Brill Place Limited

BRILL PLACE

Approval in Principle

7370-WSP-00-ZZ-RP-S-200700
JANUARY 2020

CONFIDENTIAL

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Prepared by	Keith Wilson	Keith Wilson	Keith Wilson
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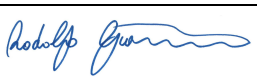
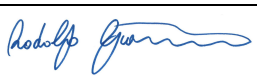
Signature			
Project number	70057370	70057370	70057370
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EXECUTIVE SUMMARY

This approval in principle document has been prepared for the single storey basement permanent and temporary works adjacent to roads and highways at the proposed Brill Place Tower development.

The project site is situated in open parkland and is located alongside the Brill Place roadway within the Somers Town district of the London Borough of Camden, London NW1.

The document format follows Annex A1a of Highways Agency standard BD 2/12 Technical approval of highway structures, where UK National Standards (Eurocodes) are used.

INTRODUCTION

Name of Project	**Brill Place Tower**
Name of Bridge or Structure	**Brill Place Tower**
Structure Ref No.	**-**

1 HIGHWAY DETAIL

1.1	Type of highway	Brill Place is an urban side road. The road is on grade.
1.2	Permitted traffic speed	20mph (32kph)
1.3	Existing restrictions	None

2 SITE DETAILS

2.1 Obstacles crossed

The site is located in the St Pancras and Somers Town Ward, within the London Borough of Camden.

Approximately rectangular on plan, the site is roughly orientated so that its sides face the northwest, northeast, southeast and southwest directions. The site is bound to the southwest, northwest and northeast by the existing Purchase Street Open Space parkland. To the southeast the site is bound by the Brill Place highway.

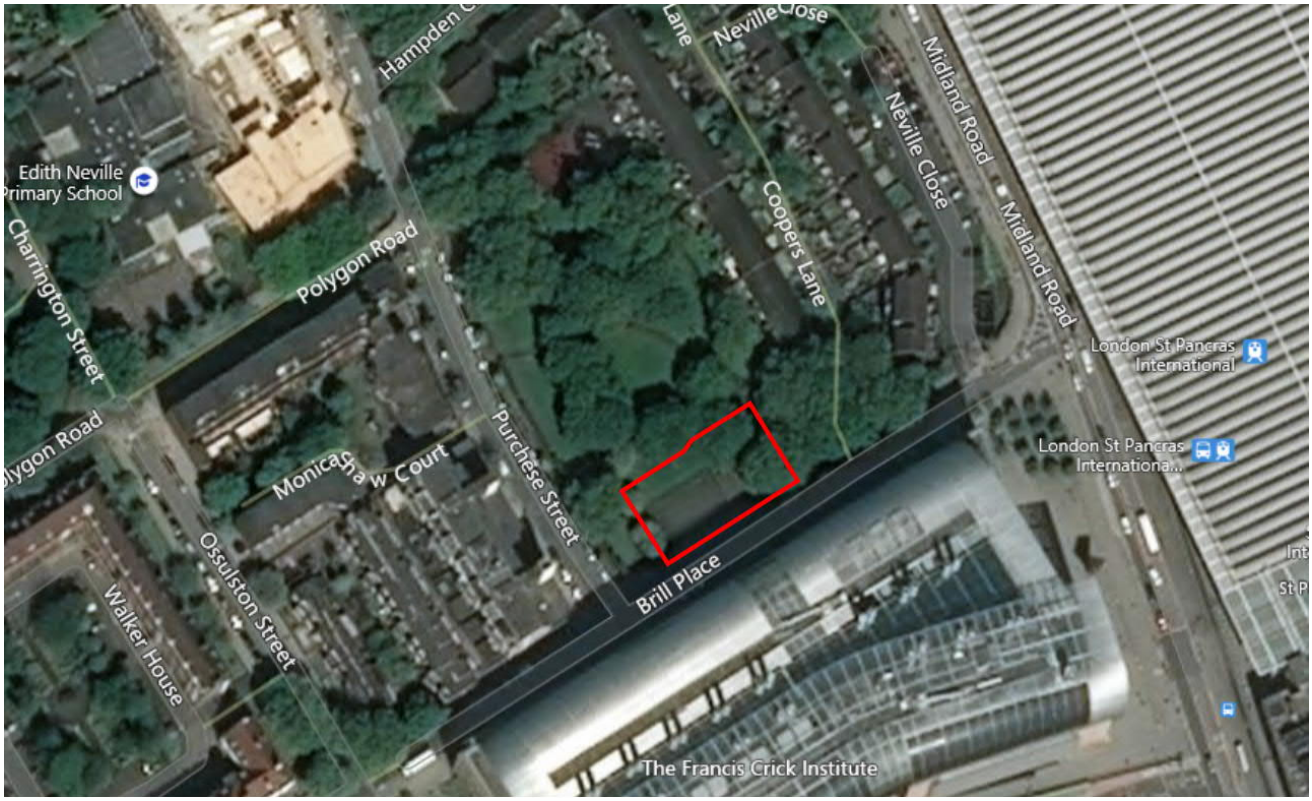


Figure 1 - Site Location

3 PROPOSED STRUCTURE

3.1	Description of structure and design working life	The proposed development is a 23 storey residential tower located above a single storey basement. The below ground structural elements form an enclosed space which can be referred to as the 'basement box'. The structural elements that make up the basement box include the ground floor slabs, the basement slabs (raft slabs and a suspended slab) and the liner walls. The basement box is formed within a contiguous pile wall located around the perimeter of the development. Both the contiguous pile wall and the liner wall are propped in their permanent state by internal structure at ground and basement level. Gravity loads and earth pressures are carried by both the new RC in-situ raft elements and the new in-situ contiguous pile wall. Water pressure is resisted by the RC in-situ liner wall. The design working life for the contiguous pile wall structure is a minimum of 100years. All other structural elements are designed for a minimum design working life of 50 years. The concrete mixes have been specified to achieve the above design working lives in accordance with BS 8500-1:2015+A1:2016.
3.2	Structural type	In-situ reinforced concrete construction.
3.3	Foundation type	The foundation to the development consists of a new reinforced concrete raft foundation and perimeter contiguous pile wall. The maximum retained height of the contiguous pile wall propped in the permanent condition by the internal structure is 5.915m.
3.4	Span arrangements	Both the perimeter contiguous pile wall and the basement liner walls span vertically between the ground floor (GF) and basement (B1) slabs and are designed for bending moments and shear force envelopes derived from the condition where the wall elements are propped by the GF and B1 slabs.

			The contiguous piles are to be a minimum of 600mm diameter. The liner wall is to be a minimum of 200mm thick. The GF slab is 300/350mm thick. The basement raft thickness varies from 1000mm to 1750mm thick, the basement suspended slab is 400mm thick. The spans of the floor plates that provide the propping action vary – refer to the attached drawings in Appendix E. Where there are holes in the GF slab next to the retaining wall, the capping beam at the head of the contiguous piles is designed to span across the opening using the slab as horizontal supports.
3.5	Articulation arrangements		The contiguous pile walls will be designed as propped cantilevers in the temporary and permanent conditions.
3.6	Classes and levels		
	3.6.1	Consequence class	CC2
	3.6.2	Reliability class	RC2
	3.6.3	Inspection level	IL2
3.7	Road restraint systems requirements		Not applicable
3.8	Proposed arrangements for future maintenance and inspection		
	3.8.1	Traffic management	Not applicable
	3.8.2	Arrangements for future maintenance and inspection of structure. Access arrangements to structure	No maintenance expected after completion of the wall but remedial works will be undertaken if there are any leaks or defects. The wall will be subject to inspections at least 12 months after completion of the structures package.
3.9	Environment and sustainability		The design of the structural systems has been developed embracing the following principles: - Develop the concept to provide flexible space that can extend the life of the building and enhance the building users' experience. - Design structures economically to minimise embodied carbon - Optimise loading criteria - no overdesign.

		- Specify high levels of recycled material content (structural steelwork, reinforcement, recycled aggregates, cement replacement) - Consider future demolition and recycling opportunities
3.10	Durability. Materials and finishes	The exposure class for the basement slabs (raft slabs and suspended slab), liner wall and capping beam is XC3/4 with Design Chemical Class taken as DC-3. The design working life for the contiguous pile wall structure is a minimum of 100years. All other structural elements are designed for a minimum design working life of 50 years. The concrete mixes have been specified to achieve the above design working lives in accordance with BS 8500-1:2015+A1:2016. The concrete mix for basement liner walls has a crystalline waterproofing admixture specified: this should further enhance durability.
3.11	Risks and hazards considered for design, execution, maintenance and demolition. Consultation with and/or agreement from CDM co-ordinator	Note that the role of CDM coordinator has been superseded through the introduction of the Principal Designer role in the Construction (Design and Management) Regulations 2015. Under the Construction (Design and Management) Regulations 2015 Orsa have been appointed as Principal Designer. The residual risks have been identified and reviewed by the Principal Designer as confirmed in the letter contained within appendix D. Please also refer to appendix D for the design risk register.
3.12	Estimated cost of proposed structure together with other structural forms considered (including where appropriate proprietary manufactured structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates)	Not applicable.

3.13 Proposed arrangements for construction

3.13.1 Construction of structure

Construction sequence of the contiguous pile wall and the basement box is given below:

- Construct temporary piling mat.
- Install contiguous piles to form perimeter retaining wall to basement.
- Construct capping beam and temporary vertical corbels and install temporary props to provide lateral restraint to the head of the piles.
- Excavate down to foundation formation level.
- Pour blinding then construct basement raft and slab.
- Construct ground floor slab.
- Remove temporary props and vertical corbels.
- Construct liner wall.

Piling rigs will be located within the site boundary.

Refer to Appendix F for a diagrammatic representation of the proposed basement construction sequence.

3.13.2 Traffic management

Site access will be via Brill Place. All vehicles will pass through the wheel wash facility prior to exiting on to the public highway. Regular audits will be carried out with regards to traffic management to ensure that all required controls are implemented.

3.13.3 Service diversions

No service diversions anticipated/needed.

3.13.4 Interface with existing structures

To the southeast the site abuts the Brill Place highway. The site is bound to the northwest, southwest and northeast by the existing Purchase Street Open Space parkland.

Monitoring points will be established prior to the works commencing and regular checks will be completed to ensure neighbouring structures are unaffected by the basement and superstructure construction works.

In addition, inclinometer points will be installed within the retaining wall structure so that movement checks can be completed during construction of the wall itself and the basement structure which will ultimately support it.

4 DESIGN CRITERIA

4.1	Actions		
	4.1.1	Permanent actions	Self-weight of structure, soil pressure, water pressure.
	4.1.2	Snow, Wind and Thermal actions	Snow: snow load covered by surcharge load allowance. Wind: not applicable to retaining wall. Thermal: the retaining wall is both in contact with the ground and inside the basement, therefore it is protected from thermal extremes and at a constant temperature.
	4.1.3	Actions relating to normal traffic under AW regulations and C&U regulations	A surcharge loading of 20kN/m² will be assumed and this will cover all normal traffic in the UK.
	4.1.4	Actions relating to General Order traffic under STGO regulations	Not applicable.
	4.1.5	Footway or footbridge variable actions	Footways are to be designed for a pedestrian load of 5kN/m^2
	4.1.6	Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section	Not applicable.
	4.1.7	Accidental actions	Accidental actions are covered under the 20kN/m^2 surcharge loading considered under item 4.1.3.
	4.1.8	Action during construction	Accidental actions are covered under the 20kN/m^2 surcharge loading considered under item 4.1.3.
	4.1.9	Any special action not covered above	None
4.2	Heavy or high load route requirements and arrangements being made to preserve the route, including any		Not applicable.

	provision for future heavier loads or future widening	
4.3	Minimum headroom provided	Not applicable.
4.4	Authorities consulted and any special conditions required	London Borough of Camden. Requirement is for 25mm maximum horizontal deflection to the top of the retaining wall.
4.5	Standards and documents listed in the Technical Approval Schedule	Refer to Technical Approval Schedule.
4.6	Proposed Departures relating to departures from standards given in 4.5	None
4.7	Proposed Departures relating to methods for dealing with aspects not covered by standards in 4.5	None
4.8	(Wales only) List of record of options and choices (for Categories 2 and 3 checks)	Not applicable

5 STRUCTURAL ANALYSIS

5.1	Methods of analysis proposed for superstructure, substructure and foundations	The building superstructure and basement box are modelled and analysed using ETABS (FEM software package). The forces are extracted from the ETABS analysis model for use in design. The liner wall and raft foundation capacities are assessed using the Concrete Centre spreadsheets for concrete design to BS EN 1992-1-1:2004. The geotechnical design philosophy for the embedded retaining walls was based on Design Approach 1 (DA-1) of BS EN 1997 – 1:2004 (EC7), as prescribed in the UK National Annex of EC7, and complemented by the good practise guidance provided in CIRIA C760. The analysis of the wall sections was carried out using WALLAP, a soil structure interaction software program (Borin, 2002). The program performs limit equilibrium calculations using a subgrade reaction analysis. The limit equilibrium calculations for the required toe level for stability rely on the Strength Factor Method prescribed by EC7. This method calculates the factor by which the soil strength must be reduced to bring about failure.
5.2	Description and diagram of idealised structure to be used for analysis	Computer model of whole building structure to include idealisation of contiguous pile wall as a line spring and soil bearing as a foundation area spring. Non-linear behaviour of soil modelled (i.e. zero tension material). The liner wall is idealised as a propped cantilever spanning between the ground floor slab and the basement slab. The pile wall, in the permanent condition is idealised as shown below:

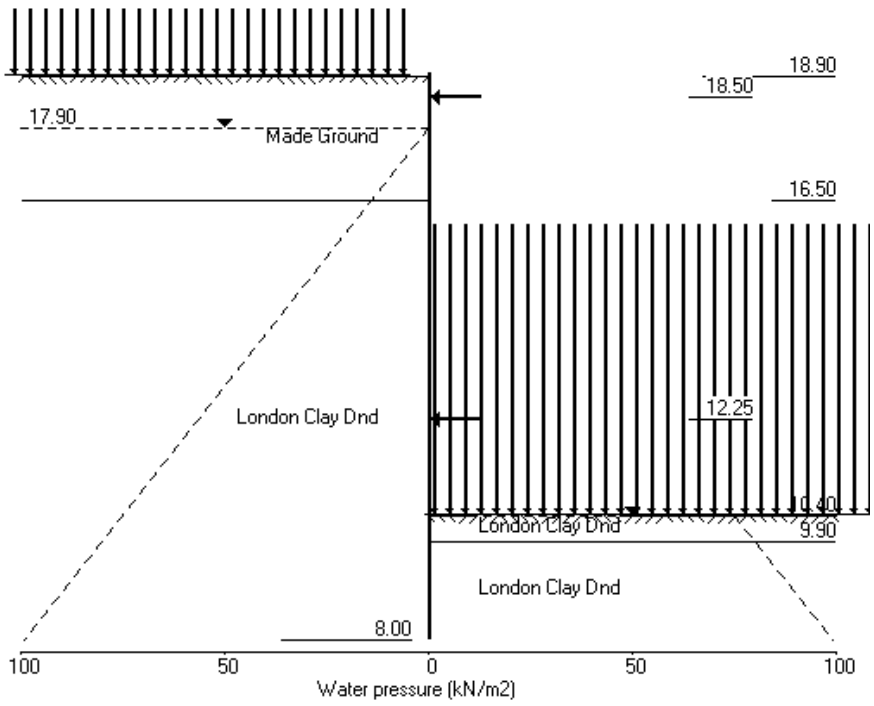


Figure 2 – Idealised Pile Wall Structure

5.3 Assumptions intended for calculation of structural element stiffness

Wall Stiffness

The initial Young's modulus of the concrete (E0) was taken as 30GPa. The short-term Young's modulus of the concrete was taken equal to 0.7E0 and the long-term equal to 0.5E0, representing a cracked modulus.

The second moment of cross-sectional area was estimated using the following expression;

$$I_{wall} = \pi . pile\ diameter^4 \Big/ 64 . \text{pile spacing}\ (m^4/m\ run)$$

For the floor plates and temporary props, an equivalent stiffness of EA/LS was used.

5.4 Proposed range of soil parameters to be used in the design of earth retaining elements

See table 7.1 below taken from Ground Investigation Report.

The Ground Investigation Report is attached in Appendix C.

Table 7-1 summarises the geotechnical parameters for each stratum.

Table 7-1 – Geotechnical design profile

Strata	Top Elev. (m.O.D)	γ_{BULK} (kN/m^2)	c' (kPa)	ϕ' (°)	c_u (kPa)	E' (kPa)	E_u (kPa)	DS Class	ACEC Class
Made Ground(1)	+18.9	18	-	25	-	10,000	-	DS-2	AC-1s
London Clay	+16.5	20	5	23	See note (2)	$320c_u$(3) $640c_u$(4)	$400c_u$(3) $800c_u$(4)	DS-4	AC-3s
Lambeth Group	-1.0	20	5	27	300	$320c_u$(3) $640c_u$(4)	$400c_u$(3) $800c_u$(4)	DS-1	AC-1s

Notes:

(1) Various obstructions present within the Made Ground.

(2) c_u = 100kPa from +16.5m.O.D to +10.0m.O.D, increasing to 300kPa at -1.0m.O.D.

(3) For routine foundation design.

(4) For retaining wall design.

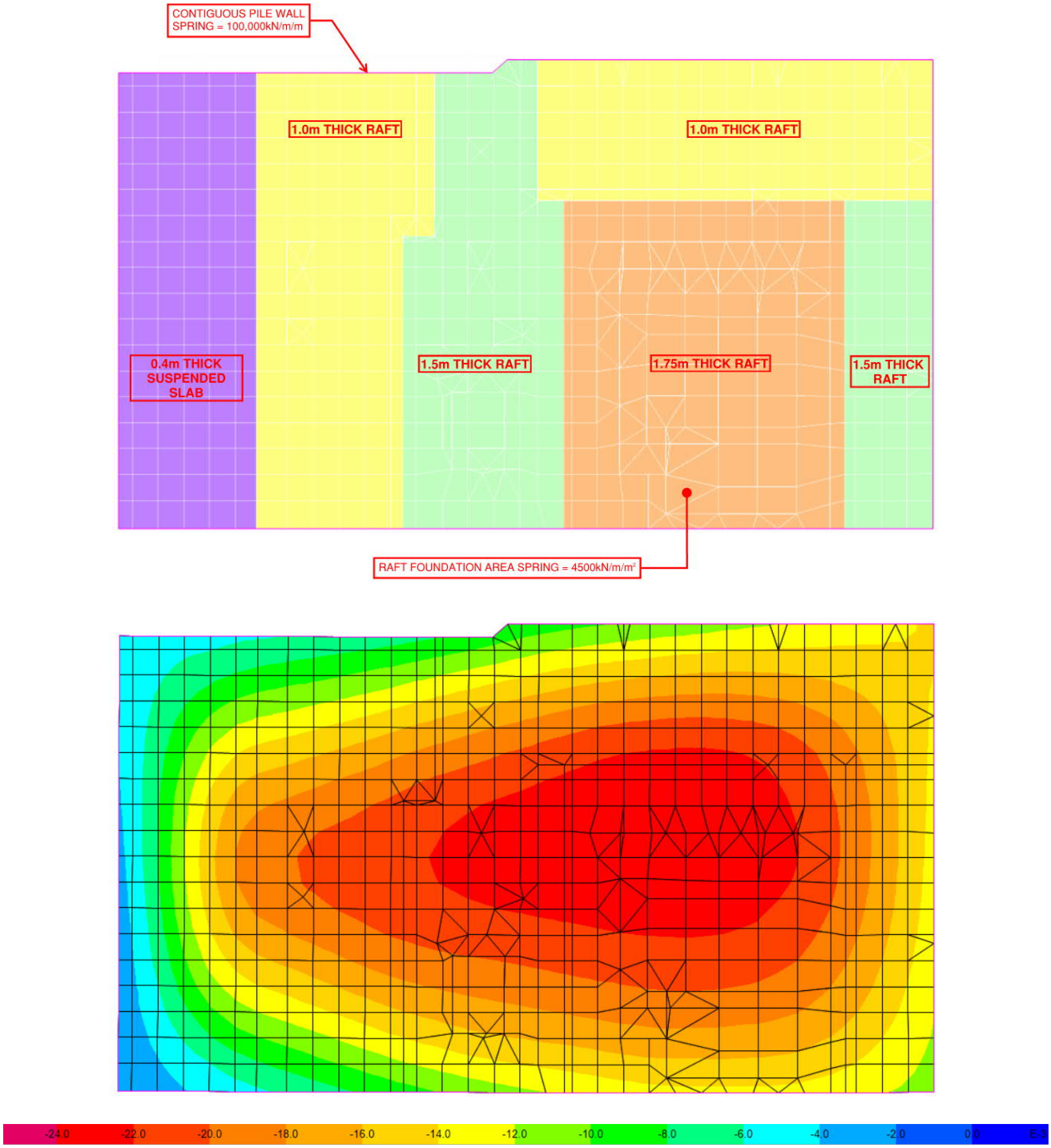
6 GEOTECHNICAL CONDITIONS

6.1	Acceptance of recommendations of the Geotechnical Design Report to be used in the design and reasons for any proposed changes	No departures from the recommendations of the Ground Investigation Report are proposed.
6.2	Summary of design for highway structure in the Geotechnical Design Report	The Ground Investigation Report provides in general good coverage of the site to define the general geology, soil parameters and the groundwater conditions at the site. The development specific ground investigation boreholes have confirmed that deposits of Made Ground directly overlie the London Clay that in turn overlie the Lambeth Group Beds. An idealised ground profile adopted for geotechnical design matters is provided below;

Stratum	Description	Elevation of Upper Surface (m.O.D)	Typical Thickness (m)
Made Ground	A heterogeneous mix of clayey sandy gravel, gravelly silty clay and silty sand and gravel	+18.9	2.4
London Clay	Stiff becoming very stiff with depth, grey clay	+16.5	17.5
Lambeth Group	Very stiff multicoloured clay	-1.0	Not Proven

6.3 Differential settlement to be allowed for in the design of the structure

The plot of vertical settlements, in millimetres, around the perimeter wall is shown below. The plot is for the unfactored permanent and variable load combination ($G_k + Q_k$). The max differential settlement along the wall that is anticipated is +/- 6mm over 10m length.



6.4	If the Geotechnical Design Report is not yet available, state when the results are expected and list the sources of information used to justify the preliminary choice of foundations	Not applicable. Ground investigation Report is available. See Appendix C.

7 CHECK

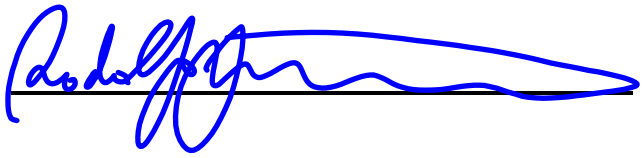
7.1	Proposed Category and Design Supervision Level	Category II
7.2	If Category 3, name of proposed Independent Checker	Not applicable
7.3	Erection proposals or temporary works for which Types S and P Proposals will be required, listing structural parts of the permanent structure affected with reasons	The temporary works are categorised as type S. The proposed construction sequence and temporary propping arrangement is shown in appendix F.

8 DRAWINGS AND DOCUMENTS

8.1	List of drawings (including numbers) and documents accompanying the submission	See appendices.

9 THE ABOVE IS SUBMITTED FOR ACCEPTANCE

We confirm that details of the temporary works design will be passed to the permanent works Designer for review.

Signed 

Name Rodolfo Giannini

Design Team Leader

Director

Engineering Qualifications CEng MIStructE

Name of Organisation WSP UK Ltd

Date 03/03/2020

AIP CONTIGOUS PILE R/W

10 THE ABOVE IS ~~REJECTED~~/AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW

Signed

Name G. NATKUNAN

Position Held Structures Team Leader

Engineering Qualifications BSc(Hons) CEng. MICE

TAA L.B. CAMDEN

Date 10-03-2020

Appendix A

TECHNICAL APPROVAL SCHEDULE

Appendix B

STAGE 3 STRUCTURAL REPORT

Appendix C

GROUND INVESTIGATION REPORT

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DESIGN RISK REGISTER AND PRINCIPAL DESIGNER'S LETTER OF CONFIRMATION

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