BATTERSEA POWER STATION PHASE 3A

LOCATION

LONDON

CONTRACT VALUE

£38.2M+

KEY FEATURES

Large diameter piles

400m secant & sheet pile retaining wall

400+ multi strand ground anchors

Bottom-up construction

Scour feature

The Scheme

Battersea Power Station is one of London's most significant new developments. Phase 3A lies immediately to the south of the grade II* listed structure.

Geotechnical Conditions

STRATA	LEVEL	NON-SCOUR DESIGN LINE	LEVEL	SCOUR DESIGN LINE
Made Ground	+4 mOD	N = 10	+4 mOD	N = 10
River Terrace Gravels	+0 mOD	N = 20	+0 mOD	N = 20
London Clay	-6 mOD	C_u = 81.25 kN/m^2 +6.25z	-10.5 mOD	C_u = 110 kN/m^2 +3.75z
Lambeth	-38 mOD	C_u = 250 kN/m^2 throughout	-38 mOD	C_u = 250 kN/m^2 throughout
Thanet	-57 mOD	N = 100	-57 mOD	N = 100
Chalk	-65 mOD		-65 mOD	

Bearing Pile Solution

Over 1500 bearing piles installed, many of which were located within a large drift filled hollow (scour feature).

- Eurocode complaint design.
- Compressive loading up to 15MN.
- Pile diameters up to 1.5m designed and installed, utilising a minimum concrete mix of C30/37.
- Max pile length 62m, founding in the thanet sand.
- Partial factors based on working and preliminary pile tests.
- Sectional flight auger (SFA) mini piling technique used for areas with low head room.

Response to Underperforming Test Piles

BBGE demonstrated a robust response when excessive pile settlements were recorded during testing of the 600mm diameter mini piles. The response included:

- Carrying out six additional working pile tests.
- Installing ten 30m deep boreholes with full classification testing.
- Coring of the failed test piles.
- Back calculating the design parameters to match worst performing working test piles.
- The solution required installing 63 additional 600mm diameter remedial piles as agreed with the client's engineer.

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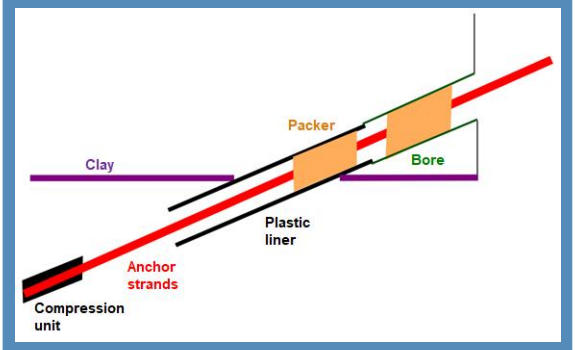
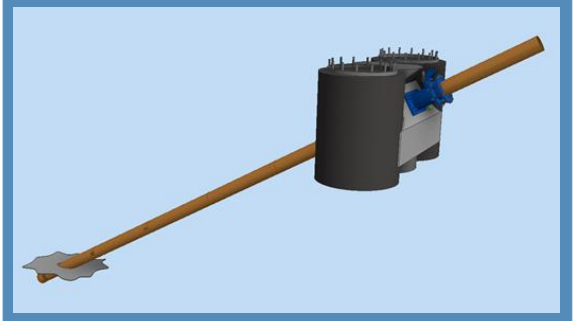
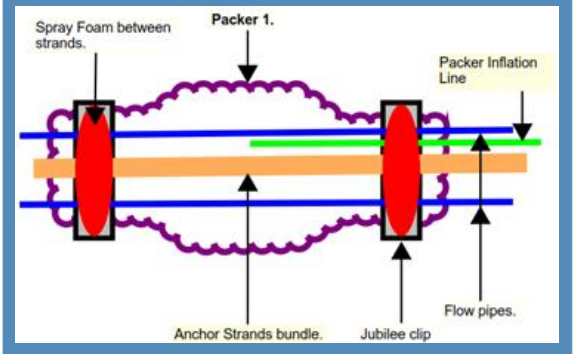
PROJECT TECHNICAL SOLUTION

STUFFING BOX SOLUTION







Retaining Wall Solution

Both secant and sheet pile retaining walls supported by over 400 multi-strand ground anchors. During construction this was the largest multi strand ground anchor project in Europe.

- Design compliant with CIRIA C760 approach.
- Designed using WALLAP and Plaxis 2D software.
- 1150mm diameter hard/firm secant piles. Mix C32/40.
- PU32 sheet piles for both temporary and permanent sections.
- Vertical loading on secant walls, requiring 34m deep piles.
- Significant building and Network Rail surcharges.
- Deflection limits of 30mm next to Network Rail line.
- Max bending moment of 2000kN.m/m (secant 1180mm Ø).
- Multiple construction sequences involving ground anchors, props and waling beams.
- Wall sections were designed for bottom up construction, with a max retained height of 17m.

Multi Strand Ground Anchor Design

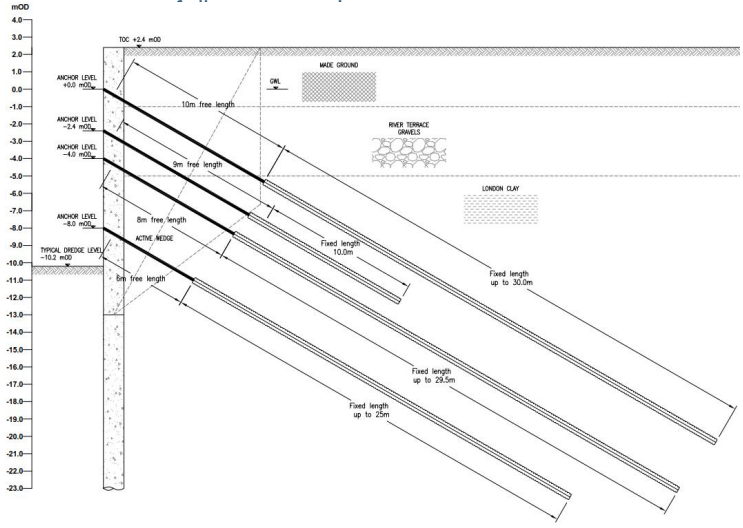
- Anchors designed in accordance with BS8081 (1989).
- Anchor testing regime compliant with BS8081 (2015).
- Number of strands installed ranged from 3 to 7.
- Each strand had the capacity to accommodate up to 125kN.
- Max anchor force ranged from 233kN to 872kN.
- Max anchor lengths of up to 45.0m.
- Up to five levels of anchors installed to a retained height of 17m.
- Significant anchor clash detection to avoid underground structures.

Installing Anchors Below the Water Table (Stuffing Box Solution)

BBGE developed an innovative solution to install anchors in granular soils below the water table. This eliminated all water ingress during construction. A separate technical solution sheet has been developed specifically for this innovation.

Ground Anchor Removal

The ground anchors were removed by stressing each individual strand until structural failure occurred, meaning the free lengths could be safely retracted from the wall. Of the 400+ temporary anchors installed, 100% of strands



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