56 Platt's Lane
London
NW3 7NT

Proposal for basement extension

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INTRODUCTION

This document has been prepared for the purposes of Approval in Principle (AIP) of the proposed structural design and details for a new basement to be located within the existing outline of 56 Platt's Lane. S R Brunswick has been appointed by the client, i.e. the owner of 56 Platt's Lane to carry out the structural design for works for the project. Land Science were also appointed by the client with the purpose of carrying out a full geotechnical investigation of the property.

1.1 HIGHWAY DETAILS

1.2 Type of Highway

The proposed works are to be constructed adjacent to Platt's Lane, London NW3 7NT. The highway is a narrow single lane two-way carriageway with pavements to either side and is used for local access to private residential properties. The road is ground bearing.

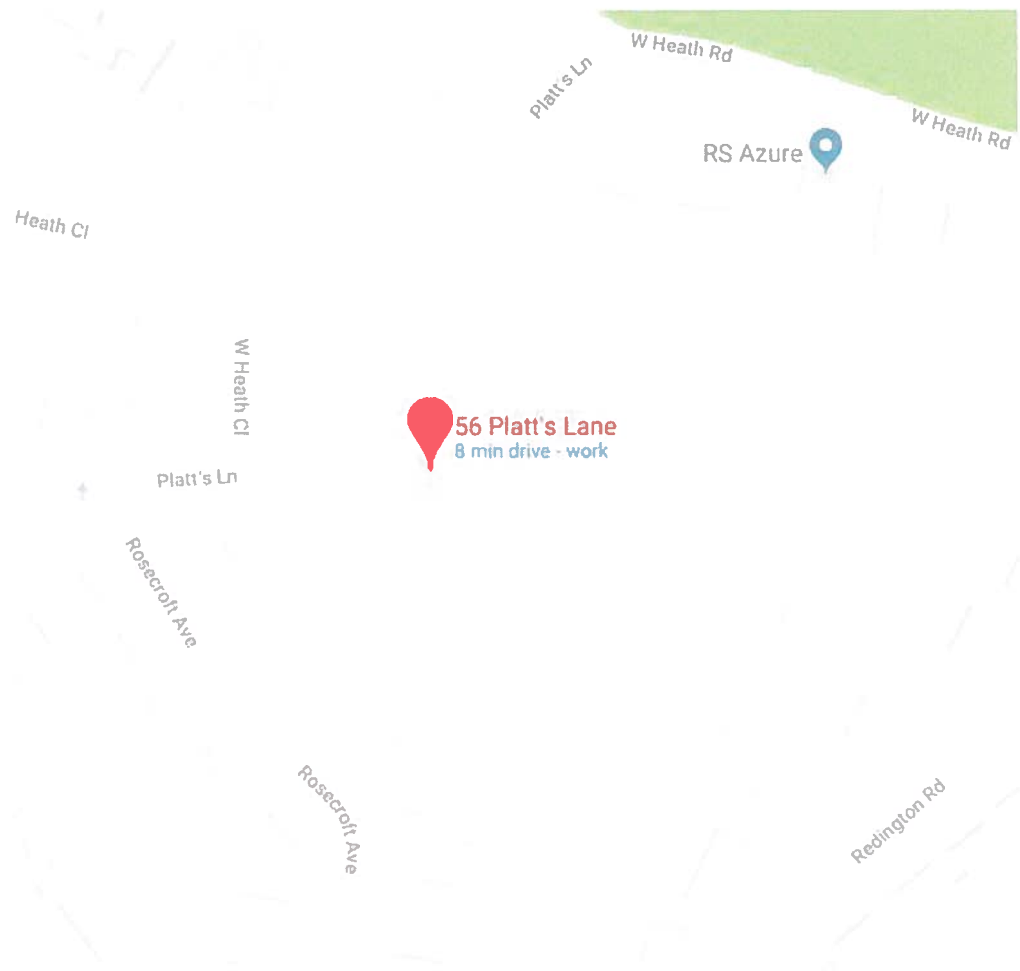


Figure 1.1 – Google Maps View showing 56 Platt's Lane

1.3 Permitted Traffic Speed

From road signage in place along Platt's Lane it is apparent that the legal speed limit on Platt's Lane is 20mph.

1.4 Existing Restrictions

Unknown – Camden Highways to comment on vehicle restrictions and allowable highway load rating.

2.1 SITE DETAILS

2.2 Obstacles Crossed

Generally, the properties along either side of the public highway of Platt's Lane have lower ground floors or basements.

On the boundary between the property and the public highway there is an existing masonry wall.

Figure 2.1.1 – Image of Front Elevation

3.1 PROPOSED STRUCTURE

3.2 Description of Structure and Design Working Life

The proposed works will include underpinning to the existing masonry boundary external walls as well as providing a new 350mm thick RC retaining wall and base slab. For further information refer to SR Brunswick permanent works drawings included in Appendix A at the back of this document. The minimum design working life of the proposed structure is to be 60 years. Additionally, a monitoring proposal has been prepared by SR Brunswick, also included in Appendix A.

3.3 Structural Type

The new RC retaining wall will be 350mm thick in-situ reinforced concrete. Concrete strength for underpinning is to have a minimum strength class of C25/30 and concrete strength for the new RC retaining wall is to have a minimum strength class of C32/40.

3.4 Foundation Type

The RC retaining walls will be founded on a ground bearing base slab, 350mm thick reinforced concrete with a minimum strength class of C32/40.

3.5 Span Arrangements

The basement is designed as a reinforced concrete box formed by underpinning the existing property and linking the underpins to a structural raft slab. The raft slab will act as a restraint to the perimeter retaining walls and transfer the load to the ground. The retaining walls have been designed as free standing cantilevers as this is the worst case and will have continuity reinforcement to link all the sections together. The internal loadbearing walls are to be carried b new structural support beams spanning between the new external retaining walls and any internal column support as appropriate.

3.6 Articulation Arrangements

The retaining wall has been designed as a vertical free cantilever.

3.7 Road Restraint Systems Requirements

Not applicable.

3.8 Proposed Arrangements for Future Maintenance and Inspection of Structure

3.8.1 Traffic Management – See traffic Management Plan below.

3.8.2 Arrangements for future maintenance and inspection of structure.

Access to be as and when required can be agreed with the owner/occupants.

3.8.3 Intrusive or further investigations proposed – Not currently required, ground test and soil report carried out, see Appendix B.

3.9 Environment and Sustainability

The new structure is to be installed where there is existing masonry structure and hard standing area so there is little or no impact on the environment. From an overall sustainability perspective, the proposed new concrete structure has been specified to contain a percentage of recycled aggregate, min. 20% as well as the option for a cement replacement such as GGBS (ground granulated blast-furnace slag) which will serve to minimise the carbon footprint of the proposed new structure.

3.10 Durability, Materials and Material Strengths

For durability purposes the minimum nominal cover to reinforcement in the RC retaining wall will be 40mm which is adequate for 'severe' exposure conditions as per Table 4.8 from BS 8110 - Part 1. The minimum concrete strength class is to be cube strength 40N/mm² at 28 days. Steel reinforcement is to be high yield grade 500B in accordance with BS 4449.

3.11 Risks and Hazards Considered for Design, Execution, Maintenance and Demolition

The proposed alterations have been designed so that all temporary loads from the building above, adjacent properties and the highway / pavement have been considered and designed into the permanent design.

The existing property is of traditional masonry and timber design for a domestic property and so care will be required in executing the underpinning and because of the depth the reinforced underpins will be constructed on a hit and miss basis in 2 staggered lifts to minimise and movement of the property.

The design parameters used in the design are on the basis of a 60 year life to reflect the standards used for new build property and it is expected that the new basement structure will last for the life time of the property. The detailing and concrete cover / strength reflect the permanent works design life and requirements of the Building Regulations and appropriate design codes.

There are no residual risks from this work as no voids are being left outside of the structure and as the water table is well below the raft level, no water courses in the ground will be affected.

3.12 Estimated Cost of Structure and other Structural forms Considered

The cost of the proposed new structure has been factored into the overall cost of the refurbishment of 56 Platt's Lane. The proposed cost for the structural works are £180,000.00.

3.13 Proposed Arrangements for Construction

3.13.1 Construction of Structure

The following outline construction sequence is to be followed;

- Remove existing structural floors from ground floor.
- Underpin operation to be carried out in sequence. 1m long sections and reduce dig to formation of new RC base slab including waling beams to support as underpin progresses.
- Temporary support to existing structural partitions to be fixed during underpin operation.
- Cast new ground bearing RC slab and remove temporary waling beams and props.

Refer to sketches in Appendix A.

3.13.2 Traffic Management – Access to be via front of property, road is of sufficient width to allow for wide vehicles to offload.

3.13.3 Service Diversions – Not Applicable.

3.13.4 Interface with Existing Structures.

The new RC retaining walls are to be cast below the existing masonry wall 75mm dry packing to be inserted between underpin and existing masonry wall.

3.14 Year of Construction

2019

3.15 Reason for Assessment

In preparing the design proposal it was necessary to review the condition of the existing property and assess its condition and ability to accommodate the proposed works without causing any damage. This is also applicable to the neighbours and adjacent highway bearing in mind that the property is on a slope and the potential for slippage of the ground during the excavation. To facilitate this trial holes were dug and a bore hole undertaken which has demonstrated that the building is founded on sand which extends to below the new proposed foundations,

3.16 Part of Structure Assessed

The assessment undertaken comprised the existing property and immediate areas on the boundary. The Property is in good condition and comprises load bearing walls and timber floors as would be expected for this property. Foundations are traditional spread footings founded on the underlying sands

4.1 DESIGN CRITERIA

4.2 Design Codes of Practice

The proposed works have been designed in accordance with the following British Standards:

- BS 6399 - Part 1: Code of Practice for Dead and Imposed Loads
- BS 6399 - Part 2: Code of Practice for Wind Loads
- BS 8110 – All Parts: Codes of Practice for the Structural Use of Concrete
- BS 5950 – All Parts: Codes of Practice for Structural Use of Steelwork
- BS 8002: Code of Practice for Earth Retaining Structures
- BS 8102: Code of Practice for Protection of Structures against Ground Water

4.3 Live Load Surcharge for Retaining Wall

A live load surcharge of $10kN/m^2$ is deemed appropriate and has been used in the structural design of the RC retaining wall as per BS 5400: Part 2, Clause 5.8.2.1 (a), HA loading.

4.4 Authorities Consulted – London Borough of Camden

The maximum deflection at road level is to be less than 125mm.

5.1 STRUCTURAL ANALYSIS

5.2 Method of Analysis

The structure has been analysed as a vertical cantilevered retaining wall which is to be supported by a ground bearing base slab. Detailed design calculations have been carried out.

5.3 Soil Parameters

With regard to soil parameters for the purposes of design of the retaining wall to the public footpath an angle of shearing resistance of 24 degrees has been assumed resulting in an active pressure co-efficient of 0.42. See Appendix C.

6.0 GEOTECHNICAL CONDITIONS

6.1 Site Investigation

SR Brunswick & Land Science have carried out an intrusive ground investigation and the interpretive report is included in Appendix C. The recommendations included in this report with respect to safe bearing capacities, angle of shearing resistance and other parameters have been adopted in the design.

7.0 CATEGORY CHECK

7.1 In accordance with BD2/12, CLAUSE 3.4.2 (c), it is recommended that the proposed development be classed as a Category 1 structure, i.e. *"earth retaining structure with an effective height of 2m or greater but less than 7m"*.

8.0 DRAWINGS AND DOCUMENTS

8.1 List of Drawings:

9.0 STATEMENT BY DESIGNER

9.1 The design is submitted for Approval in Principle on behalf of SR Brunswick, 138 Woodcock Hill, Kenton, Middlesex HA3 0JN. As part of my design I have reviewed the soils investigation results and incorporated them into my design for the basement at 56 Platt's Lane.

Signed:
Name: Steven Brunswick
Position Held: Director
Date: 6th August 2018

10.0 STATEMENT BY TECHNICAL APPROVAL AUTHORITY (TAA)

10.1 The design is agreed / rejected *(delete as appropriate)* subject to the amendments and conditions shown below.

Signed: ______________________________

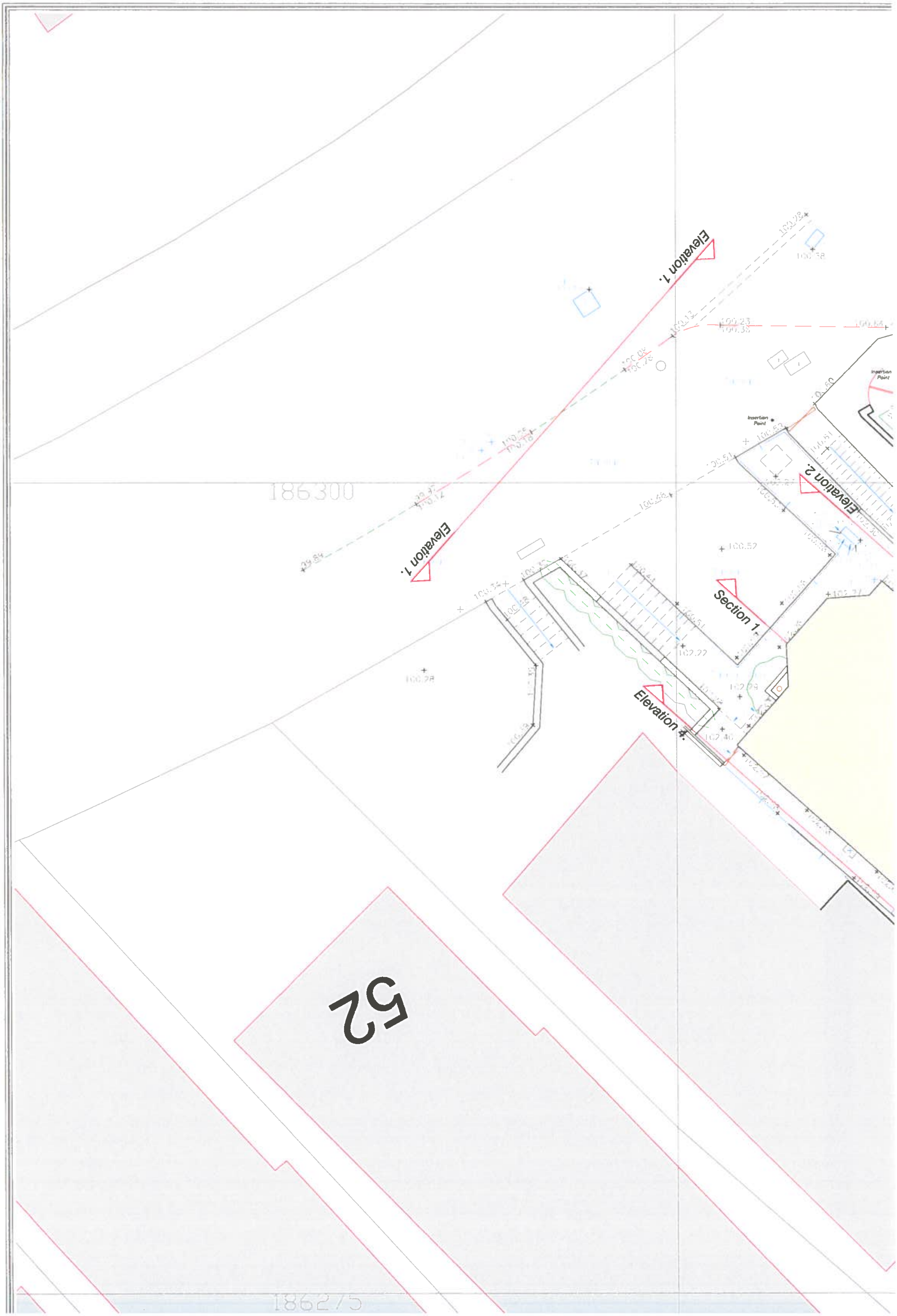
Name: ______________________________

Position Held: ________________________

TAA: ______________________________

Date: ______________________________

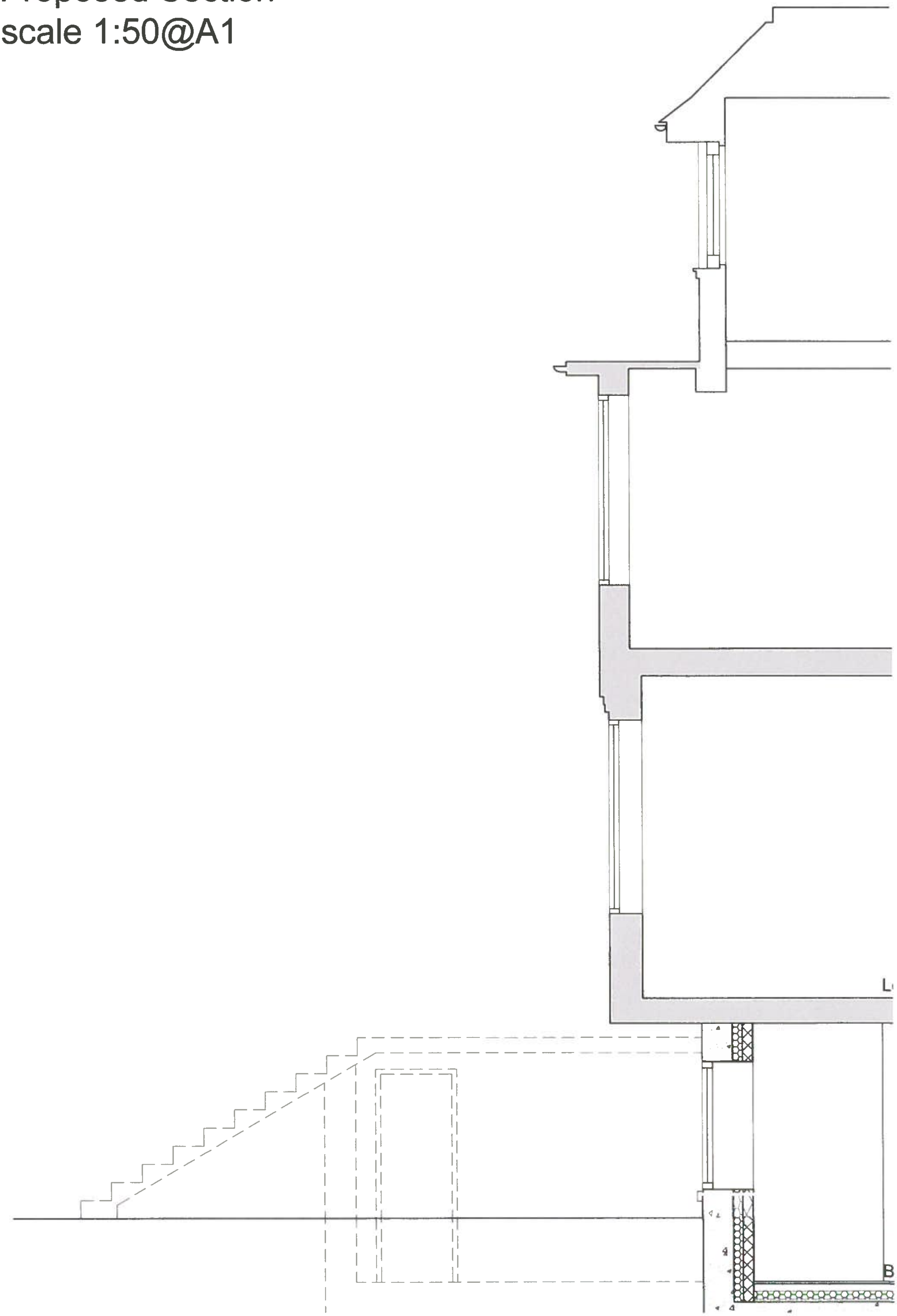
APPENDIX A – Permanent Works Drawings



186300
Elevation 1.
Elevation 1.
Elevation 2.
Section 1
Elevation 4.
52
186275

Proposed Elevation
scale 1:50@A1

Proposed Section
scale 1:50@A1



APPENDIX B – Structural Calculations

S R BRUNSWICK CEng FICE
138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

Prepared by:	Sheet:
SRB	1720 - 1
Checked by:	Date: Aug '17

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The following calculations are for the design of internal alterations and new basement to this traditional property.

These calculations should be read in conjunction with all relevant Architects Drawings. The caculations have been prepared to comply with all relevant British Standards and Building Regulations.

Loadings

Roof - 35 degree pitch

slates	0.50	KN/m2
Battens & Felt	0.10	KN/m2
Rafters	0.10	KN/m2
P/bd and skim	0.30	KN/m2
	1.00	KN/m2

Plan load $\frac{1}{\cos 35}$ 1.22 KN/m2

Super 0.6 KN/m2

1.82 KN/m2

say 1.9 KN/m2

Flat roof to dormer = 1.9 KN/m2

Floor

Boards	0.15	KN/m2
Joists	0.15	KN/m2
Plasterboard & Skim	0.30	KN/m2
Super	1.50	KN/m2
	2.10	KN/m2

Partitions - stud say 0.60 KN/m2

Cavity Wall	3.60	KN/m2
Solid wall 215	say 4.50	KN/m2
Solid wall 340	say 7.2	KN/m2
Dormer cheek	say 1.5	KN/m2

Timber to be Grade C16 to BS 5268
Steel to be Grade 43 to BS 449

S R BRUNSWICK CEng FICE

138 Woodcock Hill, Kenton, Middlesex HA3 0JN

Mob: 07803 262 009

E Mail: srb@srbrunswick.com

Prepared by:	Sheet:
SRB	1720 - 2 Rev A
Checked by:	**Date:**
	Aug '17

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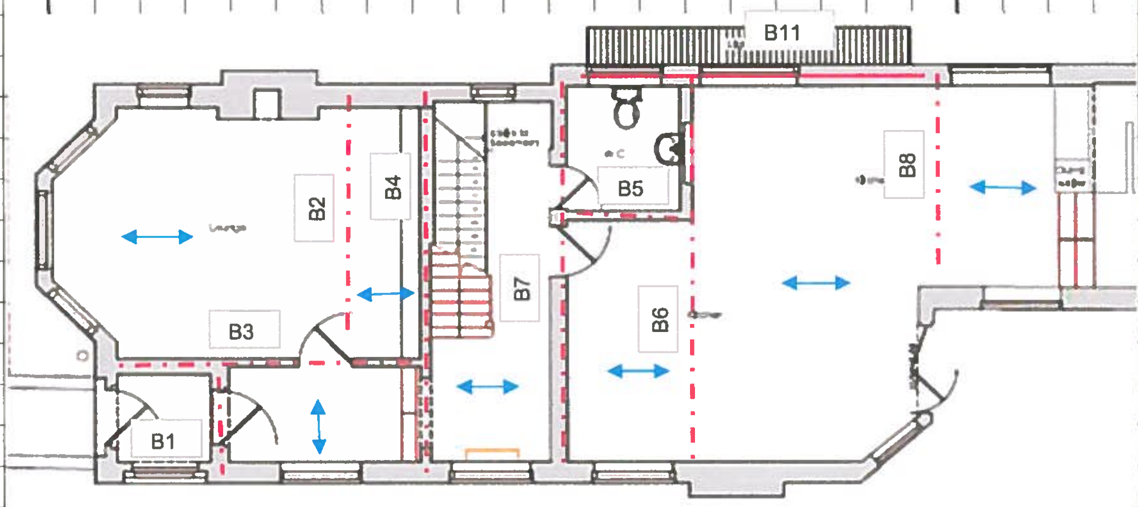
Ground Floor Plan Showing Supporting Structure Under

Ground floor to be reconstructed in timber

Rev A Basement layout amended B9 & B10 deleted



PROPOSED GROUND FLOOR PLAN

B1 - 152 UC 23 with 200 x 6 top plate
B2 - 152 UC 30
B3 - 203 UC 60
B4 - 305 UC 158
B5 - 152 UC 23
B6 - 254 UC 73
B7 - 305 UC 198
B8 - 152 UC 23
~~B9 - 203 UC 46~~
~~B10 - 203 UC 46~~
B11 - 203 UC 46
Column 139.7 CHS founded on 1.2 x 1.2 x 500 thickening in raft (150mm deeper section locally)

Beam to Beam connection to be with 10mm end plate and 4M20 Grade 8.8 bolts, 6mm full profile fillet weld

Where beams sit on retaining wall provide 2 M20 Grade 8.8 anchor bolts

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138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

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Design of floor joists

Case 1 to lounge over Bedroom   Span 4100

UDL 2.1 KN/m2

Max BM 2.1 x 4.1Sq / 8 = 4.4 KNm/m

Z Reqd 4.4e6 / 5.3 x 1.1 = 757 mm3 / m

Try 225 x 50 @ 400 ctrs (Z = 940 e3 mm3)

Deflection
5 x 2.1 x 0.4 x (4.1)4 x e3 / 384 x 8.8 x 41.1 = 8.5mm

span x 0.002   OK

Worst case so provide 225 x 50 @ 400 ctrs in all areas

Beam B1

Span 1800

Loading
225 wall 4.5 KN/m2 x 2.5 x 90% = 10.1 KN/m
Floor say 2.1 KN/m2 x 1.5m = 3.2 KN/m
13.3 KN/m   Reaction 12 KN

BM 13.3 x 1.8Sq / 8 = 5.4 KNM

By inspection provide 152 UC 23 in floor depth

Beam B2

Span 4400

Loading
Udl floor = 2.1 KN/m2 x 6 / 2 = 6.3 KN/m   Reaction = 13.9 KN

Max BM 6.3 x 4.4Sq / 8 = 15.3 KNm

Try 152 UC 23
L/Ry = 1.2 x 4400 / 36.8 = 144

Pbc = 98 N/mm2

Fbc = 15.3 e6 / 165.7 e3 = 92 N/mm2
OK

Provide
152 UC 30

Deflection
5 x 6.3 x (4.4)4 x e5 / 384 x 210 x 1263 = 11.5mm   Deflection = 8.3mm
too high

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138 Woodcock Hill, Kenton, Middlesex HA3 0JN
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Bwam B3

Span 5100

Loading

UDL 1

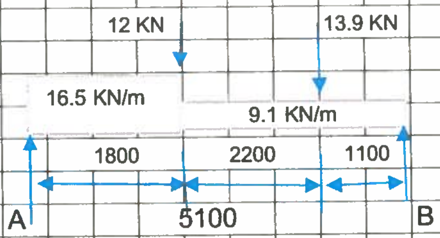
Wall 2.2 KN/m2 x 3.2 = 7.0 KN/m
Floor 2.1 KN/m2 x 2 / 2 = 2.1 KN/m
9.1 KN/m

UDL 2

Wall 4.5 KN/m2 x 3.2 = 14.4 KN/m
Floor 2.1 KN/m2 x 2 / 2 = 2.1 KN/m
16.5 KN/m

Point load B1 = 12 KN
B2 = 13.9 KN

Ra = 9.1 x 3.3 x 1.65 / 5.1 +
16.5 x 1.8 x 4.2 / 5.1 +
12 x 3.3 / 5.1 +
13.9 x 1.1 / 5.1 =
44.9 KN



Rb = 9.1 x 3.3 x 3.45 / 5.1 +
16.5 x 1.8 x 0.9 / 5.1 +
12 x 1.8 / 5.1 +
13.9 x 4.0 / 5.1 = 40.7 KN

Point of zero shear from B = (40.7 - 13.9) / 9.1 = 2.945m

Max BM 40.7 x 2.945 - 13.9 x 1.845 - 9.1 x 2.945 Sq / 2 =
54.8 KNm

Try 201 UC 46

L / Ry = 1.2 x 5100 / 51.1 = 120

Pbc = 125 N/mm2

Fbc = 54.8 e6 / 449.2 e3 = 122 N/mm2

Deflection

Equivalent UDL = 8 x 54.8 / 5.1Sq = 16.9 KN/m

5 x 16.9 x (5.1)4 x e5 / 384 x 210 x 4564 = 15.5 mm

Too high

Provide
203 UC 60
Deflection = 11.6mm
Span / 435

S R BRUNSWICK CEng FICE
138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

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Checked by:

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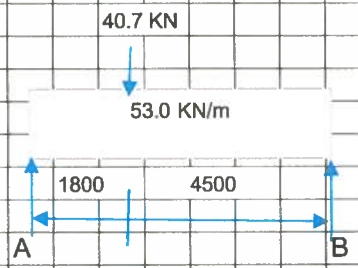
Beam B4

Span 6300

Loading

Roof	1.9 KN/m2 x 8 / 2	=	7.6 KN/m
2nd Flr	2.1 Kn/m2 x say 3m	=	6.3 KN/m
1st Flr	2.1 Kn/m2 x 8 / 2	=	8.4 KN/m
Grd Flr	2.1 KN/m2 x 3.5 / 2	=	3.7 KN/m
Wall	say 3Kn/m2 ave x 9m	=	27.0 KN/m
			53.0 KN/m

Point load B3 = 40.7 KN



Ra = 53 x 6.3 / 2 +
40.7 x 4.5 / 6.3 =
196.0 KN

Rb = 53 x 6.3 / 2 +
40.7 x 1.8 / 6.3 =
178.5 KN

Point of zero shear from B = 178.5 / 53 = 3.368

Max BM 178.5 x 3.368 / 2 = 300.6 KNM

Try 305 UC 158

L / Ry = 1.2 x 6300 / 78.9 = 96

Pbc = 149 N/mm2

Fbc = 300.6 e6 / 2368 e3 = 127 N/mm2

OK

Deflection

Equivalent UDL 8 x 300.6 / 6.3Sq = 60.6 KN/m

5 x 60.6 x (6.3)4 x e5 / 384 x 210 x 38740 = 15.2mm

Span / 412

OK

Provide
305 UC 158

Beam B5

Span 2000

Loading

wall	2.2 Kn/m2 x 2.7	=	5.9 KN/m
Floor	2.1 Kn/m2 x say 1	=	2.1 KN/m
			8.0 KN/m

Reaction 8 KN

Max BM 8 x 2 Sq / 8 = 4 KNm

By inspection provide 152 UC 23 as B1

Provide
152 UC 23

S R BRUNSWICK CEng FICE
138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

Prepared by: SRB
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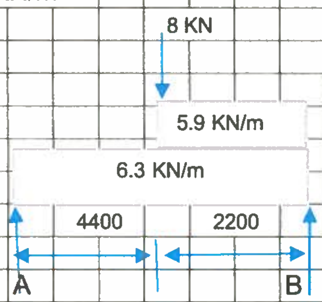
Beam B6

Span 6600

Loading
|Floor 2.1 KN/m2 x 6 / 2 = 6.3 KN/m

e/o wall as B5 = 5.9 KN/m

Point load B5 = 8 KN



Ra = 6.3 x 6.6 / 2 + 8 x 2.2 / 6.6 +
5.9 x 2.2 x 1.1 / 6.6 =
25.6 KN

Ra = 6.3 x 6.6 / 2 + 8 x 4.4 / 6.6 +
5.9 x 2.2 x 5.5 / 6.6 =
36.9 KN

Point of zero shear from A = 25.6 / 6.3 = 4.06m

Max BM 25.6 x 4.06 / 2 = 52 KNm

Try 203 UC 52

L / ry = 1.2 x 6600 / 51.6 = 154

Pbc = 106 N/mm2

Fbc = 52 e6 / 510.4 e3 = 102 N/mm2

OK

Deflection
Equivalent UDL 8 x 52 / 6.6 Sq = 9.6 Kn/m

5 x 9.6 x (6.6)4 x e5 / 384 x 210 x 5263 = 21.5 mm

too high

Provide
254 UC 73
deflection = 9.9mm

Beam B7

Span 6300

Loading

Roof	1.9 Kn/m2 x 8 / 2	= 7.6 KN/m
2nd flr	2.1 KN/m2 x 8 / 2	= 8.4 KN/m
1st flr	2.1Kn/m2 x 8 / 2	= 8.4 KN/m
Partitions	0.6KN/m2 x 2.7 x 3	= 4.9 Kn/m
Grd flr	2.1 KN/m2 x 8 / 2	= 8.4 Kn/m2
Wall grd & 1st	4.5 KN/m2 x 6.5m	= 29.3 KN/m
Wall 2nd	0.6 KN/m2 x 2.7	= 1.6 KN/m
		68.6 KN/m

Point load B5 = 8 KN

S R BRUNSWICK CEng FICE
138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

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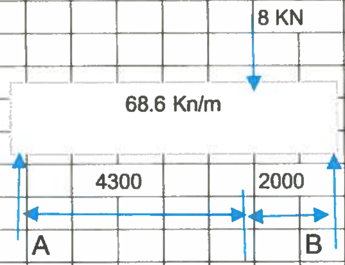
Ra = 68.6 x 6.3 / 2 + 8 x 2 / 6.3 =

218.6 KN

Rb = 68.6 x 6.3 / 2 + 8 x 4.3 / 6.3 =

221.6 KN



Point of zero shear from A
218.6 / 68.6 = 3.19m

Max BM 218.6 x 3.19 / 2 = 348.3 KNm

Try 305 UC 158
L / Ry = 1.2 x 6300 / 78.9 = 96

Pbc = 152 N/mm2

Fbc = 348.3 e6 / 2368 e3 = 147 N/mm2

Deflection
Equivalent UDL = 8 x 348.3 / 6.3Sq = 70.2 KN/m
5 x 70.2 x (6.3)4 x e5 / 384 x 210 x 38740 = 17.7mm

Too high Provide 305 UC 198
Deflection = 13.5mm
Span / 465

Beam B8

Span 3600

UDL floor 2.1 KN/m2 x 6.5 / 2 = 6.8 Kn/m

Reaction 13 KN

Max BM 6.8 x 3.6Sq / 8 = 11 KNm

Try 152 UC 23
L / Ry = 1.2 x 3600 / 36.8 = 117

Pbc = 119 N/mm2

Fbc = 11 e6 / 165.7 e3 = 66 N/mm2

Deflection
5 x 6.8 x (3.6)4 x e5 / 384 x 210 x 1263 = 5.6mm

Provide
152 UC 23

Span / 640

S R BRUNSWICK CEng FICE

138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

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Beam B9

Span 3000

Loading

225 wall	4.5 KN/m2 x 5.5	=	24.8 Kn/m
Roof	1.9 KN/m2 x 4 / 2	=	3.8 Kn/m
1st Flr	2.1 KN/m2 x 4 / 2	=	4.2 KN/m
Grd Flr	2.1 KN/m2 x say 1	=	2.1 KN/m
Ext slab	6.3 KN/m x 2.3 / 2	=	7.3 KN/m
			42.2 KN/m

Reaction 63.3 KN

Max BM 42.2 x 3Sq / 8 = 47.5 KNm

Try 203 UC 46

L / Ry = 1.2 x 3000 / 51.1 = 70

Pbc = 163 N/mm2

Fbc = 47.5 e6 / 449.2 e3 = 106 N/mm2

OK

Deflection

5 x 42.2 x (3)4 x e5 / 384 x 210 x 4564 = 4.6mm

Span / 645

Provide
203 UC 46

Beam 10

Span 2300

Loading

225 wall	4.5 KN/m2 x 5.5	=	24.8 Kn/m
Roof	1.9 KN/m2 x 6 / 2	=	5.7 Kn/m
1st Flr	2.1 KN/m2 x 4 / 2	=	4.2 KN/m
Grd Flr	2.1 KN/m2 x 4 / 2	=	4.2 KN/m
Ext slab	6.3 Kn/m2 x 3 / 2	=	9.5 KN/m
			48.4 KN

Reaction 55.7 KN

Max BM 48.4 x 2.3 Sq / 8 = 32 KNm

By inspection provide 203 UC 46

Beam 11 - over light well

Beam to be in 3 spans

Sapn 2300 max

Loading

225 wall	4.5 KN/m2 x 6.5	=	29.3 Kn/m
Roof	1.9 KN/m2 x 7 / 2	=	6.7 Kn/m
2nd Flr	2.1 KN/m2 x say 2m	=	4.2 KN/m
1st Flr	2.1 KN/m2 x 7 / 2	=	7.4 KN/m
Grd Flr	2.1 KN/m2 x say 1	=	2.1 KN/m
			49.7 KN/m

Reaction 57.2 KN

Max BM 49.7 x 2.3Sq / 8 = 32.9 KNm

By inspection Provide 203 UC 46

S R BRUNSWICK CEng FICE
138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

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Column Support to B8, 9 & 10

Height 3200

Loading

B8	13 KN
B9	63.3 KN
B10	55.7 KN
	132 KN

Connection to top of column will be a cap connection with B9 sitting on the column and B8 and B10 bolting to it

BM say 132KN x 0.075 = 9.9 KNm

Try 139.7 CHS t = 10mm

L / Ry = 1.5 x 3200 / 46 = 104

Pbc = 180 N/mm2 Pc = 78 N/mm2

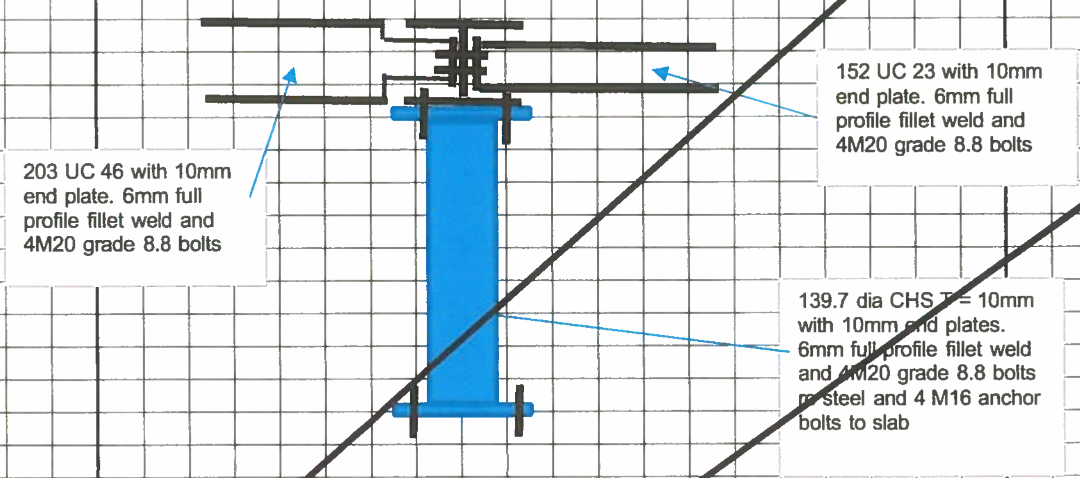
Fbc = 9.9 e6 / 123 e3 = 81 N/mm2

Fc = 132 e3 / 40.7 e2 = 33 N/mm2

UF 81 / 180 + 33 / 78 = 0.87

OK

Provide
139.7 dia CHS
t = 10mm



Column bearing on basement slab
GBP = 132 / 1.2 x 1.2 = 92 KN/m2
OK

S R BRUNSWICK CEng FICE
138 Woodcock Hill, Kenton, Middlesex HA3 0JN
Mob: 07803 262 009
E Mail: srb@srbrunswick.com

56 Platts Lane, Hampstead

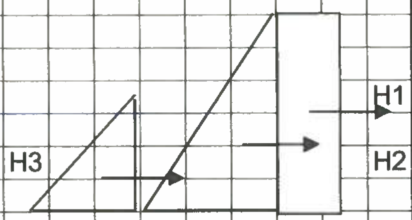
Design of Basement

The basement is formed within the slope of the ground with a maximum retained height of 3.5m. The walls are to be constructed as reinforced concrete underpins connected to the raft and built in strips. to provide stability.

Maximum height 3.5m

Assumed soil parameters for dense sand as found in trial holes
density 18 KN/m2 Angle of internal friction 40 degrees
Ka = 0.26

Surcharge say 5 KN/m2



H1 5 KN/m2 x 0.26 x 3.5 = 4.6 KN/m
H2 soil = 18 x 0.26 x 3.5Sq/2
28.7 KN/m

H3 Water = 10KN/m2 x 2.5Sq/2
31.3 KN/m

Max BM at base of wall
4.6 x 3.5/2 + 28.7 x 3.5 / 3 + 31.3 x 2.5/3 = 67.6 KNm

Ult load say 67.6 KN/m x 1.55 = 104.8 KNm

Try 350 thick RC wall
Cover say 40mm d = 300

M/b*dsq*fcu = 105 e6 / (e3 x 300Sq x 35) = 0.033

a1 = 0.94

Ast = 105 e6 / (0.87 x 500 x 0.94 x 300) = 856 mm2 / m

Provide T16 @ 150 ctrs (1340 mm2) in each face vertically
Distribution steel T12 @ 150 ctrs (754 mm2 / m in each face)

min steel 0.13% area = 455 mm2/m

Check slenderness
Span / depth = 7 M/bdSq = 1.17
Mf = 1.75
Mf compression steel 1.12

Allowable span = 7 x 1.75 x 1.12 x 300 = 4110
OK

S R BRUNSWICK CEng FICE	Prepared by: SRB	Sheet: 1720 - 11
138 Woodcock Hill, Kenton, Middlesex HA3 0JN Mob: 07803 262 009 E Mail: srb@srbrunswick.com	Checked by:	Date: Aug '17

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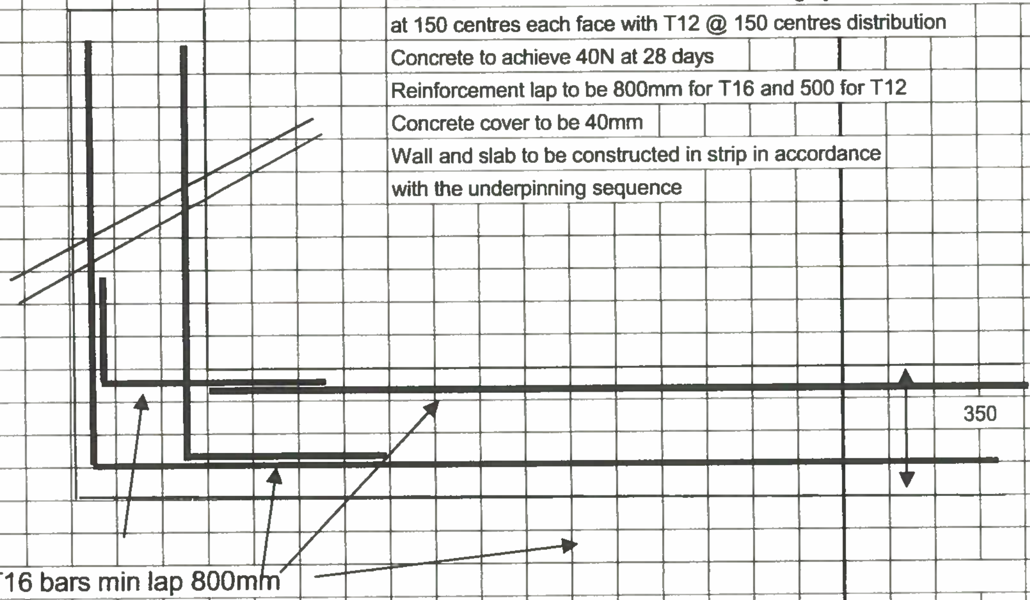
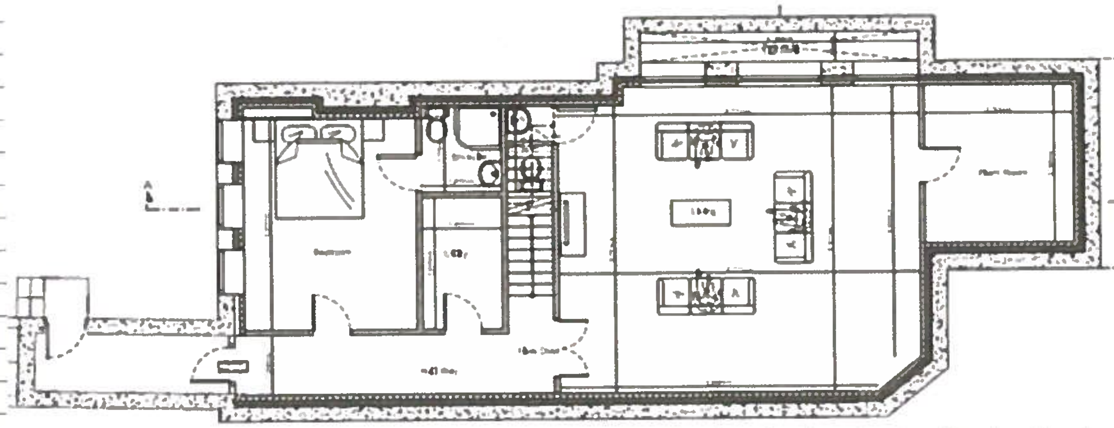
350 RC wall and base reinforced with T16 high yield bar reinforcement at 150 centres each face with T12 @ 150 centres distribution
Concrete to achieve 40N at 28 days
Reinforcement lap to be 800mm for T16 and 500 for T12
Concrete cover to be 40mm
Wall and slab to be constructed in strip in accordance with the underpinning sequence

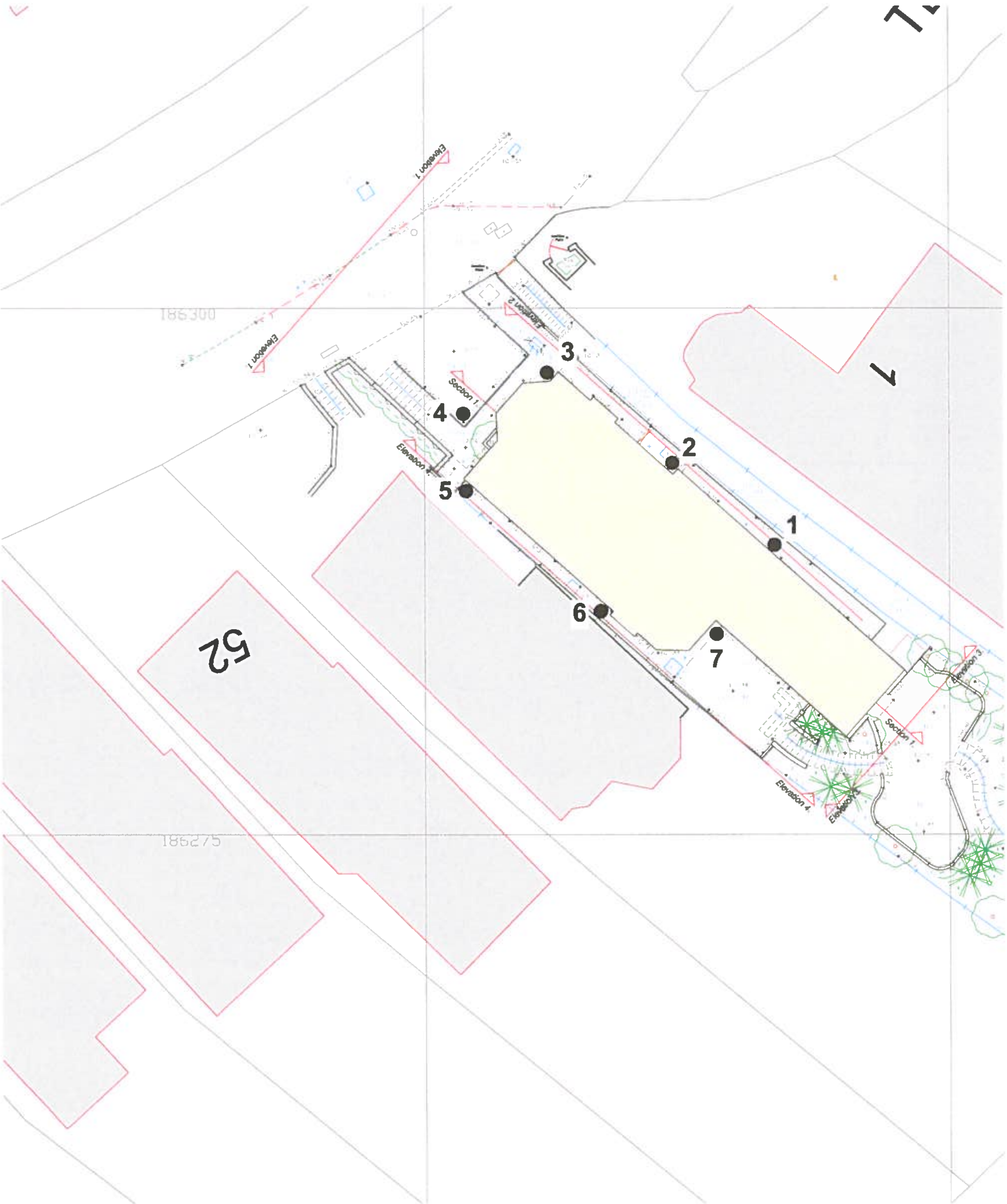


Typical RC detail, Applicable for whole basement



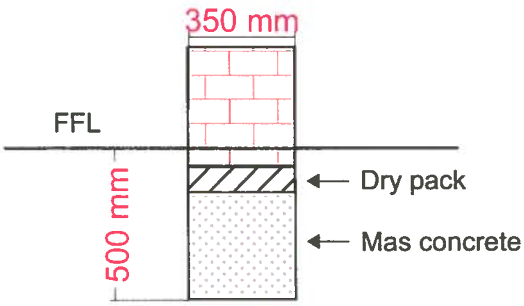
Basement Plan

APPENDIX C – Trial Hole Details & Geotechnical Ground Investigation



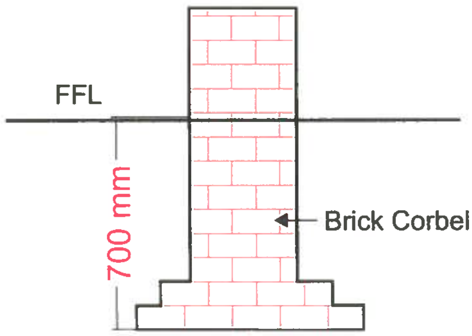
1
2
3
4
5
6
7
Section 1
Elevation 1
Elevation 2
Elevation 3
Elevation 4
186300
186275
52

Trial Hole 1 & 2



Trial Hole 4 & Sectic

Trial Hole 3 & 5



Trial Hole 6 & 7