

Lighthouse, Aarhus Ø

Foundation for the tallest building in Denmark



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At the tip of Aarhus Ø, Per Aarsleff A/S performs the design and build contract for the construction of the 142-metre-tall Lighthouse and the 10-storey low-rise buildings. Lighthouse will have more than 400 apartments, most of them with a secluded view over Aarhus Bay. The construction of the 142-metre-tall tower, which will become the tallest building in Denmark so far, requires extraordinary foundation, so we established two full-scale test piles as part of the design work. The purpose of the work was to determine the dimensions and execution method for the large drilled piles under the tower – 28 drilled piles of DN200 millimetres down to a depth of 70 metres.

In addition to the drilled piles for the tower, we also carried out the rest of the foundation work comprising driven piles for the 10-storey low-rise buildings as well as sheet piling and ground anchors for the temporary construction pits.

Challenging soil conditions

At Aarhus Ø, the soil consists primarily of fill from the original land reclamation with thin postglacial layers underneath, eg. gytje, and further down tertiary clay deposits. The fill layers are 8-12 metres thick and consist primarily of sand. The tertiary deposits consist of clay of high plasticity – Søvind Marl and Lillebælt Clay.

Due to the challenging soil conditions, settlement was one of the biggest challenges in the foundation work for the tower. That is why the tower is founded on large drilled piles at great depth, which reduces the risk of settlement damage and differential settlement.

28 drilled piles of DN2000 mm

When we established the drilled piles, we could not drill the casing pipe down to the designed toe level due to the plastic tertiary clay. For this reason, we drilled the piles with casing through the layers of fill and right into the intact layers of clay approx. 17 metres below ground level. From here, we added bentonite as drilling fluid, and we drilled further down under the casing pipe. When we reached the required drilling depth, we carried out a SoniCaliper verticality test before installing the reinforcement which consisted of four connected sections. Finally, 2-4 weeks after the casting, we tested the integrity of the concrete in the piles with Cross Hole Sonic Logging (CHSL). All 28 piles were successfully executed in accordance with the quality requirements.

The piles with their impressive dimensions are among the longest production piles ever installed in Denmark, and for this job we used a Bauer BG55 – the largest drilling rig in the Nordic countries.

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26 km of piles

For the low-rise buildings, we drove almost 7 kilometres of steel piles and more than 19 kilometres of concrete piles. The steel piles were installed in the areas close to the neighbouring buildings to reduce the impact on these. The pile driving work was carried out during a period of five months with 1-2 piling rigs.

Finally, we carried out extensive construction pit work – reinforcement of the existing sheet pile wall against the water, mainly with ground anchors, as well as new sheet piled construction pits for basement structure.

Logistics and production planning were carefully planned to find the optimum solutions in relation to safety, quality, logistics and finance.

<p>Data</p> <ul style="list-style-type: none"> • 28 drilled piles with a drilling depth of 70 metres: <ul style="list-style-type: none"> - 1,960 metres drilled - 6,200² m of drilled soil - 7,900 m³ of bentonite - 280 tons of reinforcement - 5,900 m³ of concrete - 12 km of test piles <p>(CHSL)</p> <ul style="list-style-type: none"> - SoniCaliper in all piles (verticality test) 	<ul style="list-style-type: none"> - Cross Hole Sonic Logging in all piles (integrity test) • 5,412 m² of sheet piles • 6,684 lm of steel piles • 19,268 lm of concrete piles • 4,038 m of ground anchors, 875 m against water pressure. <p>Client Lighthouse United ApS</p>	<p>Contractor Per Aarsleff A/S</p> <p>Type of contract Design and build contract</p> <p>Consulting engineer Rambøll A/S</p> <p>Construction period April 2019-January 2020</p> <p>Contract value DKK 38 million</p>
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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.

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