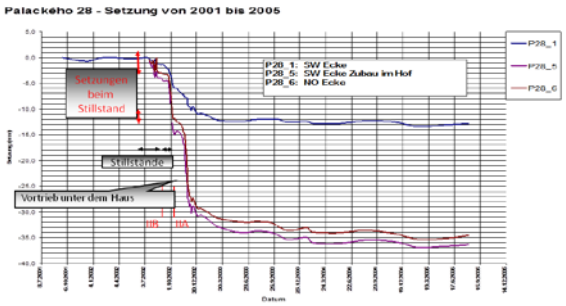
ENGINEERING APPROACH



- FLAC simulation of expected ground movements

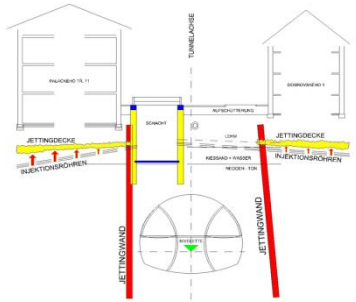


- Convergence plot from excavation period - exploration gallery



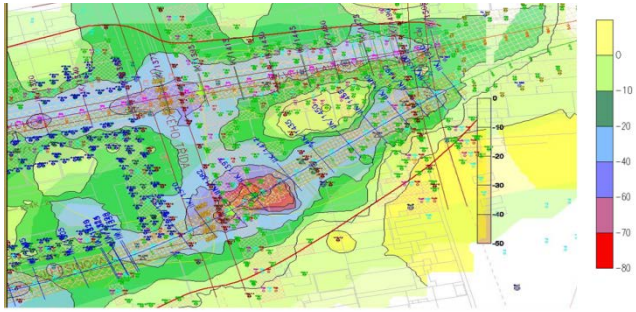
- Settlement during excavation - exploration gallery

TECHNICAL SOLUTIONS



- Compensation by injections and jet grouting

- Tunnel excavation



- Settlements in region towards east portal area

AMBERG KEY PEOPLE INVOLVED

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AMBERG TEAM @ WORK