



Secant Wall and Bearing Piles

Harbour Central, Isle of Dogs, London

Project Description

Harbour Central development includes several high-rise buildings with up to 41 floors over a 6m deep basement. Piling works included both an embedded retaining wall and piled foundations.

Given the high ground water table and the soil conditions, the appropriate solution proved to be a secant piled wall, designed as cantilever for temporary condition.

For the high compression loads transmitted to the foundation system, large diameter CFA piles were installed, toeing into a very stiff sand layer.

The piling works for the secant wall included over 600 piles with 900mm diameter, for which a guide-wall was previously installed to ensure verticality and required overlap between the hard and soft piles.

The bearing piles included over 700 piles with diameters of 750mm and 900mm embedded into the Thanet Sand formation.



Secant pile wall at Harbour Central

Client

Galliard Homes

Main contractor

Galliard Construction

Structural engineer:

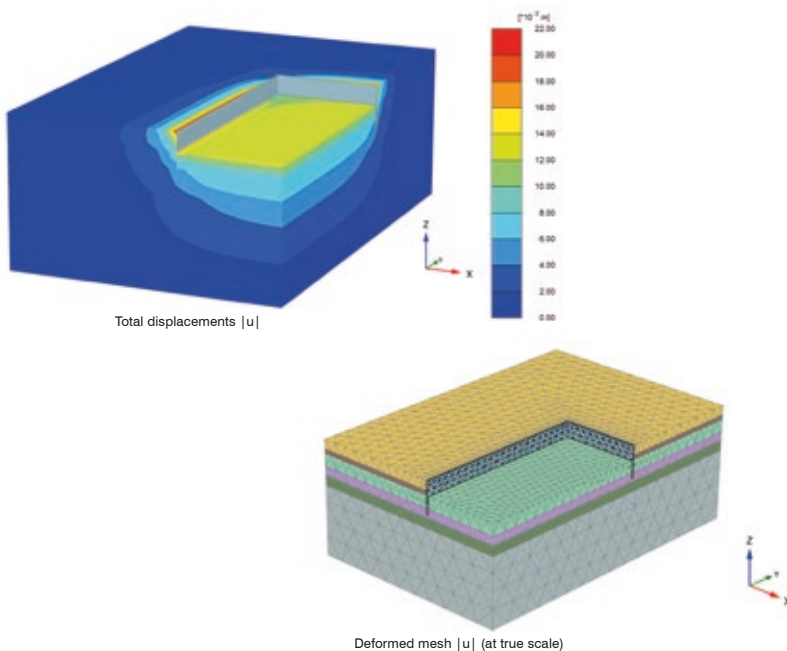
Meinhardt UK

Scope of works

- 379no. 750mm diameter CFA bearing piles
- 363no. 900mm diameter CFA bearing piles
- 608 no. 900mm diameter CFA secant wall piles

Plant

- CPL 55t CFA drilling rigs
- 7m³ hymix concrete agitator
- Putzmeister 2005 concrete pump
- IHI CCH300T – 30 Tons capacity telescopic crawler crane



FEM analysis in Plaxis 3D for secant pile wall

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Ground Conditions

The ground conditions comprised in succession Made Ground over Alluvium, River Terrace Deposits, Lambeth Group Formation, Thanet Sand and Chalk. Groundwater was found at approximately 1.5m depth.

The thickness of the Made Ground of up to 3.5m over 2m of Alluvium, high ground water table and limited lateral deflection criteria justify the use of 900mm piles for the secant piled wall.

As the Thanet Sand was found at relatively shallow depth, between 15m to 18m depth, it was justified to take the bearing piles into this layer, obtaining high bearing capacities of up to 5500kN.

Solution

For the secant piled wall 900mm diameter continuous flight auger (CFA) piles were placed at 700mm centres through a guide wall, to a depth of 13m. To ensure that a ground water seal was created the soft piles were installed to 10m depth, ensuring they are below the deepest excavation level and into a cohesive layer.

Following a pre-design based on subgrade reaction modulus method, to further evaluate the lateral displacements of the secant piled wall, a finite element analysis was performed using specialized geotechnical software Plaxis.

This allowed for a more accurate assessment of the wall movements, as on some areas of the basement the maximum retained height reached 7m.

The piled foundation solution was value engineered, managing the reduce the pile diameters from 1050mm and 900mm to 900mm and 750mm respectively, obtaining a significant saving both in terms of costs and time for the piling works.

The design was conducted in accordance to the Eurocodes, performing load tests on both preliminary and working piles to confirm and validate the design.



Installation of bearing piles inside basement