Transfer tunnel, Ny Ellebjerg Station

Piles, sheet piles and king post wall with stringent requirements

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Per Aarsleff A/S has established a connecting tunnel at Ny Ellebjerg Station, which will connect the two present railway lines with the new southern metro line, Metro Syd. The tunnel was established prior to the new metro line, as the work interfered with the new Copenhagen-Ringsted Line which was to be taken into operation before the metro.

The work at Ny Ellebjerg Station is carried out in close collaboration with Aarsleff Rail A/S who specialises in work at the railway track.

Complex project

To establish the transfer tunnel under the main tracks and an existing bridge carrying the Køge Bugt Line, we carried out a complex system of retaining walls, primarily as drilled piles of different dimensions; DN610-DN914 millimetres, but also as traditional sheet pile walls and king post walls.

The drilled piles of DN914 millimetres were also used as foundation piles for the slab and for new bridge foundations. The piles under the existing structures were drilled under very difficult conditions with limited height and logistics, placing high demands on planning of storage and choice of materials. Due to the tight working space, the retaining walls were supplemented with jet grouting to prevent water penetrating; a total of 80 drillings, of which 20 were drilled 3-5 metres through an existing bridge foundation.

To ensure the stability of the construction pit, we installed 70 ground anchors in several phases. At the upper level, the anchors were established at an edge beam cast in situ on top of the bored piles. At the lower level, the anchors were established at the waling consisting of plates of 400x700 millimetres, which were mounted by means of adhesive anchors attached to the bored piles. In addition, at a critical section, we established a waling system with load monitoring mounted by hydraulics (Groundforce). This allowed us to tension bracing profiles across the construction pit, if – contrary to expectation – the deflection of the wall would be too big due to an unknown load from the existing bridge foundation.

Aarsleff's specialists from Design & Engineering were involved in the project in relation to the design of the friction piles, the hydraulic waling structure and the determination of anchor lengths and dimensions.

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Challenges in the process

The project was challenging, as we had to work while the tracks were in operation, and as we worked at Banedanmark's area with Metroselskabet as contractor, there were stringent requirements to the execution. The main part of our work was carried out under an existing bridge for the Køge Bugt Line. This meant further requirements to equipment, but also in relation to the impact on existing structures.

Throughout the project, there were fixed sub-deadlines due to planned track closures by Banedanmark. As some of the contracts were delayed prior to our work, we had to postpone the start-up of our work for approx. one and a half month. This affected our time schedule, as we still had to observe the planned track closures, so in some periods, we had to work in shifts around the clock. Nevertheless, we complied with all the client's deadlines, and we handed over the project on schedule.

Data

- 160 lm of DN508 mm bored piles (foundation)
- 1,900 lm of DN610 mm bored piles (wall)
- 60 lm of DN914 mm boredpiles (wall/foundation)
- 135 lm of DN880 mm bored piles (wall/foundation)
- 100 m² of sheet pile wall with predrilling
- 200 m² of king post wall with HE500B and predrilling
- 70 ground anchors
- 80 jet grouting drillings, a total of 468 lm
- 17 drillings for groundwater lowering
- 1 water treatment plant
- 1 alarm monitoring system
- Waling structures

Client

Metroselskabet A/S

Contractor

Per Aarsleff A/S

Cooperation partners

Aarsleff Rail A/S
Wicotec Kirkebjerg A/S

Type of contract

Main contract

Consulting engineer

Aarsleff Design & Engineering
COWI-SYSTRA JV

Construction period

February 2018-June 2019

Contract value

Approx. DKK 100 million

Aarsleff Ground Engineering is one of Europe's leading piling contractors, and we undertake a wide variety of piling, drilling and foundation projects in Denmark and abroad. We have offices in Poland, Sweden, Germany and the UK.

Our fleet covers hydraulic piling and drilling rig as well as cranes and vibrators.

Contact

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04.01.21-R109-UK-rev2