215130.101Rev E

November 2015
Rev A April 2017
Rev B September 2017
Rev C October 2017
Rev D March 2018
Rev E August 2018

STRUCTURAL FEASIBILITY REPORT

For

BASEMENT CONSTRUCTION

At

43 BURGHLEY ROAD
NW5

For

MR E NATHANSON

ENGINUITY
ENGINEERING INGENUITY

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CONTENTS

1.0 Summary

This report considers the structural feasibility of constructing a proposed basement under an existing house at 43 Burghley Road NW5, with particular reference to the basement and lower ground floor construction and the effects on nearby buildings. A concept structural layout and construction sequence has been developed as part of the considerations. This utilises traditional and underpinning techniques as are now frequently adopted for schemes of this type.

The proposals are considered entirely feasible using normal underpinning techniques with only minor risk of non-structural damage to nearby structures, which would be within category 1 of BRE Digest 365

The effects of the basement on the water table and on surface water flows have been considered by others and are covered in other supporting documents.

Subsequent to the first issue of this report further queries have been raised by Campbell Reith, reviewing the planning application, Items 5, 6, 7 and 9 are addressed as follows:

Item 5 - Outline Retaining Wall designs are required. These have been prepared and are included in Appendix B.

Item 6 - Underpinning sequence and propping plans are required. Underpinning sequence and propping proposals are included.

Item 7 - Temporary/long term drainage: Temporary drainage will take the form of individual pumped pits at each location. The amount of water generated will be modest and not require particularly onerous volume for disposal. In the long term counterfort drains will be required behind the wall connected to the drainage system. These are indicated on the drawings attached.

Item 9 - BIA identifies SUDS drainage should be implemented into the scheme. Outline requirements to be included. These are now included in this report.

Subsequent to the second issue of this report further queries have been raised by Campbell Reith who have requested:

Propping Arrangements, sketches fine, including plan and sections. These were shown in Revision A of this Report but have been augmented in Revision B.

Item 5 Outline Retaining Wall designs, the existing designs are indicative of typical basement designs. Campbell Reith have requested more site specific soil data be used. Updated indicative calculations are attached in Appendix B.

Item 5 Underpinning Sequence, this is included in Revision A

New Item, Ensuring that structural loading don't exceed bearing capacity. This was included in Revision A of the report.

Subsequent to the third issue further queries have been raised by Campbell Reith who have requested:

Revision of Indicative Calculations to include alteration of Phi value and inclusion of perched water table loadings.

A statement concerning temporary de-watering to be included.

Statement advising wall will have temporary and permanent propping but that walls are conservatively designed as cantilevers.

In addition to this the SUDS statement has been expanded and reference to the Architects Waterproofing and details included.

Subsequent to the fourth issue, clarification of predicted settlements has been requested. The BIA confirms there to be up to 5mm which is assessed not to have a significantly detrimental effect on adjoining properties.

Section 4.11 of the Camphill Reith Audit dated March 2018 states that "estimates of heave are predicted on the assumption that the basement slab is to be suspended. This is at odds with the SFR which show a ground beam slab."

The cross section has been clarified to show a suspended slab, and the indicative calculations augmented accordingly.

A comment relating to the impermeable area has been added.

Subsequent to the forth issue, the indicative calculations have been amended to result in a bearing stress under the basement walls of approximately 90kN/m^2 as recommended by the BIA. Indicative calculations have been revised accordingly.

2.0 Instructions and Limitations

2.1 Instructions were received from you via your Architect requesting a Structural Methodology Statement on the proposal to construct a basement under and into the garden of 43 Burghley Road London NW5 We understand the report is required to supplement a Planning Application.

2.2 Our investigation and report is based on currently available ground data and is to supplement a Basement Impact assessment prepared by Ground and Water. This report has been prepared in consideration of the basement only and should not in any way be taken as a report on the condition of the structure of the existing building.

2.3 This report is prepared for the information, benefit and use of Mr E Nathanson only and any liability of Ian Harban Consulting Engineers to any third party, whether in contract or in tort, is specifically excluded. Any third party finding themselves in possession of this report may not rely upon it without first obtaining the written authority of Ian Harban Consulting Engineers.

2.4 RHS refers to the right hand side of the building when viewed from the road.

2.5 LHS refers to the left hand side of the building when viewed from the road.

3.0 Description, History and Proposals

3.1 The site is rectangular on plan with the existing building situated close to the Road. There is back garden approximately 11m beyond the rear wing of the building. The existing house has three stories plus attic.

3.2 The ground floor level is raised above pavement level 1.5m.

3.3 It is proposed to construct a new basement under the footprint of the building extending slightly to the rear of the site to form a lightwell. Architectural drawings are included in the Planning Application and are not reproduced in this report for brevity.

4.0 Site

4.1 Existing Structures

4.1.1 The existing building is predominantly a load bearing masonry construction, it is of an era where the ground floor would most likely be ground bearing lower floors and with corbelled brick footings.

4.1.2 Although minor internal modifications are proposed to the upper levels of the building this will not affect the overall loadpaths to the ground.

4.1.3 The building is mid terrace so the two side walls are Party Walls.

4.1.4 Window sampling by Ground and Water reveal there to be filled ground to the front of the property to a depth of 2.5m from front yard level. This level is approximately 1m below ground existing ground floor level.

4.1.5 A Trial pit excavated by ground and water revealed the foundation to be underpinned with brick to a depth of .15m below ground level and concrete down to between 2.35 and 2.45m below ground level.

4.2 Access

4.2.1 The current site access from the road and this will be maintained during construction.

4.3 Geotechnical

4.3.1 Basement Impact Assessment, provides local borehole data. This suggests the site will comprise London Clay down to the excavation levels proposed by this development. Water table levels are below proposed excavation depths.

4.4 Groundwater

4.4.1 Ground water and flooding effects are fully considered in the Ground and Water Basement Impact Assessment and not reproduced in this report for brevity. It is noted that free water may be present to the walls in the filled ground up to 2m thick and the indicative design has taken into account the possibility that the water pressure may be present to this depth.

4.4.2 Temporary pumping may be required during construction to control and free water entering the construction area. This will be achieved using local excavated sumps and temporary pumps.

4.5 SUDS

4.5.1 SUDS involves primarily limiting stormwater flow off site to flows existing prior to the development. It could be argued that the existing impermeable building area is not increased as part of the proposal, as the lightwell at the front of the building will replace existing impermeable surfaces. It is noted that the BIA indicates a slight increase in impermeable area, so this report recommends the use of and attenuation tank as part of the SUDS design.

4.5.2 To the rear the formation of the lightwell at the rear replaces existing paving. This again will not therefore increase the existing storm water volume of run off. However, it is acknowledged that the presence of the lightwell may accelerate the flow of water into the system and as such an attenuation tank included as part of the pumping system should be included to delay the flow of water into the storm system.

5.0 Structural Proposal and Construction Methods

5.1 Structural Proposals

5.1.1 The drawings in Appendix A show the proposed concept structural layout and construction proposals with respect to the basement construction. The upper floors have not been considered in this report, not being affected by the underground construction.

5.1.2 It is proposed to install a reinforced concrete underpinning wall to the two adjoining property party walls and to form a similar reinforced concrete wall at the front and rear. Lateral stability will be achieved with a new concrete ground floor providing propping action to the top of the wall.

5.1.3 The floor plate of the basement will be reinforced concrete along with the ground floor. In order to mitigate heave the basement slab will be designed as suspended with collapsible form work filler below.

5.1.4 Indicative structural calculations are shown in Appendix B and these are based on an at rest soil condition, ie Ko =1.0. The geotechnical report indicates there may be water in the made ground down to 2m so this has been included as possible loading in addition to soil loads.

5.1.5 The indicative calculations are based on the assumption that the top of the wall is not restrained by the ground floor. This is a very conservative approach as the methodology recommends the introduction of temporary struts across the wall and the inclusion of a concrete slab at ground floor. Therefore, walls will effectively be propped cantilevers.

5.2 Proposed Basement Construction Method

5.2.1 The proposed sequence and method of construction needs to take account of temporary stability during construction, both of the site itself but also the neighbouring buildings.

5.2.2 The works would need to be undertaken by a contractor familiar with underpinning methods and basement construction.

5.2.3 More particularly the proposed structural sequence would be as follows, assuming other site set up/ welfare etc has been completed:

5.2.3.1 Isolate and make safe services to existing building.

5.2.3.2 Demolish existing building as necessary; grub out foundations and ground floor, filling any resulting voids with material arising but which will not impose obstructions.

5.2.3.3 Excavate 1m wide trenches to bays marked 1 shown on the drawings, using trench sheets and strutting for temporary support.

5.2.3.4 Cast 1.0m width of foundation with starter bars for walls and adjacent bases.

5.2.3.5 Carefully break out as necessary existing concrete underpinning.

5.2.3.6 Form new walls connecting reinforcement to base reinforcement starter bars and prop side to side and install temporary propping side to side as indicated on concept sketches.

5.2.3.7 Repeat procedure with pits marked 3 on the drawings.

5.2.3.8 Repeat procedure for pits marked 5 on the drawings

5.2.3.9 Repeat procedure for pits marked 2 on the drawings.

5.2.3.10 Repeat procedure for pits marked 4 on the drawings.

5.3 Construction Good Practice.

5.3.1 Local parking is limited and therefore site operatives should use the many immediate public transport connections.

5.3.2 Demolition and excavation dust on site will be controlled by the watering of work at ground floor level. Inlets to the drainage system will be protected with filters bunded with sandbags to prevent slurry runoff entering the system.

5.3.3 The Contractor will adhere to, and respect any restrictions on working hours or the enforcement of silent periods throughout the day, which may be imposed by the Local Authority, Contract Documents or the Party Wall requirements.

5.3.3 All waste Substances from the site shall be disposed of offsite, under the appropriate Duty of Care and subject to approvals/consents from the relevant statutory bodies. Recycling is to be undertaken wherever appropriate. All vehicles leaving site carrying potentially dust-generating demolition or construction waste are to be completely sheeted with tarpaulin or netting, in good condition.

5.3.4 The site is to be securely horded along the boundary to the public highway. The hording is to be designed by the contractor's Charted Civil or Structural engineer to resist appropriate wind loadings as defined by 8S6399: 2.

5.3.5 Welfare facilities will not be placed on the public highway.

5.3.6 All live emergency exits and access routes on site will be maintained at all times.

6.0 Effects of Proposed Works

6.1 Neighbouring Structures

6.1.1 The trial hole information reveals that foundation depths are close to the depths required to form the basement. This being the case, there should not be any increase in the risk of differential foundation movement as result of foundation depth alteration from the scheme.

6.1.2 However, with all construction of this type, some adjoining structures may suffer minor movement. Any settlement resulting from a properly executed underpinning scheme will be within reasonable limits and at worst may result in superficial cracking to applied finishes. Condition surveys should be undertaken as part of Party Wall Act requirements so that the effects of any minor movement that might occur can be monitored. We would also recommend datum level monitoring stations and targets are installed to monitor levels during the works.

6.1.3 It is normal for building foundations to be designed to allow a vertical displacement as a consequence of the alterations to the loading arrangements in the ground are predicted to be in the order of 5mm. This is only likely to result damage limited to category 1 of BRE Digest 251.

6.1.4 The form of construction will also limit and lateral movement of the top of the wall, this being propped by the proposed reinforced concrete ground floor.

6.1.5 The proposed works will not affect the structural stability or integrity of the neighbouring structures.

6.2 Adjacent Trees and Root Protection

6.2.1 The proposals have been developed in way which minimises working to external areas where tree and root protection measures are required. The spoil arising from the excavations can be disposed of to areas outside the protection areas using conveyors and machines will work inside the basement footprint.

APPENDIX A

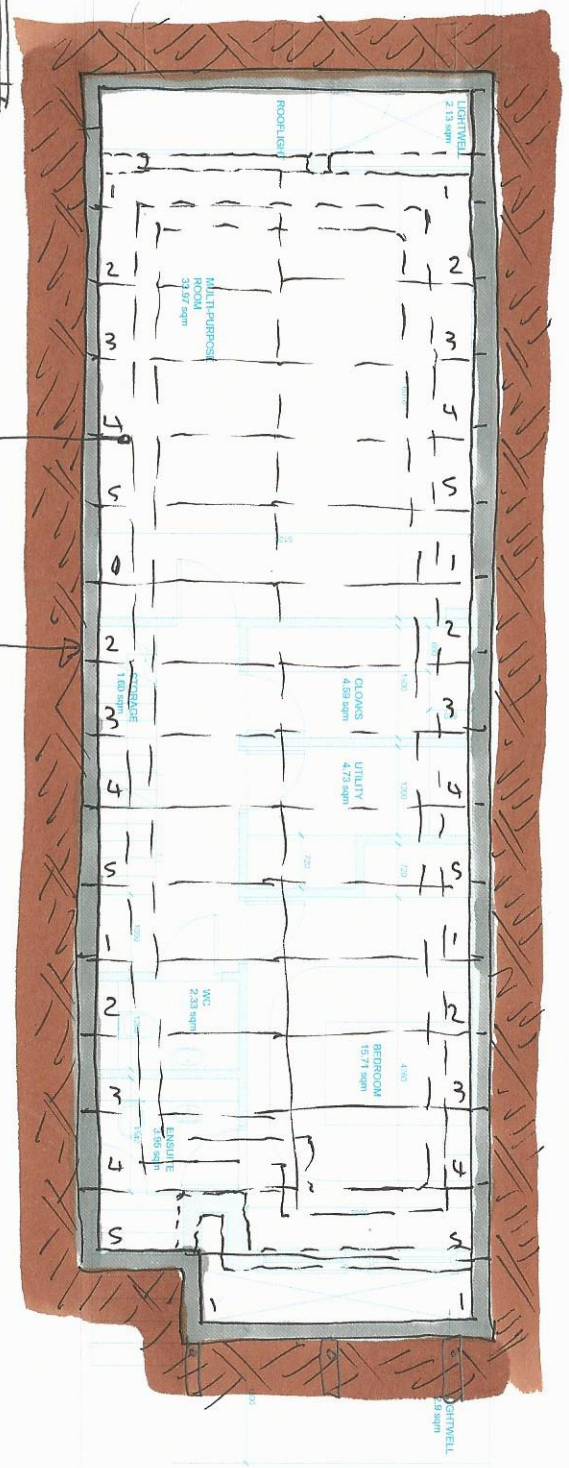
Drawings L01B-L02C

APPENDIX B

Indicative Calculations

Note Pits to be excavated & CONSTRUCTED IN FOLLOWING ORDER

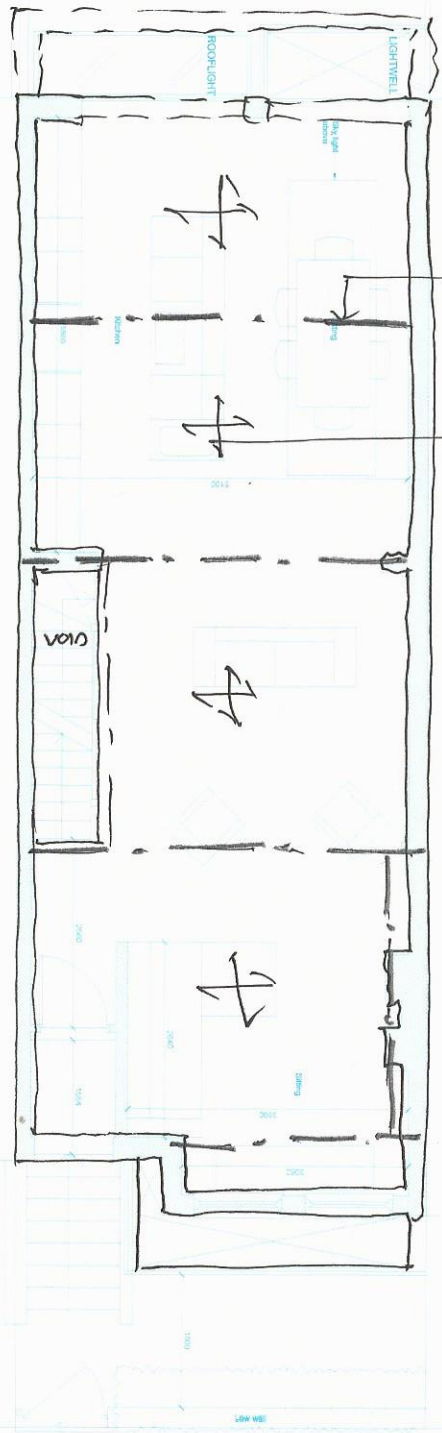
1, 3, 5, 2, 4



SLAB THICKENING MAYBE REQUIRED

WALLS UNDERPINNED IN 1M SECTIONS

BASEMENT CONCEPT



BEAMS INCLUDED AT EXCAVATION STAGE TO PROVIDE LATERAL RESTRAINT

INSITU SLAB ONE WAY SPANNING

GROUND FLOOR CONCEPT

SCALE CHECK

100mm @ A1
50mm @ A3

NOTES

1. THIS DRAWING IS THE COPYRIGHT OF ENGINEERING INGENUITY ©
2. ALL WORKING METHODS AND PROCEDURES ARE TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE HEALTH AND SAFETY AT WORK ACT 1974 AND THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2007
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SCHEDULE OF WORKS SPECIFICATIONS, ALL OTHER DRAWINGS AND ANY OTHER RELEVANT DOCUMENTS
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
5. ONLY FIGURED DIMENSIONS ARE TO BE USED. DO NOT SCALE FROM THE DRAWING
6. ALL PROPRIETARY PRODUCTS ARE TO BE INCORPORATED INTO THE WORKS STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION AND REQUIREMENTS
7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO TAKE SITE DIMENSIONS TO ENSURE SITE FIT OF STRUCTURAL ELEMENTS.
8. MASONRY WALLS HAVE BEEN DESIGNED TO BE RESTRAINED BY FLOORS, ROOFS AND OTHER STRUCTURE AND WILL REQUIRE TEMPORARY SUPPORT IF THE RESTRAINING ELEMENTS HAVE NOT BEEN BUILT.
9. FLOORS HAVE BEEN DESIGNED FOR A LIVE LOAD OF kN/m2. THE CONTRACTOR MUST ENSURE THAT THE STORAGE OF MATERIALS AND PLANT DOES NOT EXCEED THIS LOAD.
10. THE CONTRACTOR SHALL ENSURE THAT ALL EXPOSED EARTH FACES SHALL BE BACK TO 30° TO THE HORIZONTAL OR SHALL PROVIDE TEMPORARY SUPPORT.
11. UNLESS NOTED OTHERWISE ALL STEEL CONECTIONS WILL HAVE MINIMUM 2 No. M20 8.8 BOLTS, 10mm THICK PLATE AND 6mm FULL FILLET WELDS.
12. TENDERERS ARE TO ALLOW FOR THE PREPARATION OF FABRICATION DRAWINGS FOR ALL STEEL, ALUMINUM, GLASS, ENGINEERED TIMBER AND STEEL REQUIRED ELEMENTS WITH THEIR PRICE.

Rev.	Description	Date	By
A	UPIN SEQUENCE ADD		
-	Preliminary Issue for comment	**/**/14	SJF

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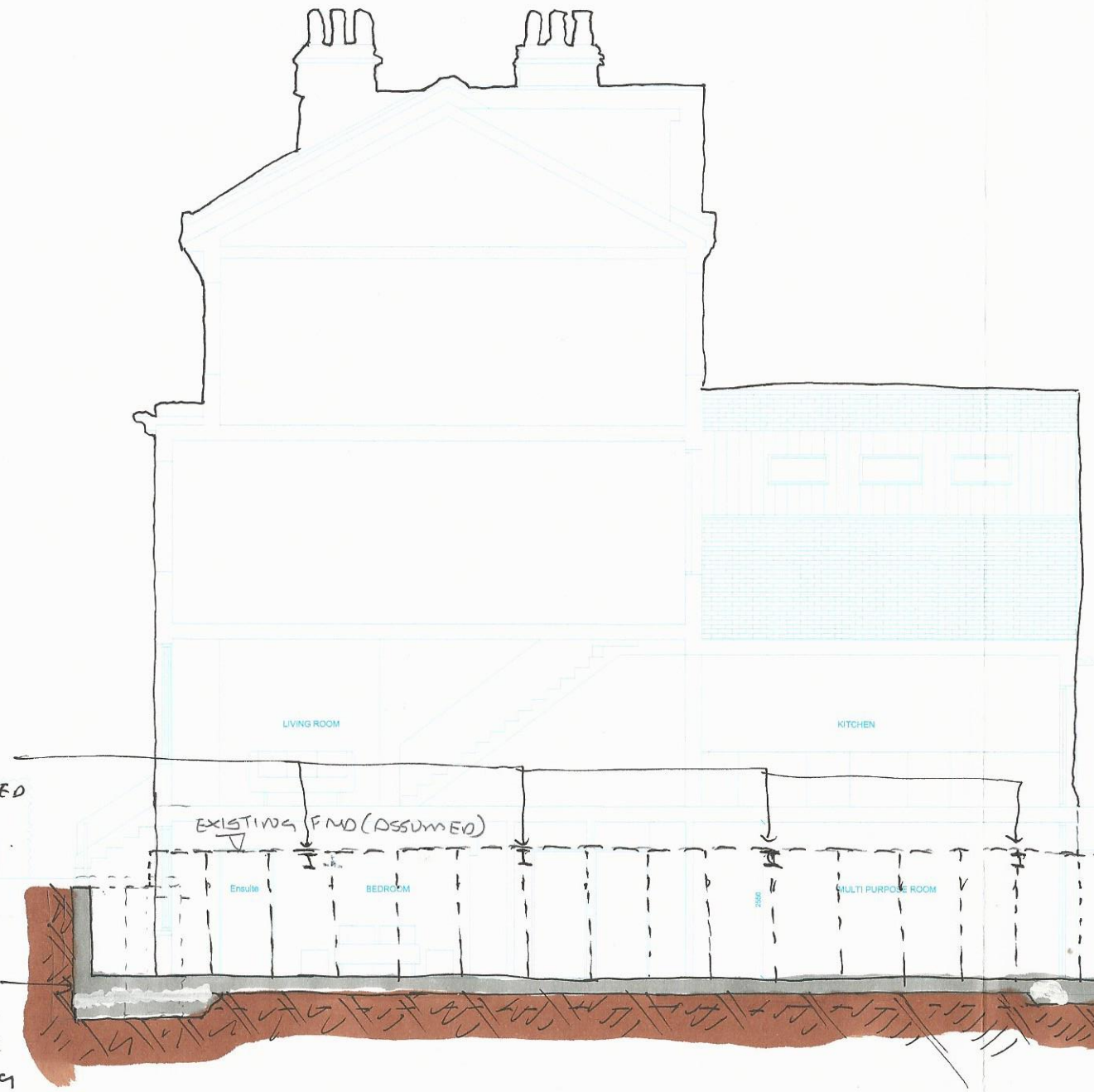
Client: ELI NOTHMANSON

Job Name: 43, Burghley Road, London

Drawing Title: Basement & Ground General Arrangement

Date	Nov '2015	STAGE	STATUS	CHECKED
Drawn	SJF	Development	✓	
Scale @ Size	1:50 @ A1	Tender		
Scale @ Size	1:100 @ A3	Construction		
Original Size	A1	Final Construction Issue		
Job No. 212130		Drawing No. L01		Rev. A



TEMPORARY PROPPING INSTALLED UNTIL TOP SLAB CAST (TYPICAL).

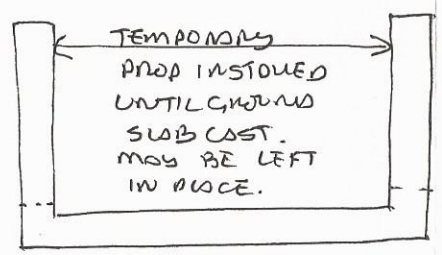
THICKER BASE TO ALLOW FOR EXISTING LONG UNDERMINING

SIDE WALLS UNDERPINNED IN 1m LONG SECTIONS

REINFORCED CONC WALL

NOTE - WEDGE PRECAUTION REQUIRED UNDER BASEMENT SLAB.

CONCEPT CROSS SECTION



TEMPORARY PROPS TO BE IN THE ORDER OF 203x203x 86 kg UC's

TYPICAL CROSS SECTION

SCALE CHECK

100mm @ A1
50mm @ A3

NOTES

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-	Preliminary issue for comment	**/**/14	SJF

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Client
ELI MATHONSON

Job Name
43, Burghley Road
London

Drawing Title
Basement & Ground
General Arrangement

Date	Nov '2015	STAGE	STATUS	CHECKED
Drawn	SJF	Development	✓	
Scale @ Size	1:50 @ A1	Tender		
Scale @ Size	1:100 @ A3	Construction		
Original Size	A1	Final Construction Issue		
Job No. 212130		Drawing No. L02		Rev. C

Job Name 43 BURGHLEY ROAD		
Date APRIL 17	By IGW	Scale
Job Number 215130	Sheet Number C1	Rev C

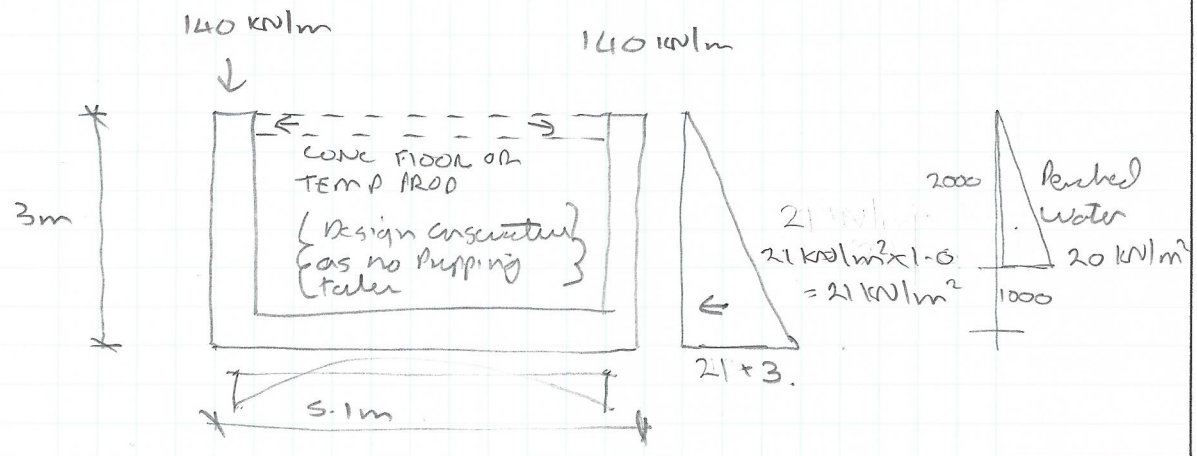
Ka updated to 0.42

INDICATIVE RETAINING WALL DESIGN

Site Investigation Show ϕ 26°
Current Design Assumes γ_s 21 kN/m³ @ K_o = 1.0

LOADS

1. Soil Dry 16 kN/m³ Ka = 0.42 K_o = 1.00
   Soil wet 21 kN/m³ Ka = 0.42
   Water Behind Made Ground =
2. BUILDING LOAD TO SIDE WALLS ≈ 140 kN/m (1m).



Mmt in Wall = 21 × 3 × 1.4 × 2/3 × 3 = 176 kN/m
(water) + 20 × 2/2 × (1/3 × 2 + 1) × 1.4 = 46 kN/m
222 kN/m

Wall thickness Say 300 mm d = 250

$\frac{M}{bd^2 f_{cu}} = \frac{222 \times 10^6}{1000 \times 250^2 \times 40} = 0.0888$

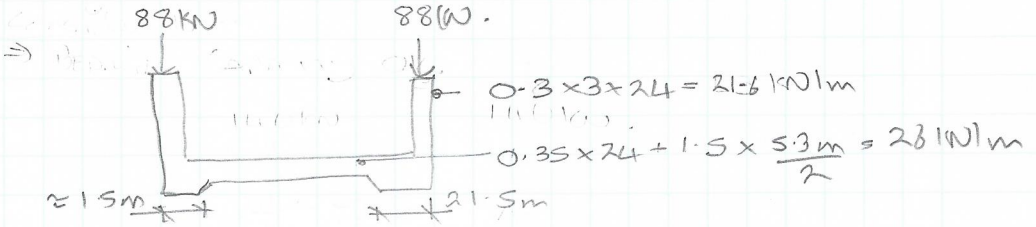
La factor = 0.889 < 0.95.

$A_{st} = \frac{222 \times 10^6}{0.87 \times 460 \times 250 \times 0.889} = 2495 \text{ mm}^2/\text{m}$ USE H25-150
A_{st} 3272 mm²

Job Name	BURGHLEY ROAD	
Date APRIL '17	By ICW	Scale
Job Number 215130	Sheet Number C2	Rev B

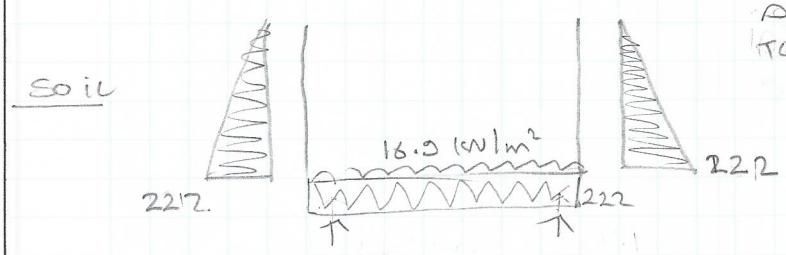
SLAB EDGES ADDED.

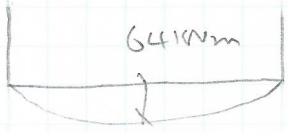
Consider Base - Bearing under wall edge to be 90 kN/m² as noted in BIA



Total = 88 + 21.6 + 28 = 135 / 90kN/m² = 1.5 m wide Toe

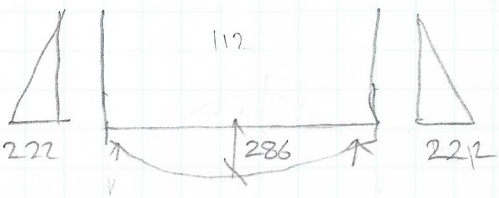
NOTE
SEE SHEET C4 FOR ADDITIONAL MMT DUE TO BASEMENT





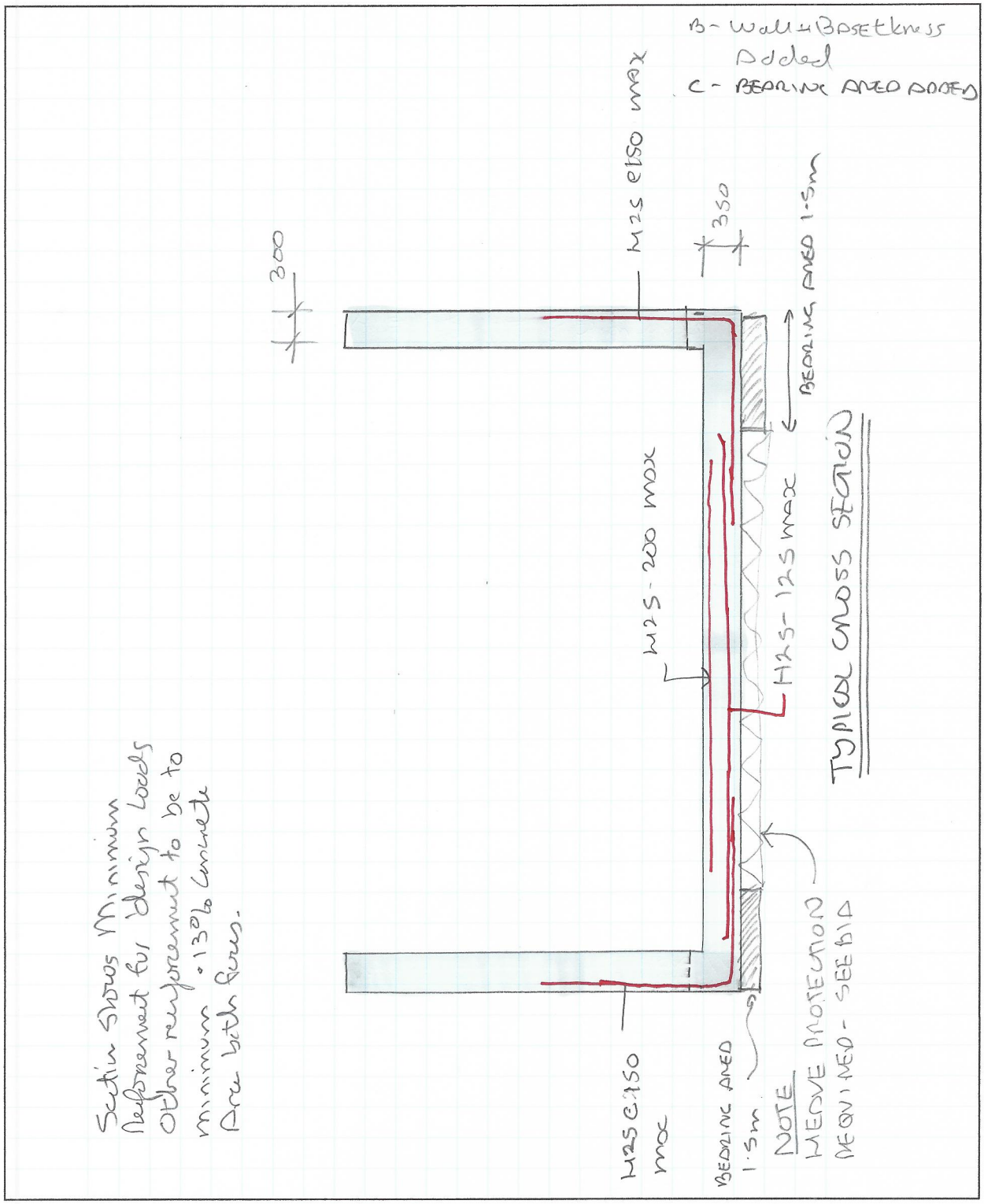
Total = 222 + 64
= 286 kNm

286×10⁶ / 1000 × 300² × 40 = 0.079
La factor = 0.95
Ast = 286×10⁶ / 0.87×460×300×0.95
= 2507 mm²



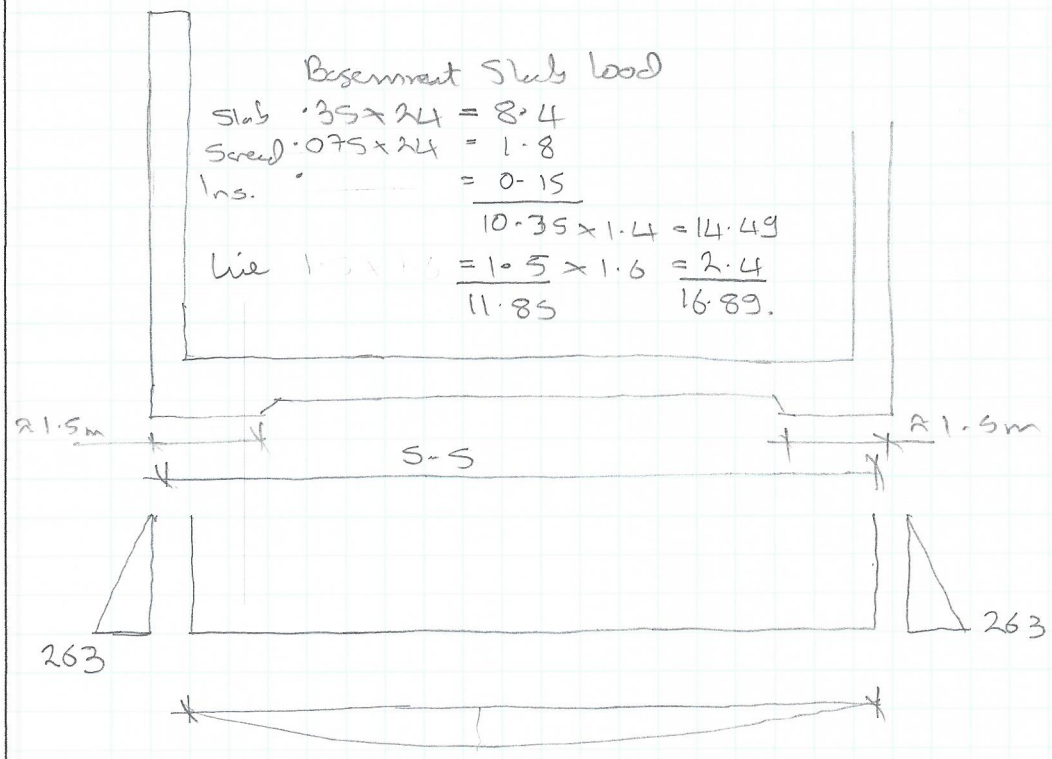
M25 - 150 Ast = 3272 mm²

Job Name	43 BURGHLEY ROAD		
Date	APRIL '14	By	IGM	Scale	
Job Number	215130	Sheet Number	C3	Rev	B



Job Name 43 Burghley Road		
Date March 18	By IGW	Scale
Job Number 215130	Sheet Number C4	Rev

EFFECTS OF BASEMENT SLAB



$16.89 \times \frac{5.5^2}{8} = 64$ kNm

Total Mmt = 64 + 263 = 327 kNm

$\frac{327 \times 10^6}{1000 \times 250^2 \times 40} = 0.13$ La factor 0.88

$Ast \geq \frac{327 \times 10^6}{0.87 \times 460 \times 250 \times 0.88} = 3714$ mm²/m H25-125

Ast = 3926 mm² ⇒ OK

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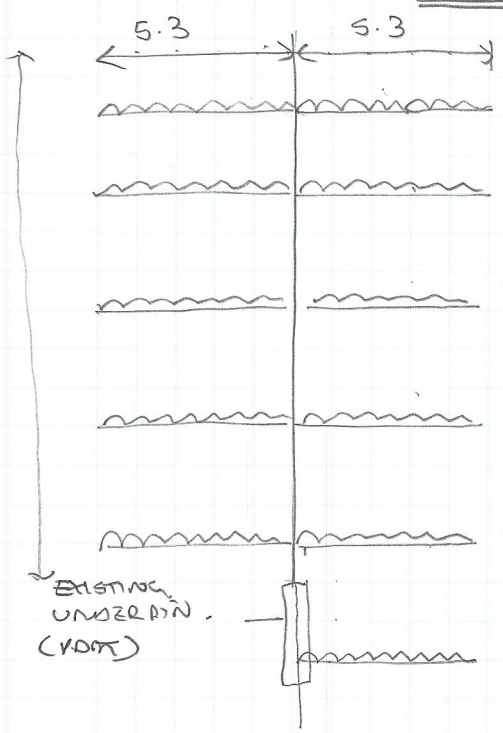
Job Name 43 BURGHLEY ROAD		
Date July 17	By IGW	Scale
Job Number 214116	Sheet Number SK01	Rev

LOADS TO PARTY WALLS



EXISTING

	kN/m²	width	
ROOF	1.6	× 5.3	= 8.48
ATTIC	0.5	" "	= 2.65
2nd	2.0	" "	= 10.6
1ST	2.0	" "	= 10.6
GND	6.5	" "	=

(Assume Ground Bearing).

BASEMENT. 6.5 — 32.33

With Underpinning

Existing Wall 10m×2.15×18 = 38.7
Internal Walls. 0.25×5.3×3floors = 4.0
Underpin 1.2×2.2m×24 = 64.0

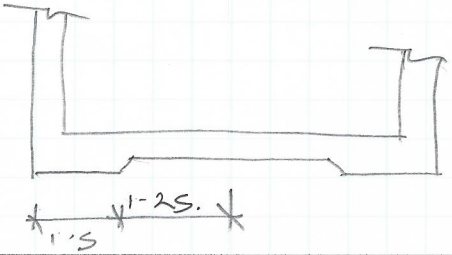
139.0 / 1.2 = 115kN/m²

Without Underpinning

75 / 0.6 = 125kN/m²

After Cavity.

	32.33 + 38.7 + 4	= 75.03
Ground	6.5 × 5.3 = 34.45	= 34.45
Walls	.35×24×2 = 16.80	16.80
Basement	6.5×(2.75 − 1.25) = 9.75	9.75
	186.00 / 1.5m toe	= 90kN/m²



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