Construction pit at Kalvebod Brygge in Copenhagen

Establishment of 10,600 square metres construction pit

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At Kalvebod Brygge in Copenhagen, Per Aarsleff A/S has carried out the construction pit for one of Denmark's biggest public-private partnership projects – a 40,000-square metre office building with 20,000-square metre basement. The project is carried out by A. Enggaard A/S for the Danish Building and Property Agency. The construction pit presented many challenges which resulted in specialised solutions created in One Company collaboration between the departments Construction and Ground Engineering with assistance from Design & Engineering.

Challenging sheet piling

To begin with, it was a traditional job of designing and establishing a sheet piled construction pit with a circumference of 400 metres. However, several conditions made the job untraditional. In connection with the sheet piling, we were challenged by an existing district heating channel placed about 30 centimetres from one side of the estimated sheet pile line. When we started vibrating the sheet piles, our measurements soon showed large settlement damage, and we had to stop the work.

Different solutions were assessed before we – in close collaboration with Aarsleff's own Design & Engineering department – chose to carry out predrilling with one of our large Kelly drilling rigs. This meant that we were able to meet the challenge with our own equipment and carry out full predrilling and casting with DIWA-MIX – a cement-based slurry with a consistency very similar to the drilled clay and with a very low permeability (and therefore watertight). Subsequently, we placed the sheet piles carefully which resulted in a minimum of settlement. At the same time, a solution with driven concrete piles close to the district heating channels was replaced by a solution with bored foundations.

Coordinated groundwater lowering and accelerated excavation work

We faced another challenge when we were to establish a large groundwater lowering system, and at the same time, the Cityringen project also carried out groundwater lowering from a site right next to our working area. This placed heavy demands on obtaining the required authority permits and on complying with the control level of the surrounding area. As a consequence, we decided to extend Aarsleff's system and use it for reinfiltration of water from both construction pits. As our construction pit was based in an old railway terrain, it required a large-scale water treatment system for the purification prior to the reinfiltration in the surrounding areas.

The third and final major challenge was related to the excavation of the construction pit. Due to the delay caused by the district heating channel close to the sheet pile line, we decided to accelerate the excavation work together with the client. Instead of loading the soil onto lorries, we drove dumpers directly into the excavation for loading of soil. This allowed us to carry out excavation at double speed and in addition, we could continue for more hours than normally, as the dumpers could drive the soil to a temporary deposit, so we were not dependent on the normal opening hours of soil deposits.

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Data
- 420 m of sheet piles
- 237 wall anchors
- 459 uplift anchors
- 105,000 m² of excavated soil inclusive of 27,000 tons of contaminated soil
- 803 m of DN110 mm PP gravity pipes
- 6 wells for wastewater, oil separation and drain pumping
- 4,000 m³ of pebble gravel on base slab
- 4,000 m³ of sandfill between sheet piles and outer basement walls
- 30 pump wells
- 12 monitoring wells
- 50 infiltration wells
- 265 m³/hour of groundwater lowering and carbon filter system capacity

Client
A. Enggaard A/S

Contractor
Per Aarsleff A/S

Type of contract
Main contract

Consultant
MOE A/S

Construction period
January 2016 – December 2016

Contract value
DKK 77 million

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