Camden

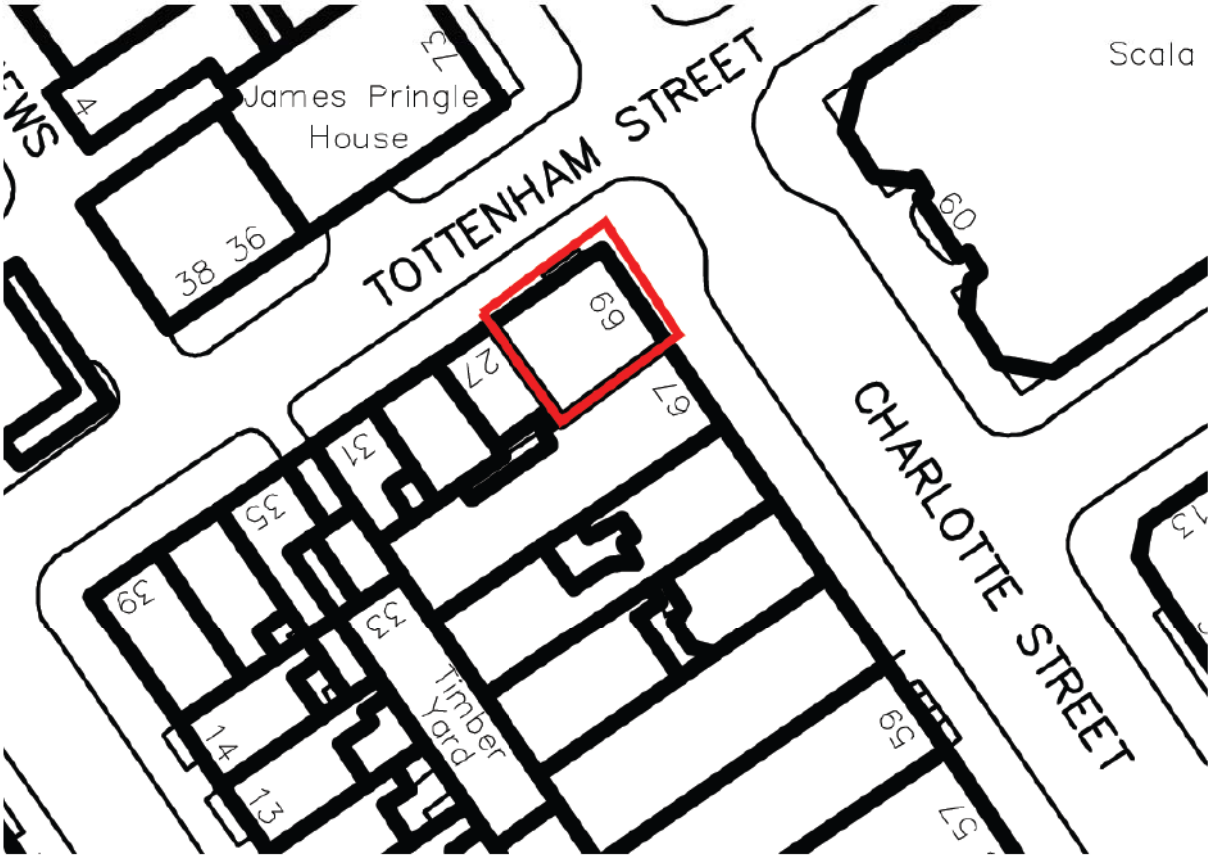
Model form of Approval in Principle for the design of bridges and other highway structures where UK National Standards (Eurocodes) are used

Name of Project	No.69 Charlotte Street
Name of Bridge or Structure	Basement Extension
Structure Ref No.	.....

Summary: *It is proposed to redevelop the property at No. 69 Charlotte Street. The existing basement is to be excavated by 1.5m approximately to provide greater headroom within the basement. The perimeter walls to the existing property are to be underpinned to assist in supporting the building. All the pavement vaults and lightwells are to be underpinned and lined internally with an RC liner wall.*
The underpins will be installed in sequence and the basement vaults propped at all times.

1. HIGHWAY DETAILS

1.1 Type of Highway
Public Highway with the site located at the corner of Tottenham Street and Charlotte Street



1.2 Permitted Traffic Speed 20 mph 1

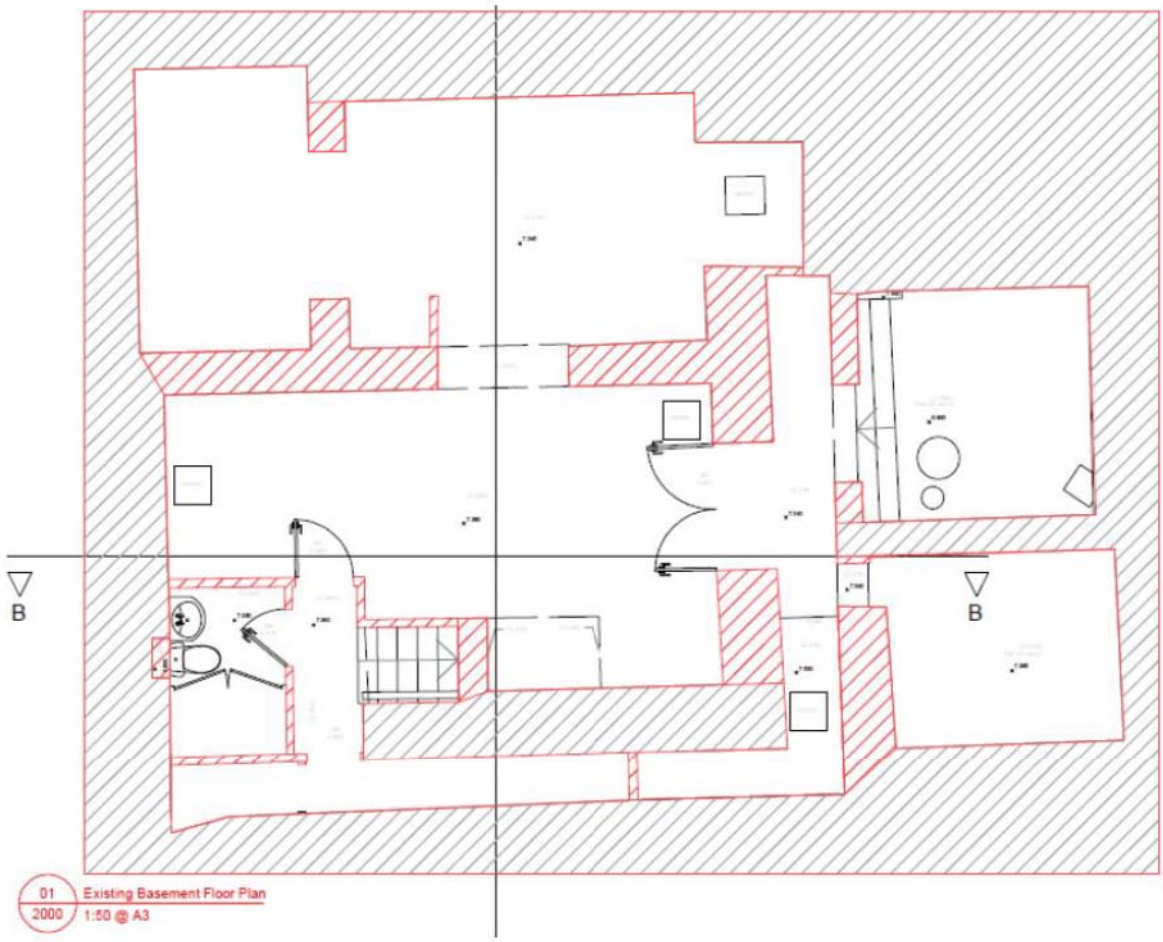
1.3 Existing Restrictions No existing or known restrictions 2

2. SITE DETAILS

2.1 Obstacles Crossed
Not Applicable

3. PROPOSED STRUCTURE

3.1 Description of structure and design working life 3
The existing lightwell and pavement vaults extend to the perimeter of the site.
The lightwell fronts onto Charlotte Street with the below pavement vaults fronting onto Tottenham Street.
The existing structure are of brickwork construction and are propped at the top and base with the existing slab/ structure.
It is proposed to underpin the existing walls in sequenced and construct a new reinforced concrete liner wall in front of the wall.
The new structure will take account of the existing structural arrangements.
The life of the structure will be designed for 60 years at minimum.

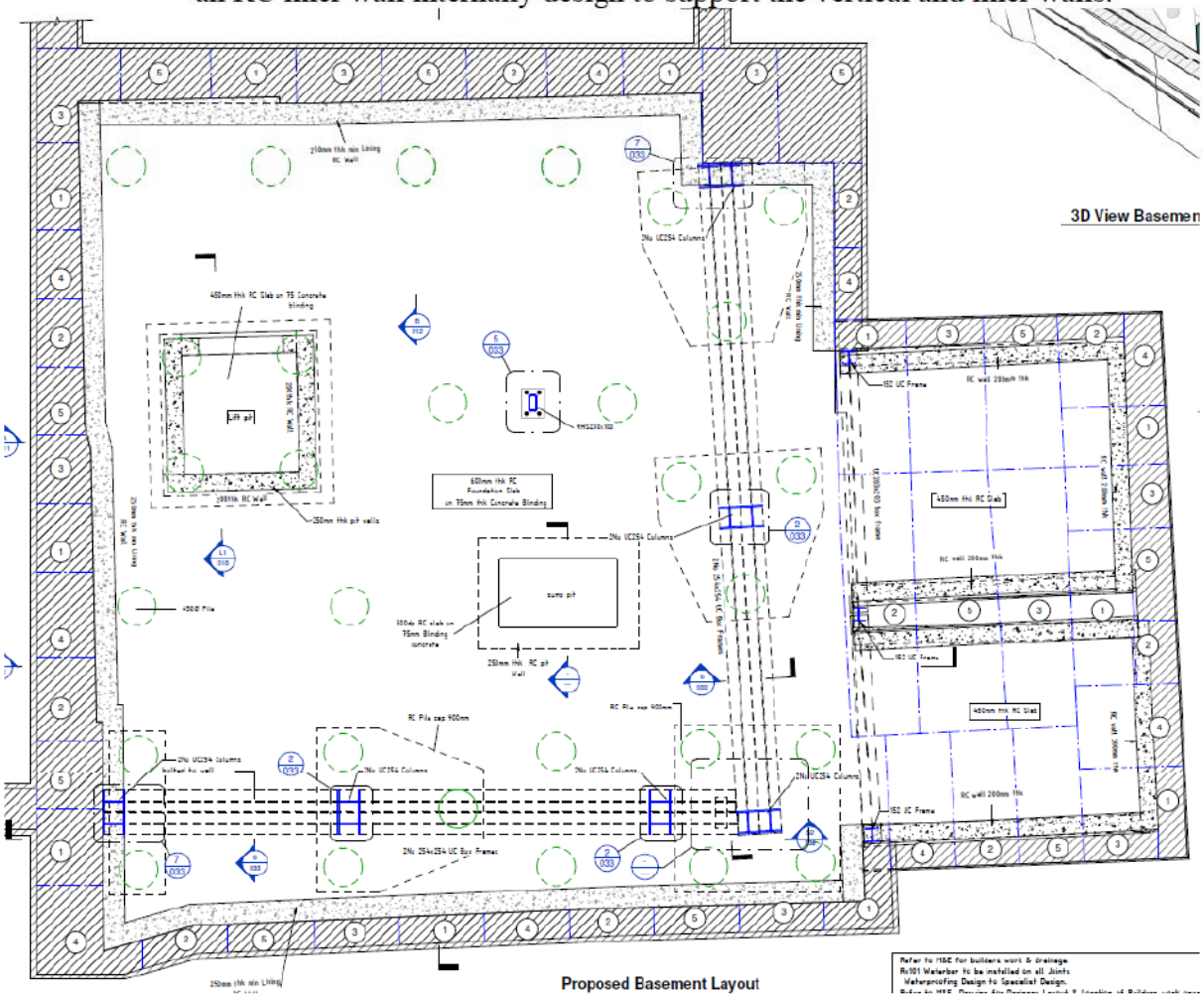


Basement Existing Plan

Existing Basement Plan and Layout

3.2 Structural type

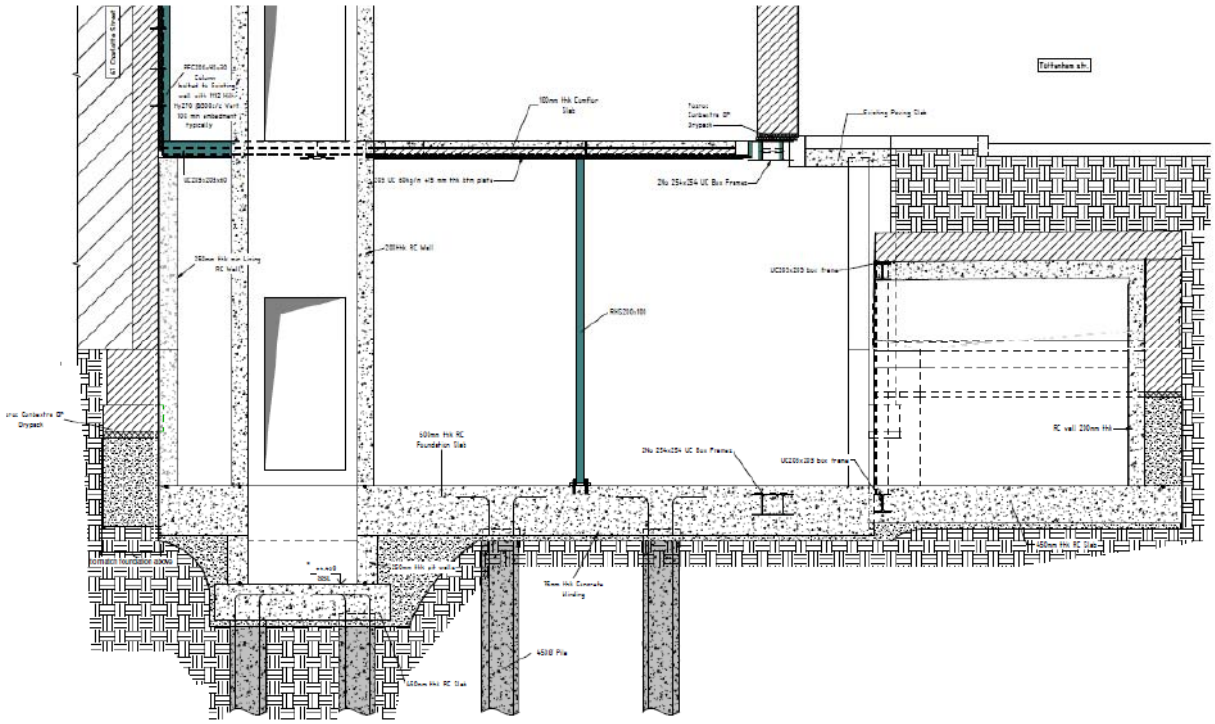
The existing structure comprises of load bearing brickwork. The proposed structure comprises of concrete underpins to the perimeter of the building with an RC liner wall internally design to support the vertical and liner walls.



Layout of the structure with the underpins to the perimeter and piles internally.

3.3 Foundation type

The foundations to the main perimeter walls comprise of mass concrete underpins and the new internal structure is supported on piles.



Section Showing the foundations and supports.

3.4 Span arrangements

The lightwell walls are supported on brick corbelled foundations and are to be underpinned. An RC liner wall is to be cast internally. The lateral loads from the external ground and imposed loads including the surcharge loads are resisted by the new RC liner wall.

The same arrangement applies to the pavement vaults. The brick vaults are to be underpinned and in addition a new RC liner wall will assist in strengthening the brick structure.

3.5 Articulation arrangements

All connections will be designed as pinned with the basement slab and ground floor slab providing restraint to the lateral loads.

3.6 Classes and Levels

3.6.1	Consequence class	CC2	4
3.6.2	Reliability class	RC2	
3.6.3	Inspection level	IL2	

3.7 Road restraint systems requirements

Not Applicable

3.8 Proposals for water management

Local perched water in the ground will be controlled using filtered sumps and pumps.

3.9 Proposed arrangements for future maintenance and inspection

3.9.1 Traffic management
The main contractor will be responsible for the traffic management.

3.9.2 Arrangements for future maintenance and inspection of structure
Access arrangements to structure.
The structure will be visually inspected during construction with movement monitoring in place. The structure will be visible until complete.

3.10 Environment and sustainability

All materials are going to be sustainable sourced and recycled/given back to manufacturer for reuse at the end of the project.

3.11 Durability. Materials and finishes. 5

All concrete will be designed to meet the requirement of DC-4 to BS8500. Concrete cover and reinforcement will be designed for exposure conditions. All RC structures supporting any highways will be specified in accordance with BS8500: Part 2 and BS EN 206. Structural steel S355 minimum Reinforced concrete grade C40/50 Mass concrete C16/20

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

Contractor to submit method statement and sequencing of construction activities prior to works commencing on site. All works must be conducted to the requirements of HSE.

Contractor to provide sufficient temporary works to mitigate against movement of the structure during the works. These will be designed for suitable surcharge loads from the pavement above to reflect the activities being carried out on site.

1	Overloading	Failure of the retaining wall (excessive moment or shear stress within the wall)	SR	L	RR
			4	4	16
	Mitigation		Residual Risk		
	Retaining masonry/concrete wall strength based on survey and test results/conservative assumtions. Wall capacity checked according to relevant codes.		SR	L	RR
			4	1	4
2	Overloading	Failure of the propping elements (excessive stresses within the section)	SR	L	RR
			4	4	16
	Mitigation		Residual Risk		
	Steel propping designed according to BS EN 1993-1-1:2005.		SR	L	RR
			4	1	4
3	Incorrect construction sequence	Excessive movements or collapse of retained wall.	SR	L	RR
			4	4	16
	Mitigation		Residual Risk		
	Provide clear construction sequence for the temporary propping and subsequent demolition works such that lateral support to the wall is always maintained.		SR	L	RR
			4	1	4
4	Berm collapse	Excessive pressure on berm leading to ground collapse and/or wall failure.	SR	L	RR
			4	4	16
	Mitigation		Residual Risk		
	Stability analysis of the berm using SRM (Strength reduction method) to determine global factor of safety.		SR	L	RR
			4	1	4
5	Insufficient number of props and underestimate members capacity	Failure of the propping system	SR	L	RR
			4	3	12
	Mitigation		Residual Risk		
	Design checks and Approvals according to BS5975 Code of practice for temporary works procedures, following a construction issue design. The specified loading not to be exceeded in order to comply with the limits provided by the manufacturer's specifications.		SR	L	RR
			4	1	4
6	Temporary works incorrect removal	Collapse of retained wall.	SR	L	RR
			4	4	16
	Mitigation		Residual Risk		
	Sequence for the removal of the temporary retention scheme to be designed and coordinated with the installation of the permanent retention system, to ensure the retaining walls are supported at all times.		SR	L	RR
			4	1	4
7	Undrestimation of ground parameters	Excessive movements/stresses or collapse of retained wall.	SR	L	RR
			4	3	12
	Mitigation		Residual Risk		
	Ground strata and parameters taken from the Ground Investigation Report.		SR	L	RR
			4	1	4

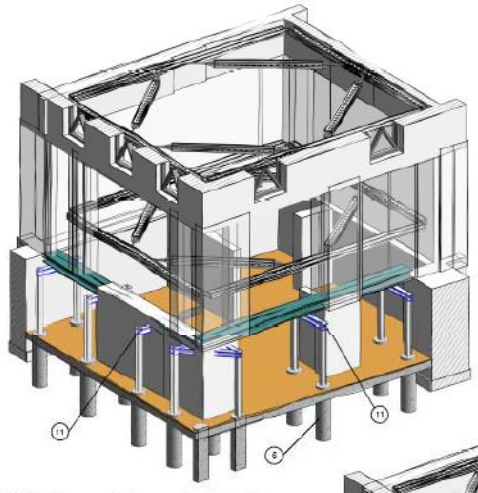
3.13 Estimated cost of proposed structure, together with other forms considered (including where appropriate proprietary manufactured structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates)

Estimated Costs £250,000

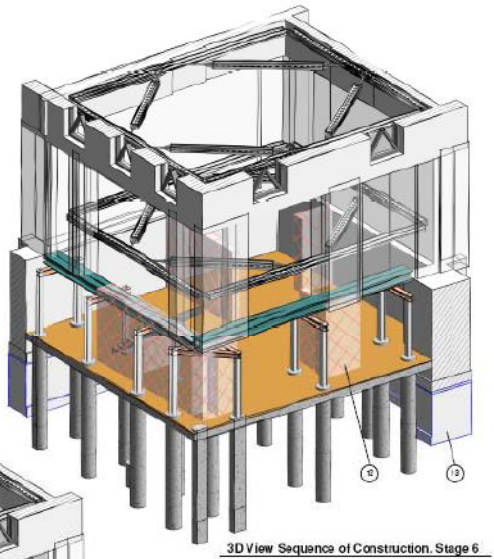
3.14 Proposed arrangements for construction

3.14.1 Construction of structure

The works will be sequenced so that a maximum opening width 1m is allowed at any one time for the existing wall to not be undermined while underpinning.
Propping will be installed sequenced with the openings to ensure the wall supported.
Refer to the sequence drawings.

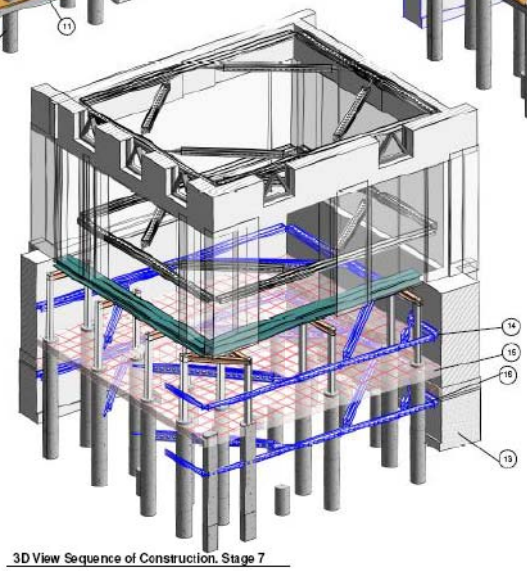


3D View Sequence of Construction. Stage 5



3D View Sequence of Construction. Stage 6

Sequences of Construction :
1. Install RHD props at roof level
2. Remove roof & partition
3. Install RHD Props 600mm below Existing Joists @ all levels to GF
4. Carefully remove floor Joists & partition from top to down
5. Install RHD Props 600mm above Existing Joists @ GF
6. Install piles i. Xing pairs
7. Install Needls beams & Remove Existing Joists @ GF
8. Install Temporary prop for paving
9. Install Steel beams in pair
10. Remove needles
11. Install UC Spreader beams
12. Carefully remove selected walls @ Basement level
13. Complete Underpins
14. Install RHD Props 300mm above existing Basement slab
15. Excavate ground
16. Install Lower level RHD Props 400mm above proposed Basement slab
17. Excavate to Formation Level
18. Install Pile caps & Basement Slab
19. Remove RHD Props @ Basement level (14)
20. Install Basement Walls in sequences
21. Remove RHD Props @ Basement level (15)
22. Install Steelworks, Basement Walls , Complete Basement
23. Remove Temporary works
24. Install GF Slab
25. Remove GF RHD water beams
26. Install Needle Beams @1st Floor
27. Install Steel Frames & Complete 1 floor.
28. Remove 1st floor Temporary works
29. Repeat 27 & 28 to completion work



3D View Sequence of Construction. Stage 7

3.14.2 Traffic management

N/A

3.14.3 Service diversions

N/a

3.14.4 Interface with existing structures

Temporary works arranged and coordinated considering the existing and permanent structure to ensure the wall is supported along all construction phases. All works are coordinated with the temporary and permanent works.

3.15 Resilience and security

N/A

4 DESIGN CRITERIA

4.1 Actions

4.1.1 Permanent actions

According to BS EN 1991-2 Traffic loads on bridges. Concrete density used in design is 25kN/m3 and soil density is 18kN/m3.

Safety factors as per BS EN 1990 from table A1.2 (B) – design value of actions (STR/GEO) (set B) and Eq.6.10:

$$\sum_{j\geq 1} \gamma_{G,j} G_{k,j} "+" \gamma_P P "+" \gamma_{Q,1} Q_{k,1} "+" \sum_{i>1} \gamma_{Q,i} \psi_{0,i} Q_{k,i}$$

$\gamma_{Gj,sup}$ = 1,35

$\gamma_{Gj,inf}$ = 1,00

$\gamma_{Q,1}$ = 1,50 where unfavourable (0 where favourable)

$\gamma_{Q,i}$ = 1,50 where unfavourable (0 where favourable)

ξ = 0,85

Boundary along adjoining roads

Clause: 4.3.2 Load Model 1

And table 4.2 – Load model 1: characteristic values.

Design allows for soil surcharge as per SI report.

Design considers a water table at 1m below the ground level. This is higher than the measured water table to allow for accidental situations.

Design allows for a ground level surcharge of 20kN/m2. Recommended values for combination of actions from table A2.1.

Factor of safety for dead loads = 1.35

Factor of safety for live loads = 1.5

4.1.2 Snow, wind and thermal actions

All loads are based on BS EN 1991.
Snow loads used for the design of the superstructure and load take down in accordance with BS EN 1991-1-3.
S = 0.75 kN/m2.
Wind loads as per BS EN 1991-4 used for the design of the superstructure stability, load take down and foundation design.
Total wind pressure of Wk = 0.65 kN/m2.
Thermal actions are not considered relevant for this site.

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

N/A

4.1.4 Actions relating to General Order Traffic under STGO regulations 8

N/A

4.1.5 Footway or footbridge variable actions

A surcharge of 20KPA has been considered.

4.1.6 Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section 9,10

N/A

4.1.7 Accidental actions

According to CIRIA C760 an accidental point load of minimum 10 kN needs to be considered as impact load.
Design carried out in accordance with the Eurocode 1-7 and the relevant national annex covering accidental actions on building structures.
The building has been designed to cater for unidentified accidental actions to limit the extent of localized failure. This is by the provision of horizontal ties and vertical ties in all supporting columns and walls in accordance with the code requirements.

4.1.8 Actions during construction

The retention system and underpinning have been designed for a 20 kPa surcharge load on the road and 5kPa for the pavement so it was considered that any vehicles stopping at the roadway are within the design vehicle loads.

4.1.9 Any special action not covered above 11

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.
N/A

4.3 Proposed minimum headroom to be provided
N/A

4.4 Authorities consulted and any special conditions required.
London Borough of Camden requirements agreed: The lateral deflection to the retaining wall at public footpath level is to be no more than 25mm.

4.5 Standards and documents listed in the Technical Approval Schedule (TAS)

Refer to Annex B1 TAS

- Mandatory – CDM Regulations 2015

CG 300 – Technical Approval of Highway Structures

4.6 Proposed departures from standards listed in 4.5
N/A

4.7 Proposed departures from standards concerning methods for dealing with aspects not covered by standards listed in 4.5.
N/A

4.8 Proposed safety critical fixings
N/a

5. STRUCTURAL ANALYSIS

5.1 Methods of analysis proposed for superstructure, substructure and foundations 12

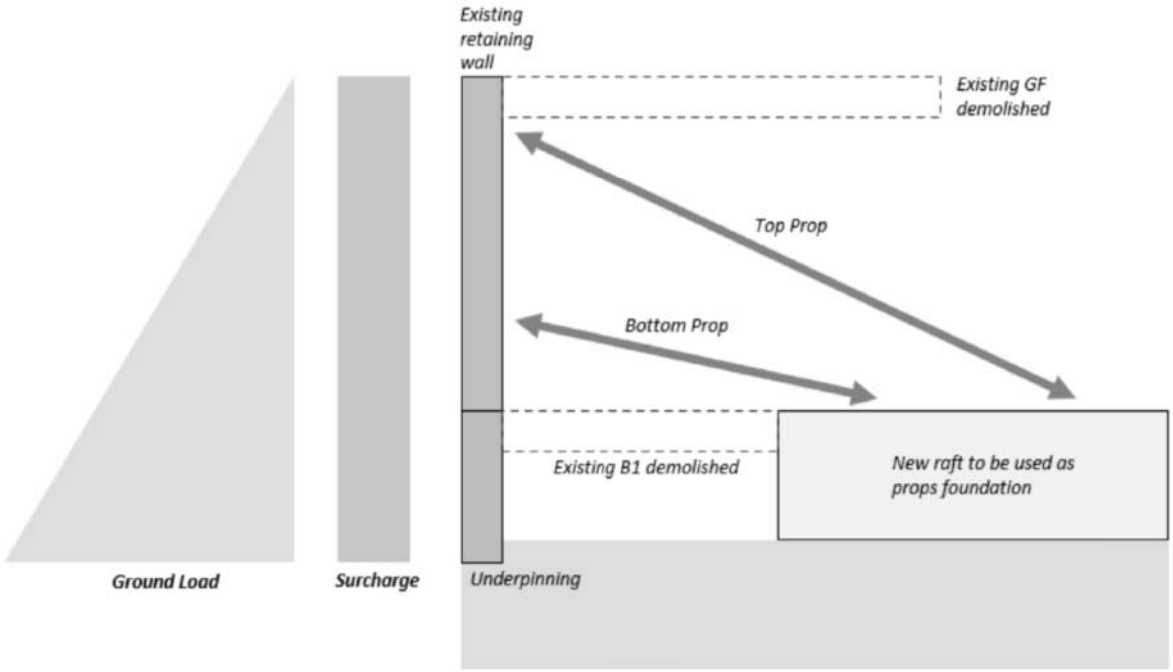
The steelwork and brick has been designed to transfer all the vertical and lateral loads down into the foundations. All columns line directly up from roof level to foundation level.
Forces arising out of the retaining action of the underpinned retaining walls are distributed between reinforced concrete liner wall and slabs and transferred through to the other side of the basement, the return walls and shear walls.

Active soil pressures are resisted by passive pressure on the other side of the excavation.
Water pressures are resisted by the underpinned wall and the basement slab, considering the counteracting effect from the gravitational forces.

Basement slab is designed to resist the uplift water pressures as specified on the geotechnical reports. The pile caps have been designed to distribute the column loads to the piles.
The underpinned and lined out RC walls act as retaining walls and the vertical loads will be taken by the internal piles.
The surcharge loads have been specified by Aspire Consulting Engineers and the liner walls have been designed for a surcharge loading of 20KN/m2 where they abut the highway.
Two levels of RC slabs act as lateral props in the underpinned walls design calculations.
The slabs have been designed to transfer the horizontal line load from the liner wall to the permanent structure. The lateral or horizontal load on the liner walls has been considered when designing the structure.

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

The structure is designed to support the perimeter walls against the lateral earth pressures and surcharge from the highway. The resultant compressive and tensile forces will be resolved in the basement foundations.



5.3 Assumptions intended for calculation of structural element stiffness

E_{steel} = 210kN/mm2
$E_{concrete}$ = 31.5kN/mm2

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

Stratum	Depth Range (m) (m OD)	Bulk Density (Kg/m^3)	Eu (KN/m^2)	E'(KN/m^2)
Made Ground	Existing basement level to 4.70 m (24.70 to 20.00)	1700	15,000	15,000
Lynch Hill Gravel	4.70 m to 6.50 m (20.00 to 18.20)	1800	50,000	50,000
London Clay	6.50 m to 24.70 (18.20 to 0.00)	1950	50,000 to 118,250	30,000 to 70,950

6. GEOTECHNICAL CONDITIONS

6.1 Acceptance of recommendations of the ground investigation report (reference/dates) to be used in the design and reasons for any changes.

Accepted

6.2 Summary of design for highway structure in Ground Investigation Report.

The liner walls span between the floors. The liner walls are to be designed to withstand soil, water and surcharge pressures and will form part of the permanent works.
The active pressures listed above will by resisted by the passive pressures of the soil.

6.3 Differential settlement to be allowed for in the design of the structure.
The basement structure has been analysed as a rigid box supported by internal bearing piles and a continuous liner wall which will settle uniformly. It is expected that the proposed structure will settle by less than 10mm under the design loading.
The predicted maximum lateral displacement of the retaining wall against the highway was calculated to be to be within the allowable limit of 16mm. These displacements are calculated on the line of the boundary wall, the displacement at the highway will be proportionally smaller.
A building damage report has been produced GEA to assess the damage category to adjacent neighbouring building resulting from the development. From the assessment, GEA concluded that the damage categories exhibited for each of the adjacent structures during the various phases of the development will not exceed category 1 (very slight) as per Ciria 580 and as such, there does not appear to be any due cause of concern.

6.4 If the Ground Investigation 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

7. CHECK

7.1 Proposed Category and Design Supervision Level.

Cat 3

7.2 If Category 3, name of proposed independent Checker
CHC Consulting Engineers

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.

002	Proposed Basement Layout	P4
003	Proposed Ground Floor Layout	P4
004	Proposed First Floor Layout	P4
005	Proposed 2nd/ 3rd Floor	P2
006	Proposed 4th Floor Layout	P2
007	Proposed Roof Layout	P2
011	Proposed Section & Details. Sheet 1	P3
012	Proposed Section & Details. Sheet 1	P2
013	Proposed Section & Details. Sheet 1	P2
018	Lift Layout & Sections	
030	Proposed Sections & Details. Sheet 1	P2
031	Proposed Sections & Details. Sheet 2	P2
032	Proposed Sections & Details. Sheet 3	P2
033	Proposed Sections & Details. Sheet 4	P2
100	Sequence of Construction . Sheet 1	P2
101	Sequence of Construction . Sheet 2	P2
102	Sequence of Construction . Sheet 3	P2
103	Sequence of Construction . Sheet 4	P2
104	Sequence of Construction . Sheet 5	P2
110	3D View Sequences of Construction. Sheet 1	P2
111	3D View Sequences of Construction. Sheet 2	P2
112	3D View Sequences of Construction. Sheet 3	P2
113	3D View Sequences of Construction. Sheet 4	P2
114	3D View Sequences of Construction. Sheet 5	P2
200	Geotechnical Cross Section	
	GEA 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	*David Murphy*
Name	David Murphy Design Team Leader
Engineering Qualifications	BSc (Eng), C.Eng, M.I.Struct.E, M.I.E.I 17
Name of Organisation	Aspire Consulting Engineers
Date	22-02-24

Signed	*Michael Hodnett*
Name	Michael Hodnett Check Team Leader
Engineering Qualifications	BSc (Eng), C.Eng, M.I.Struct.E, 17
Name of Organisation	CHC Consulting Engineers
Date	22-02-24

10. THE ABOVE IS REJECTED/AGREED[15] SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW 18

Signed	*Gnatkunan* Type text here
Name	G Natkunan
Position held	Structures Team Leader
Engineering Qualifications	BSc(Hons) CEng MICE 17
TAA	L B Camden

APPROVAL IN PRINCIPLE
(Bridge and other Highway Structures), Eurocodes

Name of Project: No.69 Charlotte Street

Date 13.3.2024

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 confirm that they have reviewed the risks and hazards identified in the AIP and are satisfied. Also see clause 2.27.
7. e.g. Load Models 1 and 2, BS EN 1991-2 [Ref 4.N]
8. e.g. SV model vehicle in Load Model 3, BS EN 1991-2 [Ref 4.N]
9. e.g. SOV model vehicle in Load Model 3, BS EN 1991-2 [Ref 4.N] 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 Highways England.
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. 2.84.
13. When the Ground Investigation Report becomes available, an addendum to the AIP, covering section 6, is to be submitted to the TAA.
The addendum is to 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 Ground Investigation 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, C Eng 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.