GEOLOGY OF PRAGUE
—
ITS INTERACTION WITH THE PRAGUE METRO

Svatoslav Chamra

Department of Geotechnics
Faculty of Civil Engineering
Czech Technical University in Prague
Czech Republic in geological system of Europe

BARRANDIAN
Barrandian - geological basin from Proterozoic to Devonian
The Barrandian

The oldest rock complexes of the Upper Proterozoic are over 550 million years old. There prevail dark shales and grayish-green greywackes containing lenses of blackish-grey lydites. Proterozoic complexes were deformed by the Cadomian folding.

Another marine transgression occurred in the Prague area at the beginning of the Ordovician. Ordovician sequences of strata are characterized by a multiple alternation of shale-dominated and sand-dominated facies, which form morphology of Prague. Firmer sand parts containing hard quartzites form elevations, whereas less resistant shale formations form depressions. The total thickness of the Ordovician deposits in the Prague area exceeds 2000 m.
Morphology of the Prague agglomeration
Longitudinal section of metro lines C, A
(superelevated profiles)
Complete sequence of marine deposits of the Silurian system is preserved with the total thickness of about 300 m. In its lower part prevail dark graptolitic shales, the upper part is characterized by mostly bioclastic limestones.

The Devonian deposits lie on the Silurian sediments with no interruption in the marine carbonate sedimentation. The development of the Devonian sediments is characterized by the prevalence of limestones. The youngest formation is typical by the clayey-sandy lithological development, which reflecting the onset of the Variscan orogenic processes in the upper Middle Devonian.
Very interesting place is hence area in the vicinity of Můstek station, where metro lines (A, B) intersects.

Furthermore there is tectonic failure called Prague fault. The width of this regional tectonic line is approximately 20 m. There are 3 types of tectonic deformation Ordovician clay shales – zahoranske & bohdalecke & dobrotivske layers. The rock mass dislocated here by several hundred meters.
Realised project of junction Můstek

Unrealised projects of junction Můstek
Realised project of junction Můstek
Prague fault in new railway tunnel under the Vítkov
TUNNELLING PROCEDURES

The used tunnelling methods had to respect the difficult geological conditions in Prague and lessen the impact on the built-up, historically valuable parts of the city.

*The line tunnels were build using the following technology:*

- "Prague" ring tunneling method with erector (in the solid rocks)
- Non-mechanized tunnelling shield (in the soft rocks and soils)
- Mechanized tunnelling shield TŠčB-3 (Soviet made)
- NATM (from the 80's)
- Cut and cover
- Launching method
This mechanized shield was used first on the running tunnels on the line A from the Malostranská station under the Vltava River to the Můstek station.

The mechanized tunnelling shield with the cutter head of 5790 mm in diameter produced so called unreinforced press concrete lining 345 mm thick.

The first TŠčB shield drove the 435 m long right tunnel under the Vltava river (the Vltava river is 195 m wide with an average water depth 4 m), was pulled through the Staroměstská station and continued by driving the running tunnel to the Můstek station.

The second mechanized shield drove 420 m long left tunnel under the Vltava River and due to time constraints was dismantled in the Staroměstská station.
Cutter head of mechanized tunnelling shield TŠČB-3
Assembling the mechanized shield in the underground assembling chamber
The view from assembling chamber to the driven tunnel tubes
Thank you for your attention!