

# Bored Piling

## East London Line Project

London, UK



### Large diameter bored piles, continuous flight auger piles, minipiles, contiguous bored pile walls & secant pile walls

#### Introduction:

As part of Transport for London's investment programme to create a London Overground railway network, the original London Underground East London Line required upgrading to National Rail standards, extending it north and south of its existing terminating points, to join the present National Rail network at Dalston and New Cross Gate.

Bachy Soletanche Ltd (BSL) were employed on an NEC Option C contract by Main Contractor Balfour Beatty Carillion Joint Venture (BBCJV) for the design and construction of all the bored pile foundations required for 4 new stations, 5 maintenance facility and operational buildings, 7 bridges, 2 viaducts and several embankments across Phase 1 of the project between Dalston Junction station and New Cross Gate.



Clockwise from top left: Artist's Impression of the London Overground Rolling Stock, extract from TfL Tube Map showing the new East London Line route as part of the London Overground network and CFA rigs installing piles for New Cross Gate Maintenance Facility.



Artist's Impression : New Hoxton station

A490

CLIENT:	Transport for London (TfL)
MAIN CONTRACTOR:	Balfour Beatty Carillion Joint Venture (BBCJV)
CONSULTING ENGINEERS:	Scott Wilson or Tony Gee Partners
DURATION OF WORKS:	Approx. 2 years

#### Works Quantities:

- CFA bearing piles:** 2210 no. piles 400mm-1050mm dia., 7.5-30m deep.
- CFA contiguous bored pile walls:** 504 no. piles 600-900mm dia., 15-27.5m deep.
- CFA secant bored pile walls:** 210 linear metres of Hard/Firm secant bored pile wall, 900mm dia. male piles and 600mm dia. female piles, up to 16m deep.
- Thin Wall Casing LDA bearing piles:** 205 no. piles 600-1800mm dia., 11-30m deep
- Segmental Cased LDA bearing piles:** 192 no. piles, 600mm to 1180mm dia., 16-31m deep
- Thin Wall Cased LDA bearing piles with temporary support fluid:** 98no. piles 1200mm-2100mm dia., 30-40m deep using either a bentonite or polymer support fluid.
- Limited access minipiles:** 129 no. 300mm diameter piles between 21-25m deep & 84 no. 450mm diameter piles 14m deep.

**Project Details:**

Over the course of 2 years on site BSL constructed piles using a variety of techniques including conventional rotary bore (LDA), continuous flight auger (CFA), minipiling, plus rotary bored under polymer and under bentonite support fluids, with diameters ranging from 300mm to 2100mm. As well as traditional bearing piles, BSL also installed piles to form contiguous and secant pile walls.



*Forest Rd Bridge Restricted Access Mini-piles*

At the beginning of the on-site works, 9no. preliminary test piles were installed across the three main project sites at Dalston Junction station, Bishopsgate and New Cross Gate and the results used, in conjunction with working pile tests, to value engineer the works.



*Cold Blow Lane Bridge—CFA piling*

Some 30 structures in total required piling and BSL prepared 25 Piling Form B designs in accordance with the required Rail Design Standards for submission and approval by TfL and its independent technical certifier Mott MacDonald. The project also presented BSL's design and construction teams with several interfaces to consider during the works, including those with existing LUL and Network Rail lines.

**Specific Examples:**

Installing 13 no. 40m long 1200mm di-

ameter rotary bored piles within 3m of the existing Central Line tunnels and 2m from a BT tunnel between Liverpool Street and Bethnal Green for Bishopsgate Viaduct. These piles were drilled using a multi-functional synthetic polymer stabilization fluid. As well as successfully installing the piles BSL's design department undertook finite element analysis as part of the design work to demonstrate the negligible movement effects the piling would have on the tunnels during the temporary construction and permanent works cases.

Completing two 48 hour continuous piling operations during Network Rail possessions on consecutive weekends as part of the construction of the foundations for New Cross Gate Flyover and its approach ramps, involved installing over 200 CFA piles. The piling locations were on different sides of the lines and therefore required significant logistical coordination to ensure men, machines and raw materials were all prepared, delivered and operational at the right location at the right time. BSL attended liaison meetings with BBCJV to gain method statement and plant approval from Network Rail.



*New Cross Gate—Preparing to commence work during a rail possession*

Undertaking piling adjacent to live Network Rail and LUL lines during normal operational hours within the collapse radius of piling rigs at New Cross Gate where CFA rigs all operated between 15-30m of live Network Rail lines and 9m of live LUL lines during normal operational hours on the basis of the implementation of some key control measures to ensure safe piling operations in-line with Federation of Piling Specialists (FPS) / Network Rail guidelines. Specific plant approval also had to be gained from LUL for the work within their zone to take place.

Completing two visits of rotary bored piling for a new bridge over the Great Eastern lines out of Liverpool Street Station involving programme coordination with BBCJV, such that work was completed prior to the demolition of the existing structure, which was used as a crash deck protection measure.



*BG30 installing piles for Bridge GE19 just outside Liverpool St Station*

Rotary bored piles under bentonite either side of the proposed Crossrail alignment to allow the development of Dalston Junction station above the no piling zone.



*Dalston Junction Station piling including installation of a reinforcement cage for 2100mm dia piles*

The contract required the use of 20 different piling rigs across the works selected to suit the ground conditions, programme, pile diameters and pile lengths. The piling works were also particularly sensitive in many areas and BSL were mindful of both local residents and the environment during the works.



*Shoreditch High Street—Large diameter rotary piling, 1500mm diameter.*