Camden

Annex A1a

Model form of Approval in Principle for the design of bridges and other highway structures where UK National Standards (Eurocodes) are used

Name of Project 36 Redington Road

Name of Bridge or Structure .....

Structure Ref No. .....

1. HIGHWAY DETAILS

1.1 Type of Highway

Public footpath and 2-way Highway

1.2 Permitted Traffic Speed 1

20mph

1.3 Existing Restrictions 2

- No height, weight or width restrictions identified on immediate approach, or at site during normal working hours.
- Vehicles over 5T are restricted along Redington Road between 6:30pm – Midnight and Midnight - 8am.
- Controlled on-street parking in place (residents permits)

2. SITE DETAILS

2.1 Obstacles Crossed

None

3. PROPOSED STRUCTURE

3.1 Description of structure and design working life 3

General Description
New build two-storey semi-detached dwelling (upto + 9.0m GL.) with single basement (3.5mbgl).

- Single storey covered basement referred to as 'Utility storage' is situated in closest proximity to public footpath and is the area most relevant for this application
- Design Work life: 50 years

3.2 Structural type

The following is as shown within Structural Drawing Package by Zussman Bear Ltd (APP2);

- 450mm ø **contiguous bored piles** to 12m depth
- 750mm (w) x 600mm (d) **RC capping beam**
- 225mm **RC retaining wall** cast in-situ
- Bearing 300mm **bored piles** supporting slab & steel columns
- Suspended 300mm **pile raft slab** over 225 compressible material

3.3 Foundation type

Bored pile and structural retaining wall tied to RC raft as per SE drawing (APP2)

3.4 Span arrangements

5.4m retaining wall span running parallel to public path

3.5 Articulation arrangements

Basement Retaining wall Strategy
The perimeter wall design is based on deflections, water retention and buildability, the optimum design is based on cantilever contiguous bored piles.

Colets: The piled retaining wall is designed without taking any beneficial effect from the inner reinforced concrete retaining wall. It is designed as a cantilever wall during construction (temporary conditions). In the permanent long term conditions, the piled retaining wall will be propped by the basement slab only. Please note that in the permanent long term conditions no beneficial propping effect from the ground floor slab has been considered and the piled wall is designed to be propped by the basement slab only.

3.6 Classes and Levels

3.6.1 Consequence class

Class 1 – Justification laid out within SE Report in Appendices 4

3.6.2 Reliability class

Class 2 – Justification laid out within SE Report in Appendices

3.6.3 Inspection level

Level 1 – Justification laid out within SE Report in Appendices

3.7 Road restraint systems requirements

None

3.8 Proposed arrangements for future maintenance and inspection

3.8.1 Traffic management

None

3.8.2 Arrangements for future maintenance and inspection of structure Access arrangements to structure.

Inspected from within property

3.9 Environment and sustainability

N/A

3.10 Durability. Materials and finishes.

Design Work Life of structure: 50 years

Materials	Grade/ Specification
Concrete	Mass concrete for foundations to be grade C20 with 40mm max aggregate size. Use sulphate resisting unless otherwise directed. Reinforced concrete is to be grade C35 with 20mm max agg. size. Provide 35mm min cover, except for reinforcement placed in the ground that has 75mm cover elsewhere.
Steel	S355
Waterproof tanking: *Delta Membrane system – Delta MS20*	In accordance with BBA Certification: *Durability – under normal conditions of use the membrane will provide an effective barrier to the transmission of salts, liquid water and water vapour for the life of the structure in which it is incorporated.*
100mm rigid insulation: *XR4000 Celotex PIR insulation boards*	In accordance with BBA Certification: *Durability – the products are durable, rot proof and sufficiently stable to remain effective as insulation for the life of the building.*
Wall finish: *12.5mm plasterboard*	Gyproc Moisture resistant performance board

3.11 **Risks and hazards considered for design. Execution, maintenance and demolition. Consultation with and/or agreement from CDM co-ordinator**[6]

All of the below risks have been identified by the appointed CDM co-ordinator - *Peardon Health & Safety Ltd:*

	Identified Risk	**Mitigation measures**
1	Collapse of ground during construction	Basement design prepared by qualified and experienced Structural Engineer (SE). All existing SE documentation provided to Principal Contractor (PC) prior to any works on site with opportunity for SE and PC to closely liaise provided both prior and during construction process. Method of permanent works to incorporate solution i.e. contiguous pile wall installed from ground level as opposed to conventional methods of shoring to excavations. All earthwork temporary works and permanent works support to be fully designed by competent design engineer and signed off under a strict requirement of compliance prior to the works progressing
2	Traffic crossing public footpath	A Traffic Management strategy to be operated by Principal Contractor to separate traffic and pedestrian routes.
3	Unauthorised access to site	i) Unauthorised access to site to be prevented by implementing arrangements for identifying authorised persons at the site, displaying signage to inform of procedures, ensuring the entrances to the site working area are not left open when unattended. ii) Perimeter fencing/ hoarding must adequately control the risk of unauthorised access to the site on all site elevations. Locked and secure hoarding is provided to the boundary with Redington Road
4	Working around live services	i) Underground services detected and identified prior to excavation on site to prevent risk of cutting through or disturbing, cables, pipes, drainage runs etc. ii) Working on around live services, where unavoidable, to be carried out by competent specialist contractors with all due safety

		iii)	precautions to prevent the risk of electrocution to site operatives. Operatives involved in Works in removal/ alterations to foul drainage system are at risk of ill-health from contact with/ ingestion of foul water and residues etc. Protection provided through good personal hygiene, PPE and welfare facilities.
5	Deep Excavation works - Falling by operatives on-site		Barriers to be provided around perimeter of excavations to prevent falls, shoring to prevent excavation collapse, ensuring means of safe access and egress from excavations, establishing inspections etc. all in accordance with part 4 of CDM regulations 2015. Regular monitoring of stability and movement of retaining walls in temporary condition to be carried out. Careful planning to execution of works

3.12 Estimated cost of proposed structure, together with other forms considered (including where appropriate proprietary manufactured structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates)

Approx. £375k up to GFL including, piling, basement works, superstructure, sub-structure, prelims.

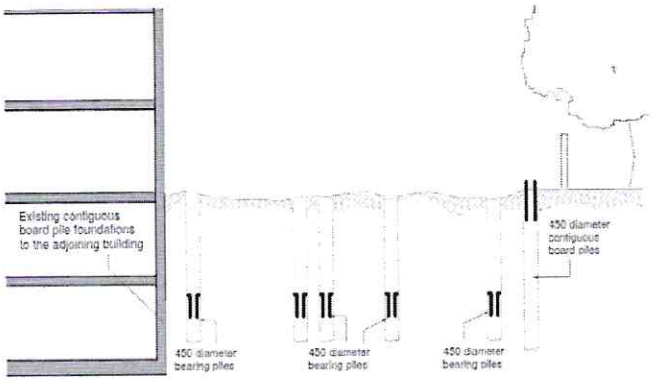
No other forms considered for the proposed structure.

3.13 Proposed arrangements for construction

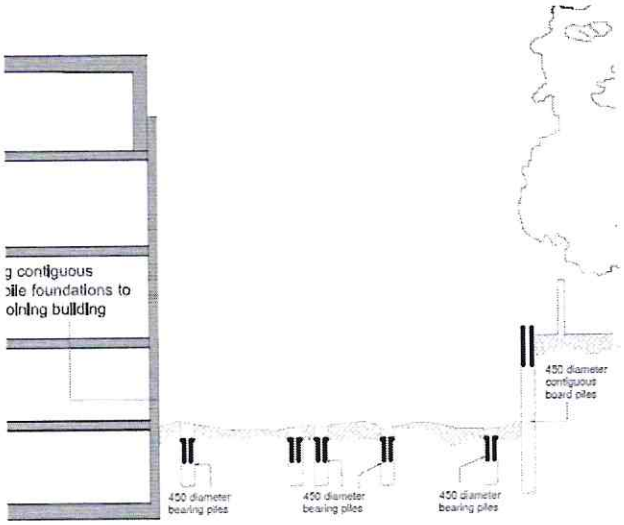
3.13.1 Construction of structure

A Structural Method Statement has been prepared by Zussman Bear and was submitted as part of the approved planning documentation.

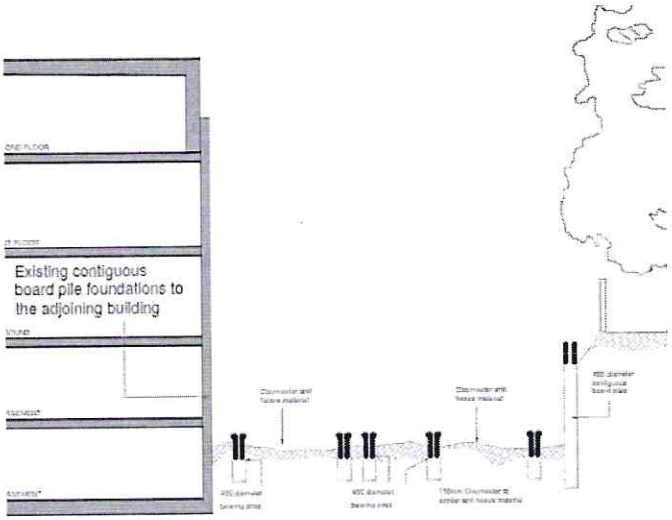
For this application, the subterranean 'utility storage' area is of concern and so only this part of the structure has been referred to. An overview of construction by way of extracts of the above report is provided below;



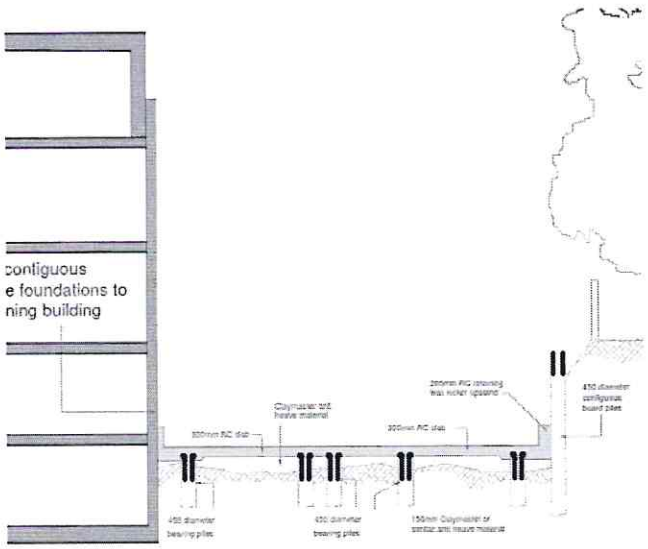
STAGE 1- Piling Section C-C



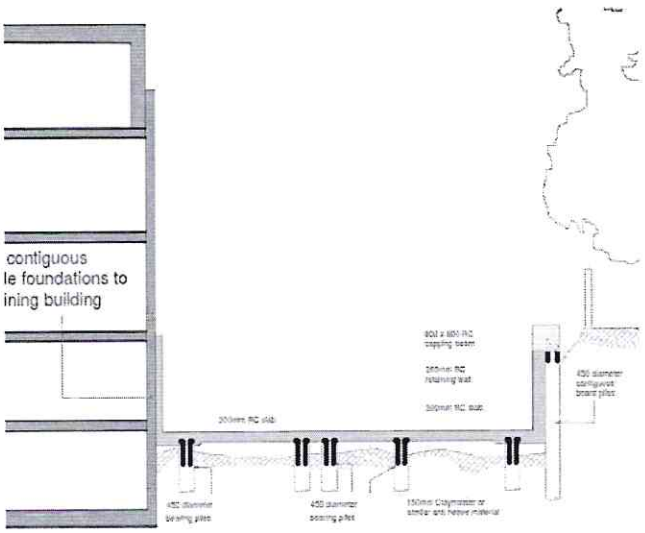
STAGE 2 - Excavation



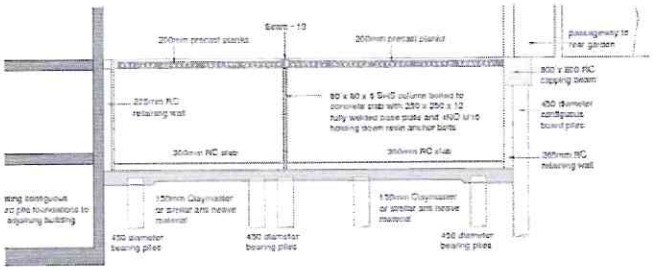
STAGE 3 - Excavation



STAGE 4 - Slab construction



STAGE 5 - Retaining
wall & capping beam



STAGE 6 - Steel
Frame & construction

Due to the method of construction design by Structural Engineers – Zussman Bear Ltd., and as reviewed by the Piling Impact Assessment by CGL, '*excavation is not considered to result in ground movement outside of the pile wall*'.

Colets: The piled retaining wall design has been carried out without using the temporary props.

3.13.2 Traffic management

Traffic Management measures laid out in Pre-Construction Information by Peardon Health & Safety Ltd and Draft Construction Management Plan by Archetype Associates. Copies available on request.

Overview: Delivery schedule managed by Principal Contractor with 'just in time' delivery measures in place, and coordinated alongside nearby construction sites. Designated route for delivery vehicles as well as details of access and egress have been identified and will be distributed to all contractors and suppliers prior to arrival on site. A designated delivery area has been assigned on-site for loading and/or offloading of materials.

Possibility of closing pathways and suspension of parking bays during later construction of development – to be coordinated with London Borough of Camden's Highways Department.

3.13.3 Service diversions

None

3.13.4 Interface with existing structures

The proposed structure shares a Party Wall with adjoining neighbour at no. 38 Redington Road. It is noted that no. 38 has a double basement and was constructed with contiguous piles. As confirmed with structural drawings, the new proposed structure will not undermine those of the adjoining neighbour.

4 DESIGN CRITERIA

4.1 Actions

4.1.1 Permanent actions

Colets: The piled retaining wall design has been carried out using Pseudo Finite Element Analysis (Wallap) which takes into account soil pressures, water pressures and surcharges.

ZUSSMANBEAR:

DEAD LOADS

Structure	Dead Load (kN/m2)
Ground to Loft	
130 Composite Metal Deck thk normal weight RC with one-layer mesh A 193 (maximum span 3.4m) including steels	3.40
Finishes, Ceiling and Services	0.6
Partition	1.0
External Brickwork Walls	4.8
Green Roof Areas	
130 Composite Metal Deck thk normal weight RC with one-layer mesh A 193 (maximum span 3.4m) including steels	3.40
Roof - Ballast	0.8
Roof - Paving	1.2
Green Roof (100mm substrate Bauder)	1.5
Roof Terrace	1.0

Dead loads will comprise the self-weight of the structure plus an allowance for the suspended ceiling, M&E services and raised access floors.

4.1.2 Snow, wind and thermal actions

None

4.1.3 Actions relating to normal traffic under AW regulations and C&U regulations

7

None

4.1.4 Actions relating to General Order Traffic under STGO regulations

8

N/A

4.1.5 Footway or footbridge variable actions

Design accommodates Footway loading 5kN/m².

4.1.6 Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section 9

N/A

4.1.7 Accidental actions

Design accommodates point load up to 20kN/m² for accidental loading.

4.1.8 Actions during construction

None

4.1.9 Any special action not covered above 11

No additional special actions required

4.2 Heavy or high load route requirements and arrangements being made to preserve the route, including any provision for future heavier loads or future widening.

None

4.3 Minimum headroom provided

N/A

4.4 Authorities consulted and any special conditions required

Consulting Authority: London Borough of Camden
Condition: top of retaining wall to have maximum 25mm lateral deflection (as confirmed during meeting with S. Greig and G. Natkunan of Camden structures Team – 28.05.19)

Consulting Authority: Thames Water
Conditions: Bored piles shall be at least three metres or 1.5 times the diameter of the pile, whichever is greater, from the pipe measured between the outside face of the pile and the outside face of the pipe.
Piles adjacent to a pipe must be founded at a level not less than 1.5m below the underside of it. Any frictional resistance of the pile above a line drawn upwards of 45° from the underside of the pipe should be ignored when calculating the load carrying capacity of the pile.
All boring operations must be controlled to ensure that the minimum of vibration is transmitted to the apparatus. A peak particle velocity (PPV) of 10mm/s is the maximum that should be recorded at the face of the apparatus.

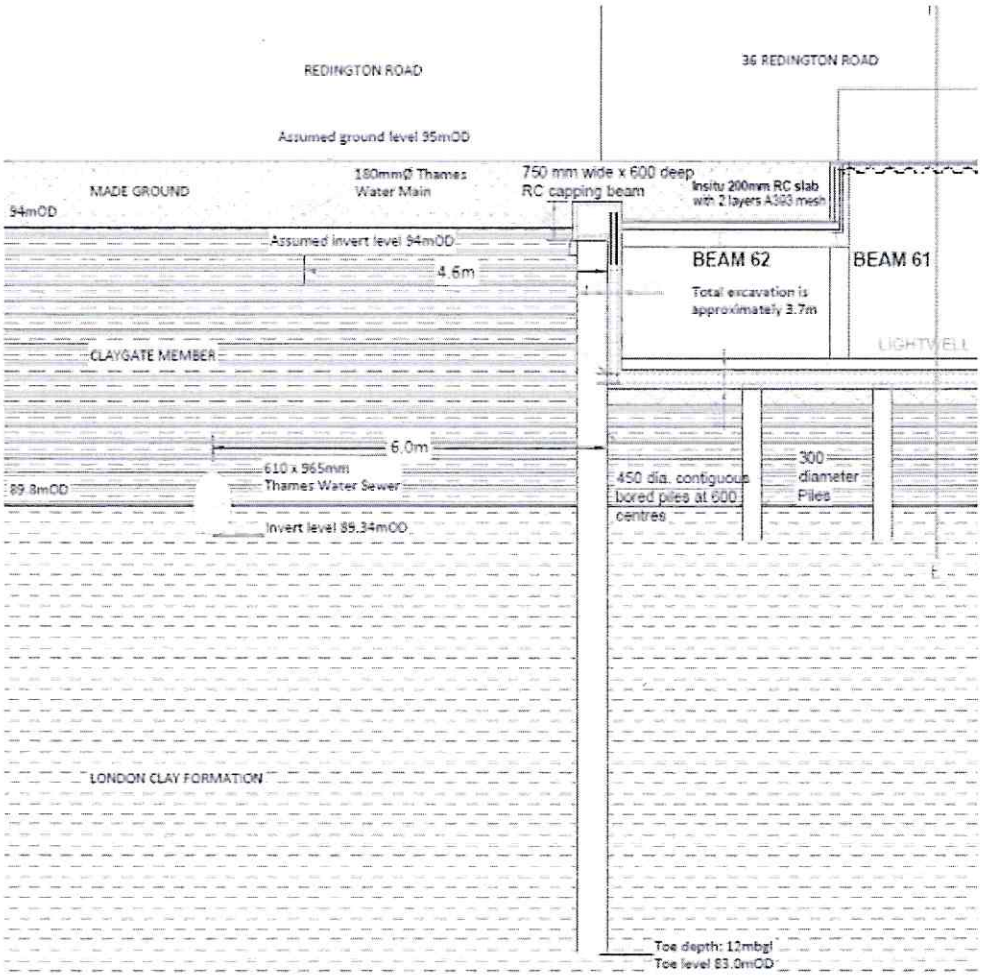


Fig. 2 Extract from Piling Impact Assessment by CGL showing Conceptual Design Section of proposed piling along Redington Road boundary in relation to Thames Water assets.

Analysis	Estimated Deflection (mm)	Estimated Max. Ground Settlement (mm)	Max Bending Moment (kN-m/m)	Max. Shear Force (kN/m)	Factor	Ult. Bending Moment (kN-m/m)	Ult. Shear Force (kN/m)	Ult. Bending Moment per pile (kN-m)	Ult. Shear Force per pile (kN)
SLS	10	5	74.3	58.6	1.00	74.3	58.6	44.6	35.2
DA1C1			110.0	61.0	1.35	148.5	82.4	89.1	49.4
DA1C2			136.0	76.9	1.00	136.0	76.9	81.6	46.1

Table 8: Wall deflection and the Load Effects (Shear Force and Bending Moment)

Maximum deflection top of retaining wall 25mm (estimated deflection 10 mm). Therefore, London Borough of Camden condition achieved.

Thames Water condition for bored piles to be at least three metres or 1.5 times the diameter of the pile, whichever is greater, from the pipe measured between the outside face of the pile and the outside of the pipe is achieved (distance > 3m, therefore satisfactory.

4.5 Standards and documents listed in the Technical Approval Schedule

[1] EN 1990: 2002 Eurocode: Basis of structural design (+ A1: 2005)

[2] EN 1991-1-1: 2002 Eurocode 1: Actions on structures – Part 1-1: General Actions: Densities, self-weight, imposed load for buildings

[3] EN 1991-1-2: 2002 Eurocode 1: Actions on structures - Part 1-2: General Actions: Actions on structures exposed to fire (+ Corrigendum March 2009)

[4] EN 1991-1-4: 2005 Eurocode 1: Actions on structures – Part 1-4: General Actions: Wind actions (+ A1: 2010)

[5] EN 1991-1-5: 2003 Eurocode 1: Actions on structures – Part 1-5: General Actions: Thermal actions

[6] EN 1991-1-6: 2005 Eurocode 1: Actions on structures – Part 1-6: General Actions: Actions during execution

[7] EN 1991-1-7: 2006 Eurocode 1: Actions on structures – Part 1-7: General Actions: Accidental actions

[8] EN 1992-1-1: 2004 Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings

[9] EN 1993-1-1: 2002 Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings.

[10] NA to BS EN 1990: 2002 + A1: 2005 (BSI, 2009)

[11] NA to BS EN 1991-1-1: 2002 (BSI, 2005)

[12] NA to BS EN 1991-2: 2003 (BSI, 2008)

[13] NA to BS EN 1992-1-1: 2004 (BSI, 2005)

[14] NA to BS EN 1992-2: 2005 (BSI, 2007)

[15] NA to BS EN 1993-1-1: 2005 (BSI, 2006)

Retaining wall calculations/ design has been carried out in accordance with Eurocodes (BSEN 1997-1:2004) with reference made to the UK National Annex.

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

N/A

5. STRUCTURAL ANALYSIS

5.1 Methods of analysis proposed for superstructure, substructure and foundations.

12

Software used: Tedds (Tekla) - Tekla Tedds software developed to meet the needs of the structural engineering workflow and designed to help you automate your repetitive structural calculations.

- Loading - Seismic and Wind
- Analysis - Continuous Beams and Rolling Load
- Steel Design - Beams, Torsion, Columns
- Connections - Base Plates and Bolts

SCALE - Computer programme for the analysis, design and component detailing of steelwork, masonry, concrete timber.

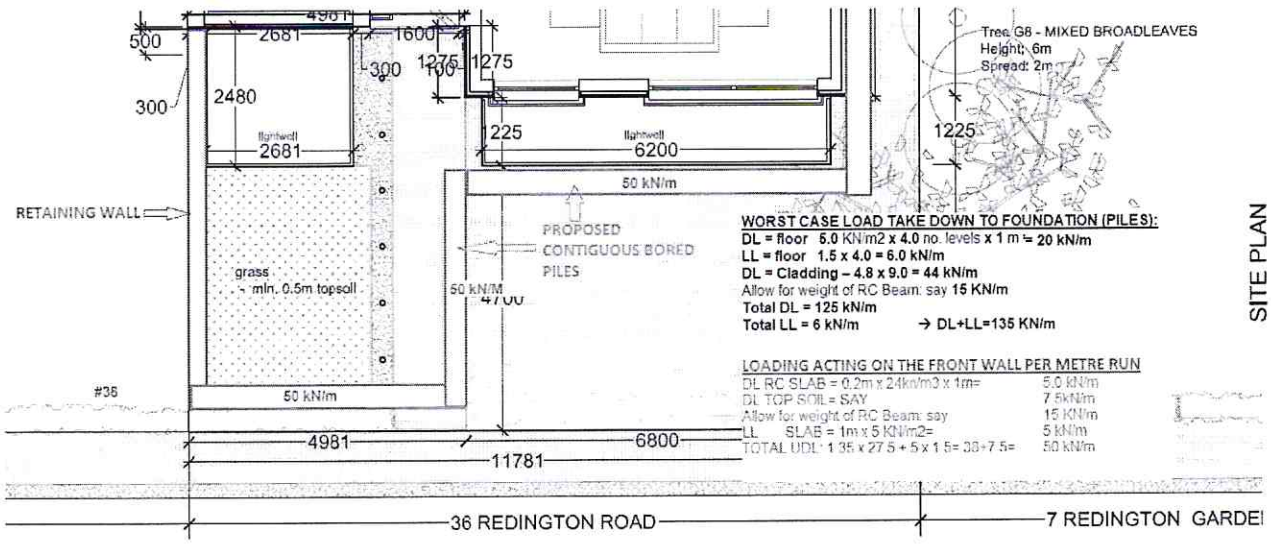
Software used by the piling subcontractor

Wallap - used for checking the lateral stability of the contiguous bored piled wall.

Oasys ADC has been used to determine the reinforcement required to withstand the bending moment induced in the wall.

5.2 Description and diagram of idealised structure to be used for analysis

Colets: The piled retaining wall design has been carried out using Pseudo Finite Element Analysis (Wallap) which takes into account soil pressures, water pressures and surcharges



50 KN/m RUN (ZUSSMAN BEAR)

5.3 Assumptions intended for calculation of structural element stiffness

The wall design is carried out using a Pseudo Finite Element (PFE) software (Wallap) and such analysis requires the bending stiffness (EI) of the wall & the axial stiffness (EA) of the props.
The Young's Modulus of concrete is taken as 28 GPa.
The short term stiffness is based on the 70% of the above value
The long term stiffness is based on the 50% of the initial value.
The bending stiffness of the above wall is summarised in the following Table 6.

	EI (kN-m²/m)
Short Term	65758
Long Term	46967

Table 6: Bending stiffness of the contiguous bored piled wall

The axial stiffness of the props is summarised in the following Table 7.

Prop	Spacing (m)	Cross-Sectional Area (m²)	Young's Modulus (kPa)
Basement Slab	1	0.30	1.40E+07

Table 7: Axial Stiffness of Props

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

Soil Parameters were identified during site investigations by way of 20m deep exploratory bore holes by Southern Testing - geotechnical consultants for the project. Data is shown below in Table 1, as extracted from Piling Impact Assessment by CGL;

Table 1. Geotechnical design parameters

Stratum	Level (mOD)	Bulk Unit Weight, γ_b (kN/m³)	Undrained Cohesion, c_u [c'] (kPa)	Angle of Friction, φ_{crit}' (°)	Young's Modulus, E_u [E'] (MPa)
Made Ground	95	19	20 [0]	27	8[a] [6[a]]
Claygate Member	94	20	67.5 [0]	21[c]	40.5[d] [30.38[b]]
London Clay Formation	89.8	20	67.5 + 3.7z [2]	24[c]	40.5 + 2.22[d]z[e] [30.38 + 1.67[b]z[e]]

a. *Based on 400c_u – BRE Settlement of Structures on Clay Soils*
b. *Based on 0.75E_u – Burland, Standing J.R., and Jardine F.M. (eds) (2001), building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*
c. BS 8002:2015, *Code of practice for earth retaining structures*
d. *Based on 600c_u – Burland, Standing J.R., and Jardine F.M. (eds) (2001), building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.*
e. z – depth below surface of London Clay Formation

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.

- Horizontal and vertical movement of the ground have been considered within recommendations of Geotechnical report.
- All recommendations have been adopted including use of contiguous piling, bored piling method, heave protection, mesh to retaining wall to avoid soil erosion between piles etc.

NB: Geotechnical report carried out by Southern Testing Environment & Geotechnical and submitted as part of the approved planning permission 2015/3004/P. A secondary Piling Impact Assessment has been prepared by CGL and is submitted as part of Pre-Construction planning conditions.

6.2 Summary of design for highway structure in Geotechnical Design Report.

In support of recommendations laid out in the BIA report, the following is as shown within Structural Drawing Package by Zussman Bear Ltd;

- Temporary propping by way of Contiguous bored piles prior to excavation.
- Permanent propping and protection of soil erosion between piles by way of 225mm RC retaining wall with 2 layers of B1131 mesh

The following provision has been proposed within the basement by the project Architects;

- Delta membrane, applied internally for protection against permeation of groundwater.

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

None – Estimated max. ground settlement of 5mm

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.

N/A – report available on request.

7. CHECK

7.1 Proposed Category and Design Supervision Level.

Cat 2.

7.2 If Category 3, name of proposed independent Checker

N/A

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

N/A

8. DRAWINGS AND DOCUMENTS

8.1 List of Drawings (including numbers) and documents accompanying the submission. 14

- APP1: 1048 (10) 01 Proposed Location plan by Archetype Associates
- APP2: Structural Drawing Package by Zussmann Bear Ltd – Structural Engineers
  - L/6218-01* Proposed Piling Layout Rev C
  - L/6218-01 Proposed Basement Rev C
  - L/6218-02 Proposed Ground Rev C
  - L/6218-03 Proposed First Rev A
  - L/6218-04 Proposed Loft Rev A
  - L/6218-05 Proposed Roof Rev A
  - L/6218-06 Proposed Section C-C Rev A
  - L/6218-07 Proposed Section F-F Rev C
- APP3: STRUCTURAL PROPOSAL AT 36 REDINGTON ROAD, LONDON, NW3 7RT
- APP4: COLINS PILING - Contiguous Bored Piled Retaining Wall and Bearing Piles Design for both Temporary and Permanent Conditions
- APP5: SOUTHERN TESTING - Basement Impact Assessment & Site Investigation Report

9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

We confirm that details of the temporary works design will be/have been[15] passed to the permanent works Designer for review. 16

Signed [signature]

Name Peter Zussman
Design Team Leader

Engineering Qualifications BSc CEng MIStructE 17

Name of Organisation Zussman beck.

Date 10/7/19

10. THE ABOVE IS REJECTED/AGREED[1] SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW 18

Signed [signature]

Name G.NATKUNAN

Position held Structures Team Leader

Engineering Qualifications B Sc(Hons) CEng. MICE 17

TAA L.B. CAMDEN

Date 15-7-2019

Notes

1. For a bridge, give over and/or under.
2. Include weight, height, width and any environmental restrictions at or adjacent to the bridge.
3. The design working life of the structure, including temporary structure, and replaceable structural parts should be given. They
should be expressed as a number of years rather than a range of years. A design working life should be based on the DMRB if stated.
Otherwise it may be based on the guidance given in the Overseeing Organisation's current requirements for the use of Eurocodes for
the design of highway structures.
4. State the classes and levels for the whole structure, as well as those for the individual structural elements if higher or lower. See the
Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures.
5. For concrete structures, give applicable exposure classes for particular structural elements. For all material strengths given, list the
relevant codes/standards.
6. Designers should name the CDM co-ordinator and confirm that the CDM co-ordinator has reviewed the risks and hazards identified
in the AIP and is satisfied. Also see clause 2.12(i), (ii) and (iii).
7. e.g. Load Models 1 and 2, BS EN 1991-2.
8. e.g. SV model vehicle in Load Model 3, BS EN 1991-2.
9. e.g. SOV model vehicle in Load Model 3, BS EN 1991-2 and/or individual vehicle which includes the following information
as applicable:
a) Gross weight of the vehicle in tonnes and vehicle type and number.
b) Axle load and spacing (longitudinally and transversely).
c) Air cushion in tonnes over area applied (in metres, longitudinally and transversely).
d) Single or twin tyres and wheel contact areas.
10. If in doubt, the heavy or high load route requirements should be confirmed by the relevant administration e.g. Abnormal Indivisible
Load team in HA. Initial indication can be found from the route maps which are available from Circular Roads No 61/72 – Routes for
heavy and high abnormal loads, and also from the website http://www.esdal.com or in Scotland http://www.transportscotland.gov.uk/
reports/road/j12054-00.htm
11. e.g. seismic action, atmospheric icing, floating debris etc.
12. List the main structural elements for superstructure, substructure and foundation. If the designs of the superstructure, substructure
and/or foundation are carried out by different teams, refer to cl. 2.22 and 2.42.
13. When the Geotechnical Design Report becomes available, an addendum to the AIP, covering section 6, must be submitted to the TAA.
The addendum must have its own sections 8, 9 and 10 to provide a list of drawings, documents and signatures.
14. Include, without limitation:
a) Technical Approval Schedule (TAS).
b) General Arrangement Drawing.
c) Relevant extracts from the Geotechnical Design Report.
d) Departures.
e) Relevant correspondence and documents from consultations.
15. Delete as appropriate.
16. This statement is applicable to temporary works design AIP only.
17. CEng, MICE, MIStructE or equivalent.
18. AIP is valid for three years after the date of agreement by the TAA. If the construction has not yet commenced within this period, the AIP must be re-submitted to the TAA for review.