

Piling Specification

The Hale, Tottenham

Client:	RG Group
Document Type:	Specification
Document No.:	1305-ACE-ZZ-XX-SP-S-1001
Revision:	001
Date:	2024/08/23

VERSION HISTORY

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Revision	Date	Notes	Prepared by	Checked by	Approved by
001	2024/08/23	First Issue	RN		JS

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1. EXECUTIVE SUMMARY

- The Hale presents reasonably consistent ground conditions for piling works.
- A piling contractor with experience of similar pile installations in similar ground is required.
- Preliminary pile testing (before main piling works) is highly recommended to inform the pile design.
- CFA piling techniques are favourable for this development.

2. SITE INVESTIGATION

2.1 AVAILABLE INFORMATION

This specification has been written based upon the following information received to date:

Consultant	Document	Reference	Date
Westlakes Environmental Limited	Phase 2 Geo-environmental Ground Investigation Report	2013-001-001	April 2022
Apex Consulting Engineers	Ground Appraisal Report	1305-ACE-GEO-GA-001	August 2024

2.2 INTERPRETATION OF AVAILABLE INFORMATION TO DATE

- The Apex Ground Appraisal Report includes a review of the Westlakes Ground Investigation Report.
- Ground conditions typically comprise the following sequence:
 - Made ground present between 1.2m and 1.8m depth from original ground levels.
 - Alluvium and Thames Gravel to a maximum of 5.6m.
 - London Clay to c. 21m with Lambeth Clay Group from c. 27m.
- Sub-artesian groundwater has been identified within the Lambeth Group, resting at c.2.2m, confined by the London Clay above. A shallower groundwater body is present within the Thames Gravel, Alluvium & made ground which looks to be in hydraulic continuity between these strata, resting at between c. 2.1m and 2.4m.
- A detailed risk assessment was commissioned by Westlakes for their ground investigation phase which concluded that no UXO mitigation

measures were needed to enable investigation. The risk assessment should be revised to account for the proposed construction (i.e. piling works).

- Piling contractors should review the information contained within the Apex and Westlakes reports and assign appropriate design values for the various ground types to enable pile design.
- Extensive services present around the perimeter of the site but none within the site boundary or any easement requirements.

2.3 IDENTIFIED DESIGN RISK

- Further site investigation works are required post-demolition to the areas within the existing building that were not covered in the current Ground Appraisal Reports.
- The presence of sub-artesian ground water within the Lambeth Group.
- Contamination detected within various made ground strata. Sub-surface concrete should be designed assuming a Design Sulphate class of DS-1 and Aggressive Chemical Environment of Concrete of AC-1 and for the Made Ground, Alluvium and Thames Gravel. For the London Clay & Lambeth Group, this should be revised to DS-2, AC-2.
- Calcrete encountered in all bore holes from c. 27m.
- Significant obstructions from current and past buildings are anticipated, including foundations, floor slabs and possible service runs.

2.4 RISK MITIGATION CONSIDERATIONS

- Pile design should be undertaken in accordance with the Environment Agency's guidance booklet "Piling into Contaminated Sites".
- Turnover of made ground required with subsequent removal and crushing of obstructions. The resultant excavations should then be backfilled with engineered fill to the Specification for Highway Works to enable provision of a piling mat, designed in accordance with BRE guidance.
- Given the presence of calcrete, it may be more economical to limit pile lengths to above 27m but utilise additional piles/wider piles to avoid having to bore into this material. It might also be necessary to pre-bore piling locations where encountered.
- The piling contractor must satisfy themselves that any proposed piling rigs have sufficient torque power to avoid excessive rotation during penetration.
- Where removal of deep obstructions is not possible, they should be uncovered and surveyed during demolition so that impacts on the proposed pile locations can be assessed.

- Piling contractor will need to ensure that piling operations stay within tolerable vibration limits to not pose a risk to adjacent infrastructure/buildings.

3 PRELIMINARY PILE CAPACITY

3.1 DESIGN ASSUMPTIONS

- Preliminary design assumptions from Green Piling are shown in the table below:

Pile type	Continuous Flight Auger (CFA)				Design Factor of			EC7 Design Factors		
Specifications	Generally in accordance with BS8004 & ICE Specification for Piling and Embedded Retaining Walls									
Concrete Mix	Grade C30 to Class DC2 as BRE Special Digest No. 1, to Green Piling requirements. Sulphate conditions to be confirmed by others.									
Section of Site	No. of Piles	Nominal Dia. (mm)	Length (m)		Loads (kN)			Reinforcement		
			Average	Total	Comp.	Tens.	Horiz.	Nr	Dia (mm)	Length (m)
All piles in 1 visit Contiguous Wall Bearing Piles	193	600	12.6	2431.8	0-1500	0	0	To Green Piling Design		
	110	600	25.4	2795	900-2000	0	0			
Design Quantities	To be confirmed following detailed design and reviewed on site as necessary.									
Negative Skin Friction / Heave	Not Included (If required to be confirmed by the Engineer as a variation)									
Piling Platform Level	Taken as borehole commencement level.									
Pile Cut Off Level	At a minimum of 450mm below Piling Platform Level, but not greater than 1000mm below.									

- Final pile lengths required on site will be subject to continuous reassessment in accordance with soil conditions encountered and final pile design by specialist subcontractor. The pile lengths are to be calculated in accordance with the recommendations of BS 8004 or BS EN 1997-1.
- The above information should be reviewed once the full post-demolition site investigations is available.

3.2 TOLERANCES

- The maximum permitted deviation from the position defined on plan will be 75mm at pile platform level. The maximum permitted deviation from the vertical of completed piles will be 1 in 75.

4 PILE TESTING

4.1 TESTING STRATEGY

The strategy for pile testing needs to be established at the time the piles are being designed. The main purpose of pile testing is either to validate the design before construction and/or to check compliance with the specification during construction.

The scope of testing will depend on the complexity of the foundation solution, the nature of the site and the consequences if piles do not meet the specified requirements. The following risks must be assessed, and the testing regime developed accordingly:

- Insufficient site investigation.
- Lack of experience of similar piles in similar ground conditions.
- Insufficient time to verify the piles design and realise any savings.
- Cost and programme implications of undertaking the pile tests.
- Cost and programme implications of a foundation failure.

4.2 PILE TESTING RECOMMENDATION

The testing strategy for pile testing should address the following objectives:

- Minimise risk by investigating any uncertainties about the ground conditions, contractor's experience, or new piling techniques.
- Optimise the pile design in terms of size, length, and factor of safety.
- Confirm any pile installation criteria such as founding strata identification, pile set or pile refusal criteria.
- Assess buildability, site variability, pile uplift, soil remoulding along the pile shaft or relaxation at the pile toe.
- Check that the pile performance meets the required load/settlement behaviour during loading.
- Assess environmental impacts of noise, vibration, or pollution.

It should be assumed that a medium level pile testing strategy should be adopted as shown in Table 2 below (medium risk level assumed).

Characteristics of the piling works	Risk level	Pile testing strategy
Complex or unknown ground conditions. No previous pile test data. New piling technique or very limited relevant experience.	High	Both preliminary and working pile tests essential. 1 preliminary pile test per 250 piles. 1 working pile test per 100 piles.
Consistent ground conditions. No previous pile test data. Limited experience of piling in similar ground.	Medium	Pile tests essential. Either preliminary and/or working piles tests can be used. 1 preliminary pile test per 500 piles. 1 working pile test per 100 piles.
Consistent ground conditions. Previous pile test data is available. Extensive experience of piling in similar ground.	Low	Pile tests not essential. If using pile tests either preliminary and/or working tests can be used. 1 preliminary pile test per 500 piles. 1 working pile test per 100 piles.

Table 1 – Pile testing strategy required according to the risk associated.

4.3 TESTING PROCEDURE

- Pile testing shall be carried out in accordance with ICE Specification for Piling and Embedded Retaining Walls.
- The maximum test load should be 1.5 times the Design Verification Load (DVL). To reach this load, two loading cycles are required, the first to 100% DVL, then to 150% DVL. Each incremental loading stage should be equivalent to 25% DVL.
- The piles shall be deemed satisfactory providing all the following criteria are met:
 - The deflection under 100% DVL after the load has been maintained for 1 hour does not exceed 10mm.
 - The deflection under 100% DVL plus 50% of the Specified Working Load (SWL) after the load has been maintained for 6 hours does not exceed 15mm.

4.4 FAILURE OF PILE TESTS

- If a working pile test fails to satisfy the design criteria, then the Contractor shall test further piles to demonstrate the validity of their design at no additional cost.

5 INTEGRITY TESTING

- Where pile shafts are in-situ concrete, the piling subcontractor shall demonstrate the integrity of every pile by suitable test methods. The limitation of the test method employed in respect of depth of penetration of the test shall be declared prior to mobilisation and the Engineer's approval obtained. Test records shall be sent to the Engineer for every pile.
- Initial test results must be submitted within 24 hours. Full report must be submitted after completion of each phase of testing within 1 week.
- Preparation of pile heads to suit test method. Inconsistencies which could inhibit execution or interpretation of test must be reported on.
- Minimum period between installation and load testing is 7 days.
- The pile heads shall be cast or driven to a level above the specified cut-off level. The piling subcontractor shall trim the pile to the cut-off level so that a sound concrete connection with the pile can be made. The casting tolerance above cut-off levels shall be as Table 3.2 of The ICE Specification for Piling and Embedded Retaining Walls.