PRICE&MYERS

REPORT

23 Netherhall Gardens

Construction Method Statement

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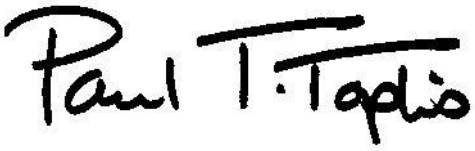

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Reviewed by:

Job Number: 24935

Date	Version	Notes / Amendments / Issue Purpose
May 2016	1	Initial Issue

1 Introduction

This report describes the structural engineering proposals associated with the proposed extension and alteration of this house. It provides input for the ground movement assessment carried out as a part of the Geotechnical & Environmental Associates Basement Impact Assessment.

The house was probably built in the 1880's or 1890's; it is shown on the Swiss Cottage historic map for 1894 and the area between Hampstead and Swiss Cottage is understood to have been built after the Hampstead Map of 1866 was published which shows the area now occupied by Netherhall Gardens as a part of Mount Farm. The house is on the west side of the street located about mid-way between the two railway tunnels that run east west crossing Netherhall Gardens to the south near Nutley Terrace and running parallel to the northern end of Netherhall Gardens, which runs in a east-west direction.

Price & Myers have been appointed by the client to complete the structural engineering design work and to review the work on site

2 Surveys and Ground Conditions

Geotechnical & Environmental Associates have completed an intrusive site investigation to determine details of existing footings, the underlying ground conditions – which have been confirmed as London Clay, and to check ground water levels. Their investigation report forms part of the project Basement Impact Assessment. Preliminary design for the building extension has been based on the initial findings of the ground investigation made available before the laboratory testing that allowed the report to be completed.

This report addresses the issue of ground water, hydrology and ground stability required by the Camden Planning Guidance CPG4: Basements and lightwells.

3 Proposals

Introduction

In principle the alterations consist of removal of large sections of the rear façade at lower ground floor to connect the house to the garden; the lower ground floor is lowered to assist in making this connection; a small basement floor is added at the rear below a single storey "garden pavilion" extension.

Permanent Works

The scope of the structural alterations to the house are shown on the drawings in appendix B, for work to the new basement and existing lower ground floor. Underpinning of the existing northern wall of the house and some internal loadbearing walls is expected to allow the change in floor level required to help link the floor to the garden on what is a naturally sloping site falling to the east and south.

In addition to the concrete box construction for the basement new steel beams are required to support the rear elevation of the house; for the larger opening these beams are part of a frame to provide lateral stability currently provided by the walls. There is also a single storey pavilion extension at lower ground level this has a timber joisted roof supported by steel posts.

Temporary Works

Due to the limited site access it is expected that only small scale plant can be used for the building work. Piling to form the retaining walls was considered but has not been shown as part of the permanent works, in part for this reason. Traditional underpinning is required at least in part under the existing building anyway so a construction sequence has been prepared that allows for excavation by hand. In order to minimise the building movement that will result from the excavation the perimeter walls will be formed by underpins that are then propped at the top before the main excavation starts. The drawings in appendix C outline the proposed overall construction sequence for the basement. As noted in the Basement Impact Assessment some form of control of groundwater flow is likely to be needed when digging the underpins. . It is expected that the volumes will be small and that a small portable sump pump will be adequate. However the programme of work will be set such that the first pin is used as a trial excavation to check the extent of water that needs to be dealt with and confirm that pumps of sufficient capacity are being used.

It is proposed that the basement work is completed before the existing walls are supported by props and needles to allow installation of the new steel supports to the rear elevation.

5 Construction Methodology

Health & Safety

The Contractor will provide their own welfare facilities, establish a safety briefing system for site visitors and their own procedures for emergency evacuation; all workers and visitors will be briefed on the site safety procedures before entering site.

At all times while the basement is under construction the Contractor will have an experienced supervisor on site, who will act as the Temporary Works Co-ordinator; supported by the Contractor's Temporary Works Designer. All temporary works designs will be agreed with Price & Myers.

Proposals for dealing the noise produced by the works on site will be agreed with the Camden Council Environmental Health Officer at the outset of the project.

Site Logistics

The narrow access each side of the existing house will limit the delivery of materials to the site. The Contractor will prepare detailed logistic plans to ensure that deliveries do not result in vehicles waiting or queueing on Netherhall Gardens. When excavation of the basement is underway a secure hoarding will be erected between the property and number 21 within the adjoining garden.

Site Hoardings and Security

The building site will have a secure boundary in place at all times; this will be adjusted during the work to suit the progress of construction.

Existing Tree

The layout of the garden extension has been planned to limit the need for construction under the tree canopy, which is expected to be of a similar area to the root protection zone.

Movement Monitoring

It is essential to check that the effect of the construction work will have on the existing house and the surrounding buildings. The work has been planned and will be supervised to minimise the potential for any movement in the house or adjoining houses, in particular number 21. The

monitoring should demonstrate that the measures taken have performed as required; if however the trigger levels are reached it will allow the swiftest possible action to be taken to limit building movement.

The movement monitoring will be carried out by a specialist surveyor. The survey shall be to an array of targets fixed to the house and to number 21 at locations to be agreed but at least three targets on each of the front and flank elevations of each building, and on the front bays of the house where the ground movement analysis suggests that building damage could be slight. The targets and surveying system will allow for measurement in three orthogonal directions.

Readings shall be taken fortnightly from the start of the work on site; the targets will be installed within a week of the work starting, until the major underpinning and excavation work start when monitoring shall be carried out weekly. When the work to form the new basement is complete the frequency of readings shall be reduced to monthly until the structural work is complete; a final set of readings should be taken after a further 6 months.

Reports recording the site readings in tabular and graphical format will be issued to all Parties within two days of the measurements being carried out. These will show the trend and size of any movements.

When there is a difference between two individual readings in excess of 6mm recorded and this shows a trend of increasing movement, or there is an overall trend of increasing movement in excess of 8mm, this is a “cause for concern” and the Contractor and Engineer are to assess the need to carry out any additional works to provide temporary support to the excavation or adjust the planned work sequence to reduce the potential for further movement. Where there is a “cause for concern” all Parties are to be informed of the result of the review and of any agreed additional works or adjustment to the planned work sequence

Should there is a difference between two individual readings in excess of 10mm recorded; work will be suspended as soon as practicable until all Parties agree on the action to take.

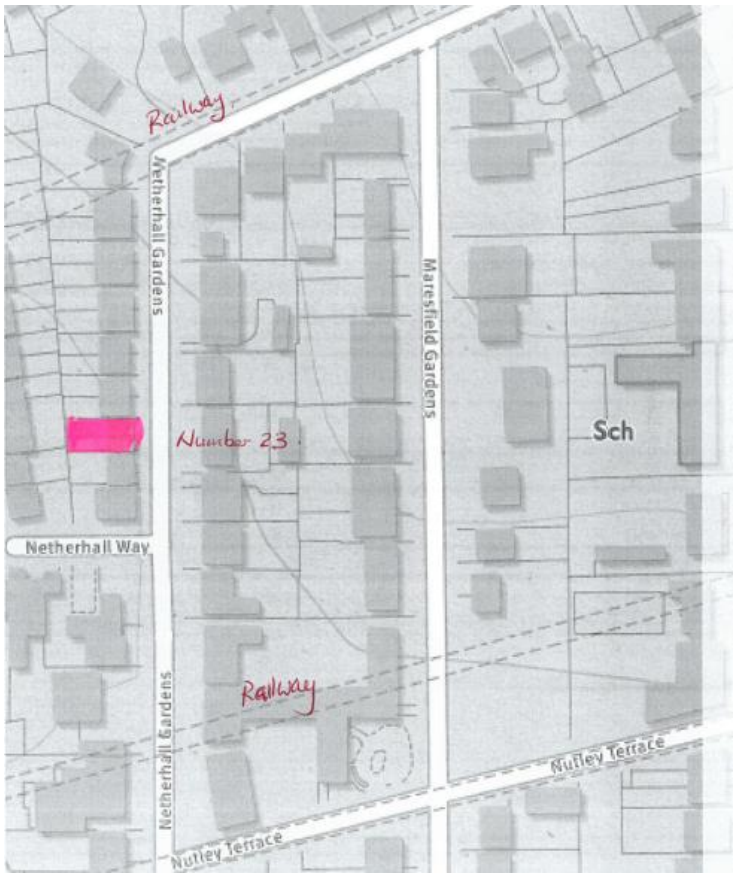
6 Conclusions

The proposed basement can be constructed safely without affecting the stability of the house being extended or the adjoining houses.

Appendix A

Site Location Plan

Extract from 1894 map of Swiss Cottage



Current OS Map Extract showing Site Remote from Railway Tunnels

Appendix B

Proposed Drawings

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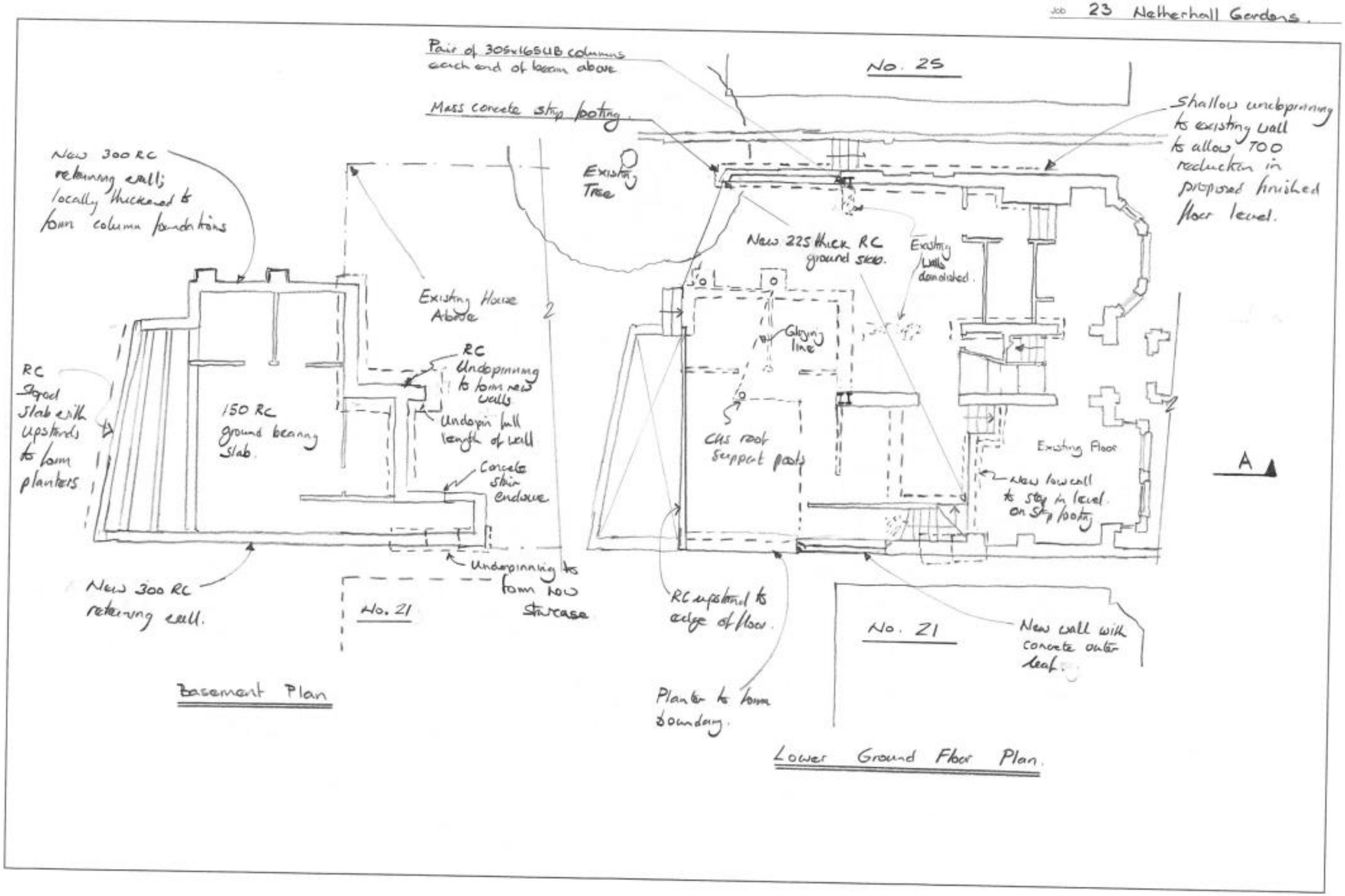

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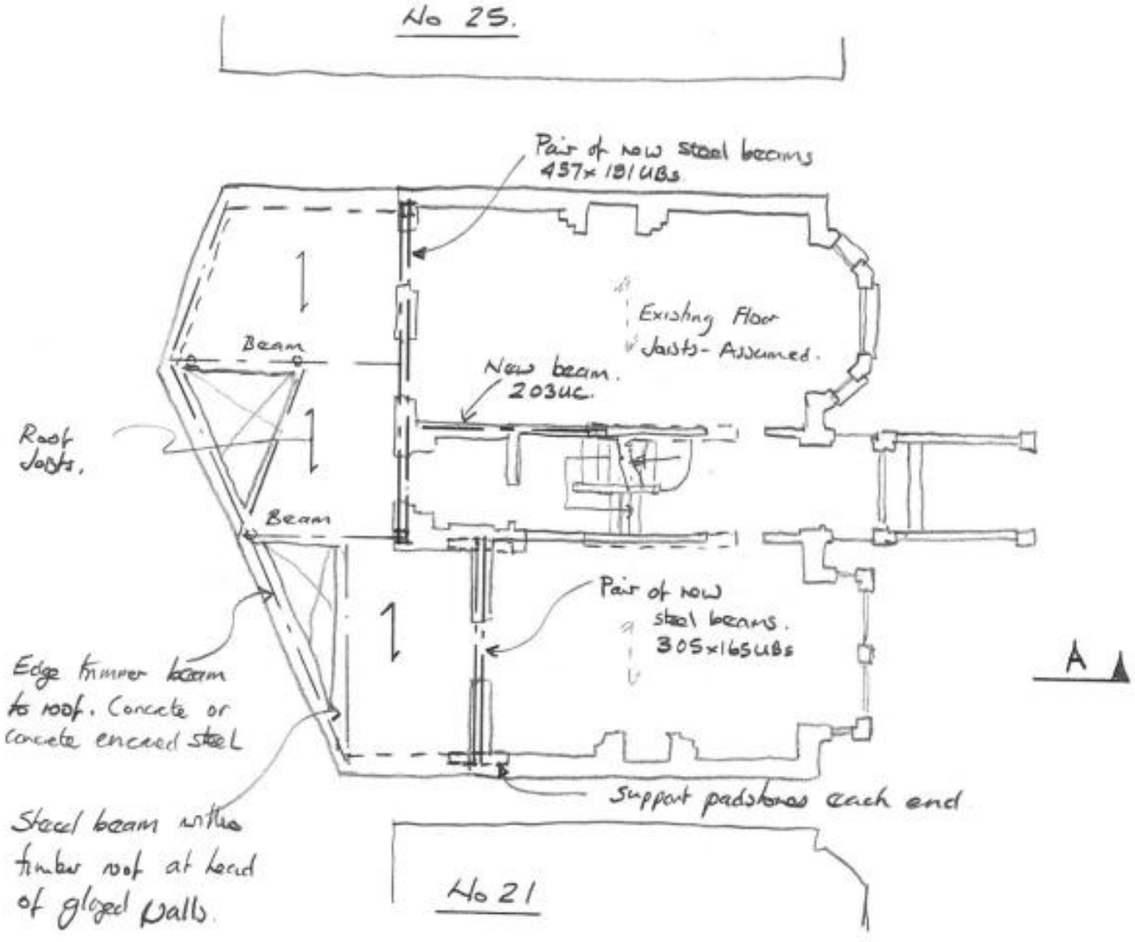

Ground Floor Plan

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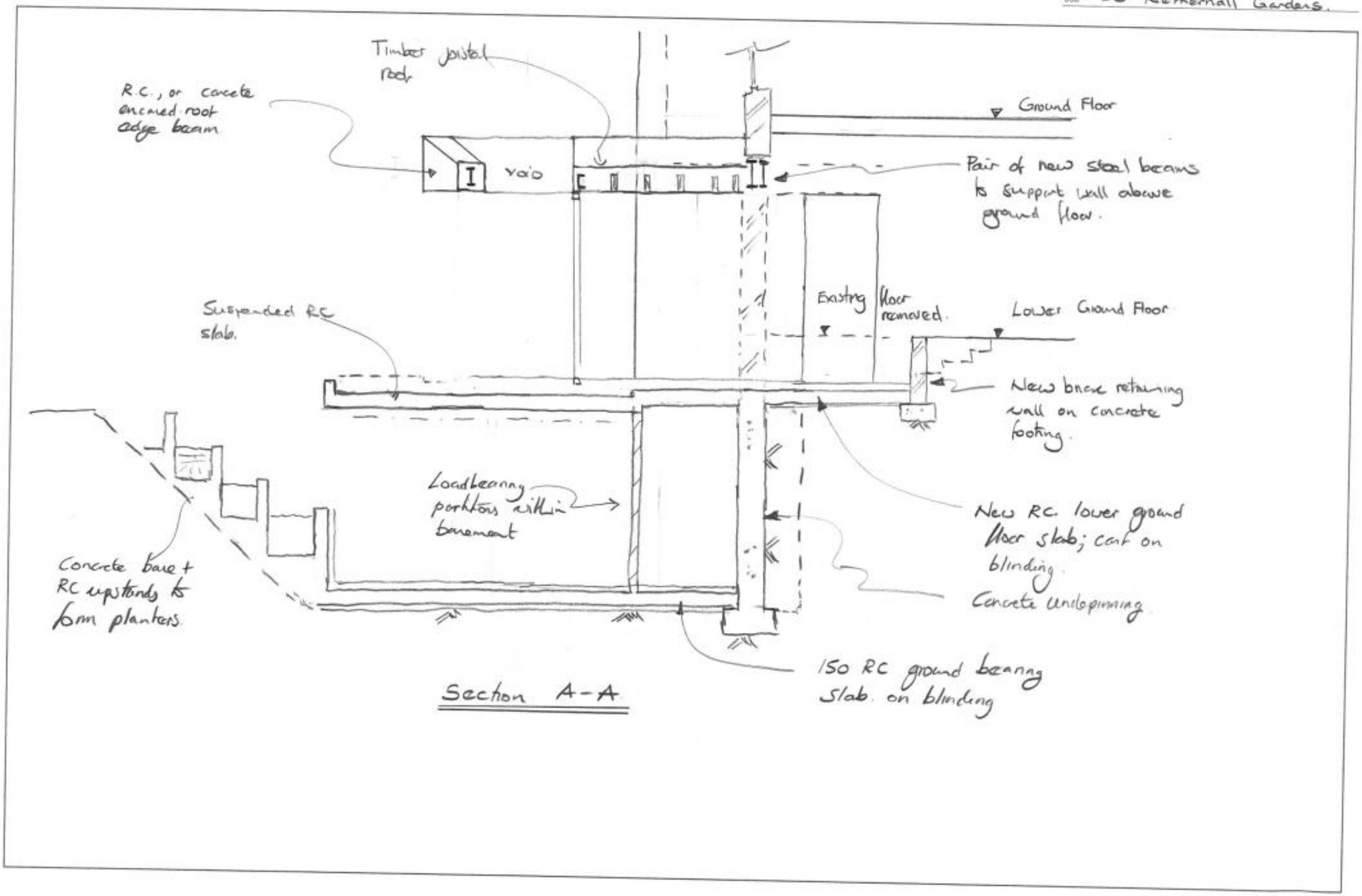

Section A-A

Appendix C

Proposed Temporary Works Sequence and Drawings

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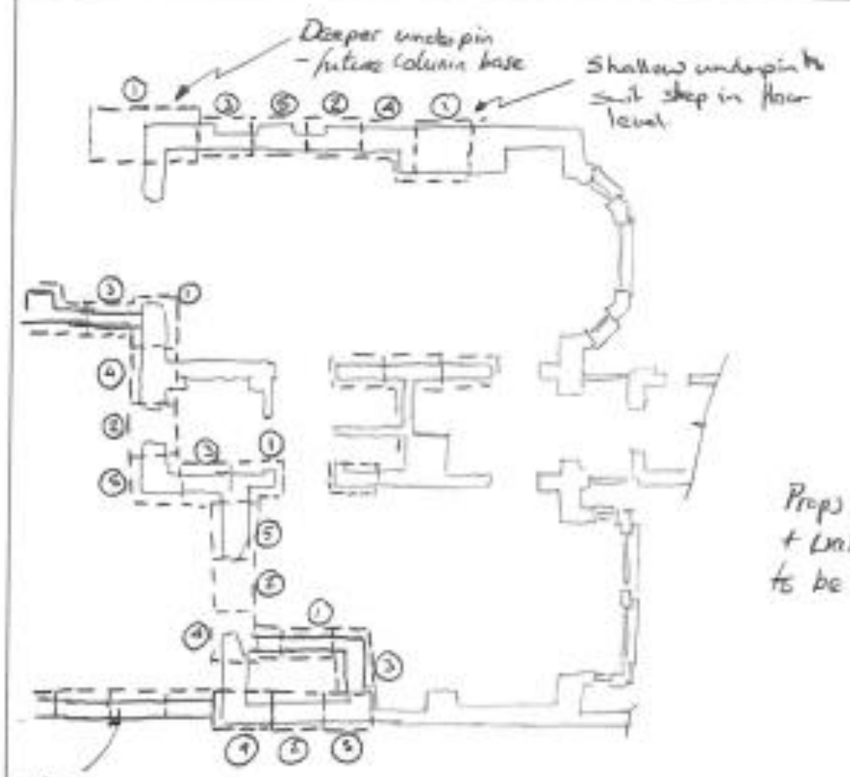
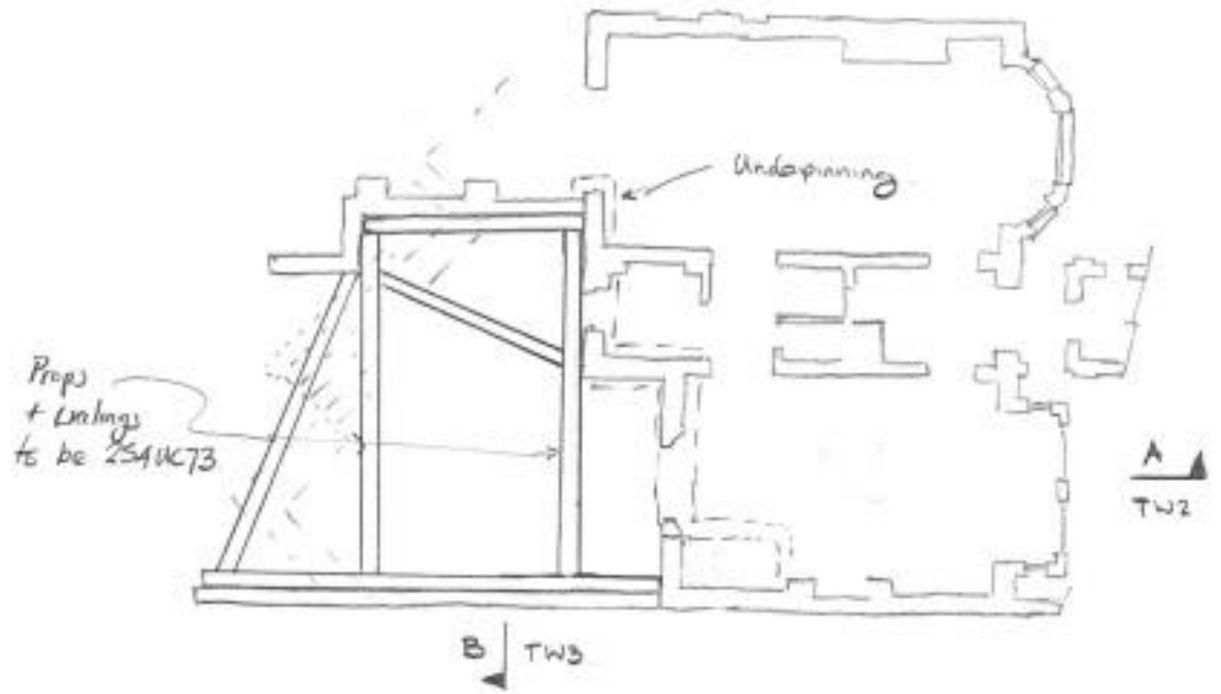


Stage 1 - Underpinning

Form underpins; backfill excavation on completion



Stage 2 Propping

Excavate trenches + install steel props + ealing beams to prop top of underpinning
All props + ealings are just below level of ground floor slab.

Temporary Works - Plans

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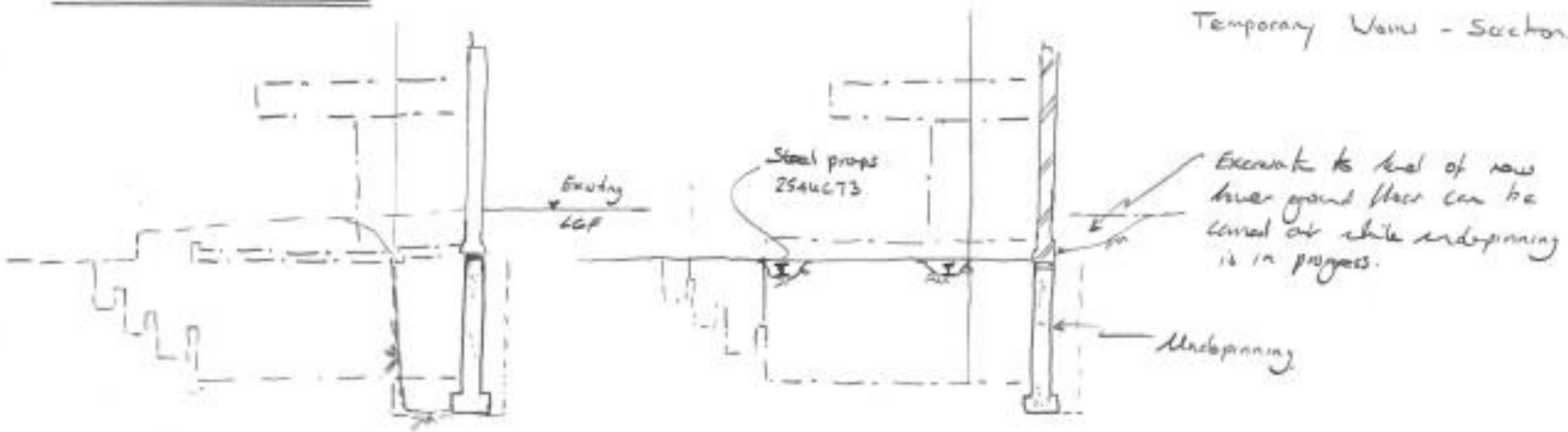
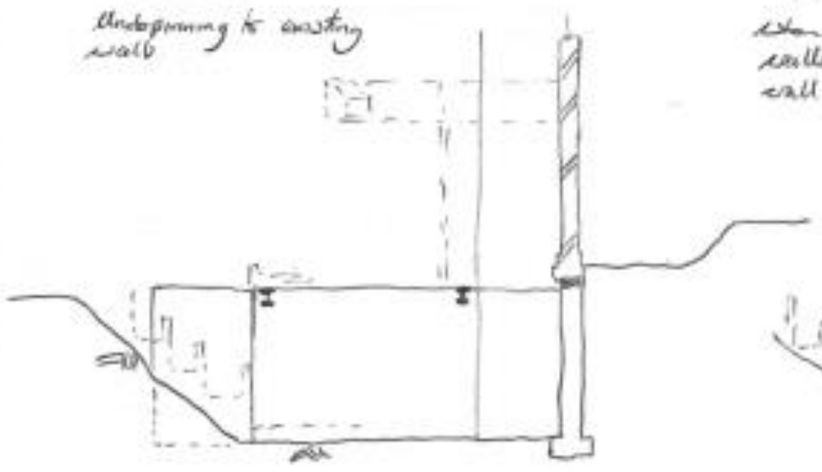
SECTION A-A

Temporary Works - Sections Sheet 1



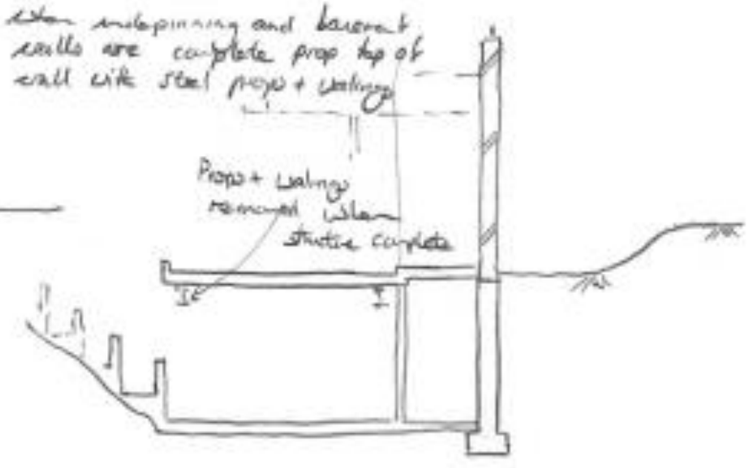
Stage 1

Underpinning to existing wall



Stage 2

When underpinning and basement walls are complete prop top of wall with steel props + walings



When the basement construction is complete prop to rear wall to the new concrete floor + form new openings in rear wall with needle frames, followed by inserting new steel beams into place.

Stage 3

Excavate to basement level

Stage 4

Construct new walls + slab to prop at ground level; then remove temporary props.

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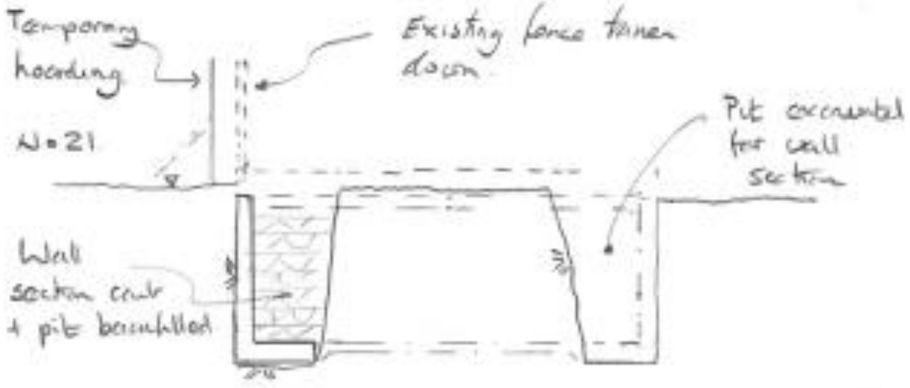
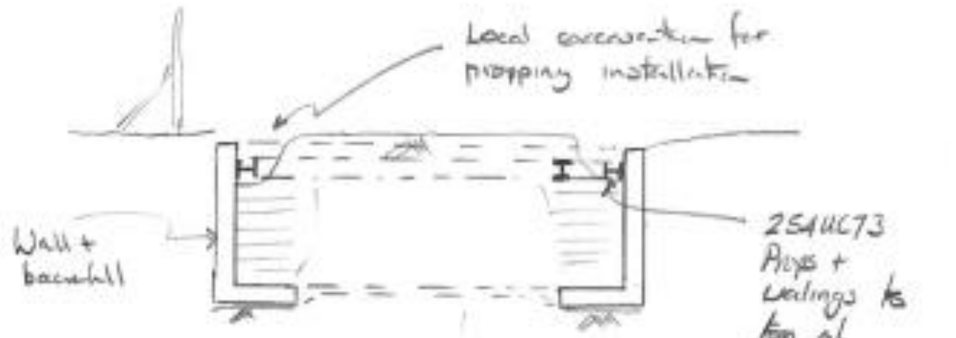
SECTION B-B

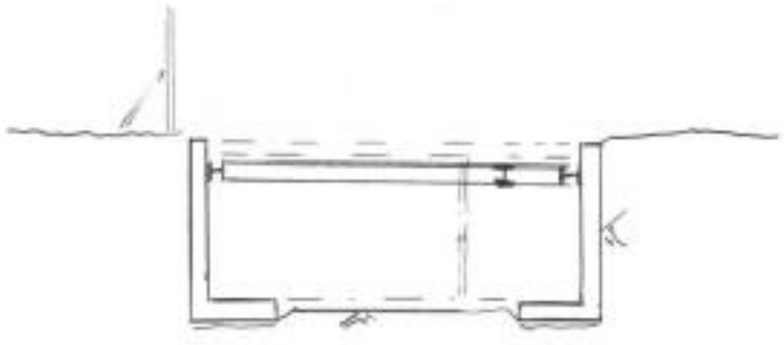


Temporary Works Sections - Sheet 2



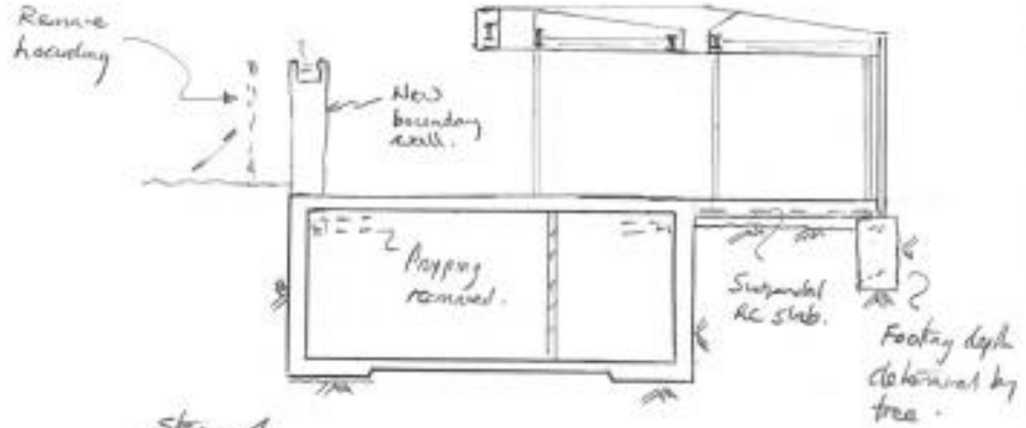
Stage 1

Construct RC basement walls in an "underpinning operation"



Stage 2

In local, shallow trenches, install propping to top of perimeter walls.



Stage 3.

Complete excavation + construct new basement + lower ground floor slab

Stage 4.

When lower ground floor slab has strength remove props + complete construction of extension.

Appendix D

Design Calculations

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Preliminary Calculations.

Support structure for walls removed to form enlarged lower ground floor

Beam under stair wall

Allow load for 3m 1st, 2nd, 3rd + roof @ 2.75 kN/m² 27kN/m.

Say 12.0m wall allow. 3m 8" brick 15
9m stud 9
151 kN/m.

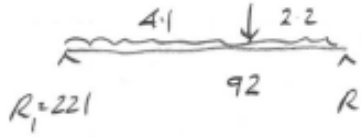
3.6m span $M = wL^2/8$ = 83 kNm

R = 92 kN.

203UC 60 S = 142 cm³/m L/D = 17.2 allow = 20 ∴ OK

Rear Wall support.

Load = 10m 13½" brick 20% openings
= 10 × 7.5 × 0.8 = 60 kN/m



$M = R_1^2/2w$

M = 407 kNm.

457 × 191 × 82UB f_c = 126 N/m

L/r_{yy} = 97 D/T = 29 P_{bc} = 125 OK.

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L/D = 13.7 allow = 2000/6 = 22.2

$f \approx \frac{6000}{360} \times 13.7/22.2$ = 11m OK.

Beam Under Offset Rear Wall Section

Span = 4m M = 120 kNm

R = 120 kN

For 2no. 305×165×46 UB

f_{bc} = 93 N/mm²

L/r_{yy} = 103 D/T = 26 P_c = 129 N/mm² ∴ OK.

L/D = 13.1 ∴ OK

305×165 UB's OK.

Check Footings

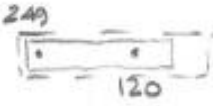
Allowable bearing press = 110 kN/m²

External wall - 6.0m span central

R = 221 kN.

For say 2m long × 1.0m wide 6 = 110 kN/m² OK.

Central loads:



wall = 51 kN/m

Say wall load = 3.5m

ΣW = 369 + 3.5×51 = 548 kN.

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2.6m long underpinned wall sect

footing width req'd = $548/(2.6 \times 110) = 1.9m$

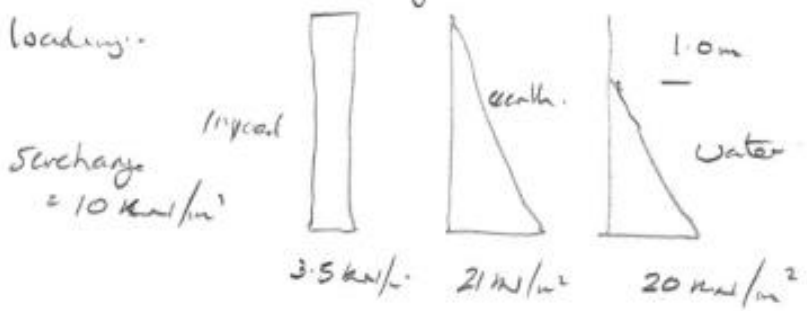
Provide 1.9m wide underpin base

New Garden Retaining Walls

Retained depth at boundary with No 21
- worst case 3m deep to proposed basement level

Say $K_a = 0.35$ + ground water at 1.0m depth

loading:



$R_T = 3.5 \times 1.5 + 21 \times \frac{3}{2} \times \frac{1}{3} + 20 \times \frac{2}{2} \times \frac{2/3}{3}$

$R_T = 20.2$ kN/m

$R_B = 36.6$ kN/m

working loads

nils $R_T = 29.3$ kN/m

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Use 300 RC wall; match adjoining underpinning to 330 brick + wall stiffness helps to minimise ground movement

Zero shear x from top

$$29.3 = 5.6x + \frac{9.8x^2}{2} + \frac{(x-1)^2 10}{2}$$

$$58.6 = 11.2x + 9.8x^2 + 10x^2 - 20x + 10$$

$$19.8x^2 - 8.8x - 48.6 = 0$$

$$\underline{x = 1.8\ m}$$

$$M = 29.3 \times 1.8 - 5.6 \times \frac{1.8^2}{2} - 4.9 \times \frac{1.8^2}{3} - 5 \times 0.6$$

$$\underline{M = 31.1\ kNm/m}$$

For 50 cover to inner face $d = 300 - 50 - 10 = 240$

$$M_u = 0.156 f_{cu} bd^2$$

$$\underline{M_u = 314\ kNm/m}$$

Clearly wall is OK

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Preliminary Temporary Propping Check

Waling beam span = 3.5m

loading, top of wall load = 20.2 kN/m

Prop is dropped below slab, but water level not extracted at 1.0m below ground in temporary case

Design waling for say 30 kN/m

as clearly OK.

span = 4m

$M = wL^2/8 = 60$ kNm/m

203UC46 $f_{bc} = 134$ N/m

$L/r_{yy} = 80$ $D/T = 20$ $p_{bc} = 153$ N/m

$L/D = 20$ ∴ deflection < L/360 OK.

Max prop load = 3.5m wide load

$P = 3.5 \times 50 = 165$ kN

7m long prop 203UC46.

$f_c = 165/5.88 = 28$ N/m²

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L/r_{yy} = 136 p_c = 49 N/mm²

$f_c < p_c$ ∴ OK.

However need to allow for eccentricity say 200mm

M = 33 kNm

For 254UC73 f_{bc} = 37 N/mm².

f_c = 18 N/mm²

L/r_{yy} = 110 p_c = 71

D/T = 18 p_{bc} 128

$f_c/p_c + f_{bc}/p_{bc}$ = 0.54 < 1

∴ OK

Use 254 × 254 × 73 Props.

Note:- Suggest all props exceeding 254UC73.