Junction 'Hoendiep' founded on HSP piles

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In January 2006 the Provence of Groningen, the Netherlands, started a major reconstruction of the ring road West in Groningen (Westelijke Ringweg). The ring road is elevated where it crosses the channel 'Hoendiep' and a local road in a grade-separated junction. The effect of this is that the ring road has been improved with regard to traffic jams and dangerous situations, which were the most important problems.

Characteristic for this project was the short time available for construction. The sugar refinery next to the junction needed the road to be available in August. This implied that the whole work had to be completed in 9 months. Part of the elevated crossing is constructed as a fly-over while the other part is constructed as an embankment. About 5 m of clay and peat were encountered at the location, but because of the short period available, there was no time to let the embankment settle. A settlement-free construction had to be designed for the embankment. In the original scope of work the embankment was constructed in reinforced soil founded on a mattress of geo-textile on piles. During the design alternatives were considered with regard to economics, planning and practicability. An anchored cofferdam with a concrete plate founded on HSP piles turned out the be the most favourable option.

HSP piles are Hoge Snelheids Palen, which literally means High Speed Piles. They owe their name to the very short production time, only a few minutes per pile. They are concrete displacement piles constructed in situ in the ground. They are installed by a fully automatic crane and during production the concrete pressure, flow, velocity, resistance and depth are constantly measured and registered to guarantee the quality of the pile.

The advantages of the HSP system are the short production time, the low vibrations and the low sound level. Furthermore the relatively slender piles can be constructed with a small centre to centre distance, so one can save on concrete and reinforcement of the floor or plate on top of the piles.

The HSP piles have been installed in March 2006. 2700 piles with a diameter of 180 mm have been installed, covering a total area of 2400 m^2. The centre to centre distance varied from 0,9 to 1,2 m. Because of the design with an anchored cofferdam, the piles only have axial loading (pressure), as distinction was made in functions with regard to vertical and horizontal loading. It was not necessary to make a connection between the HSP piles and the concrete plate.

As the piling system is relatively new the client decided to carry out pile load tests. Three piles were loaded up to just over the design resistance of the piles. The settlement of the pile top was measured during loading. All three piles met the requirements with regard to the settlement.

References:
Groningen Westelijke Ringweg, Proefbelasting op HSP palen, Gemeentewerken Rotterdam, April 2006.

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