GREEN STRUCTURAL ENGINEERING LTD
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11187/BC November 2013

CONSTRUCTION METHOD STATEMENT
23 HOWITT RD, NW3 4LT

SCOPE OF WORKS

The proposed work at 23 Howitt Rd, Belsize Park NW3 4LT, involves the construction of a new basement under the main house, to provide additional living accommodation and lightwells to the front and rear.

This CMS relates only to the structural aspects of the construction of the proposed basement.

SOIL CONDITIONS

Reference to the British Geological Survey map for the area, sheet 256, indicated the ground conditions to comprise made ground over London Clay.

Reference to the 'Lost Rivers of London' map indicates that there are no 'lost rivers' in the vicinity but that the head waters of the Tyburn do start in the area so there may be small tributary streams present.

The general ground conditions have been confirmed by several subterranean developments that we have already successfully completed near to 23 Howitt Road where excavation depths were similar to that proposed on this project. These confirmed the ground condition to be topsoil and made ground over London Clay, with groundwater encountered at approximately 2.5m beneath the proposed formation level, some 5.5m below ground level. However, ground water may be seasonal and the ground water level should be confirmed when works start and the methods altered accordingly.

DESCRIPTION OF 23 HOWITT RD AND THE ADJOINING BUILDINGS

The house at 23 Howitt Road, and the adjacent buildings which appear similar in age and period, is a three storey late Victorian/Edwardian terrace property, with the top storey set within the roof. The house has an existing partial basement under the entrance hall of the house, adjacent the party wall with No21.

The building has been refurbished relatively recently, and it is assumed this was when it was converted into flats and the basement area converted into a laundry area. It appears that the basement floor in the laundry area was lowered at this time to give better headroom.

Structurally, the main house, typically for the period, comprises load bearing masonry walls supporting timber floors. The presence of finishes has meant that the span of the timber floors cannot be ascertained without opening up. However, based on similar properties, it is likely that the timber floor joists spans front to back in the main rooms and side to side in the hall.

The presence of intermediate dwarf walls supporting the ground floor in the main rooms has not been confirmed.

The rear extension is one storey in height and appears of similar age and construction to the main house.

The building appears generally sound with no structural defects evident.

The neighboring properties are of similar age and construction and appear to be in sound condition with no obvious defects visible from visual inspection.

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STRUCTURAL CALCULATIONS

Preliminary calculations have been carried out for the design for the new basement walls to the party walls. The retaining walls are designed as free standing in the temporary and permanent conditions to avoid the need for temporary propping to the walls.

In the permanent case the new retaining walls will have additional lateral support from the new reinforced concrete floor slab to the basement.

Copies of the preliminary calculations are attached.

STRUCTURAL DRAWINGS

The following structural drawings are attached:

1. GSE section Sk001i, which gives structural details for the construction of the proposed basement retaining walls;
2. GSE MS01i gives a typical sequence of construction assumed in the design, as discussed in the following section.

CONSTRUCTION SEQUENCE

The following method statement gives the sequence of construction assumed in the design for the construction of the new basement, under the existing building; the contractor is to provide their own sequence and temporary works proposal, prior to start of works on site.

The following assumptions have been made in the design:

1. All site access will be from the street. Excavation will start from the front of the building, with the front light well being created first, before progressing backwards under the centre of the house centrally, before extending locally to the sides and rear to excavate and construct the individual pins;
2. The new retaining walls will be constructed in an under-pin type sequence with a maximum width of 900-1000mm for the pins. Adjacent pins are to be tied together using dowel bars between the walls and base segments.
3. The existing timber structure to the ground floor is to be retained;
4. The spine and hallway walls are load bearing and will require support in the temporary and permanent conditions. In the permanent case this will involve the installation of new steelwork under these walls.
5. The sequence for forming a typical underpin bay under the party walls is shown on drawing MS01 attached.

The sequence of works, assumed as part of the preliminary design, is:

1. Excavate the area of the front light-well to provide access to the new basement during the works and allow the removal of spoil, by conveyor;
2. Underpin the side walls to the bay and install temporary support to the central section of the bay window over. The underpins are designed to be free-standing in the temporary condition, once the concrete has cured, to avoid the need for any temporary propping to the retaining walls unless the contractor feels it is necessary to retain the ground behind;

3. Excavate backwards to a reduced level in the central area of the basement and install all temporary propping/ new steel beams(part of the permanent works) required to support the existing ground floor;
4. Once the rear limit of the proposed basement has been reached underpinning to the main side and rear walls will commence, in an controlled sequence which ensures no adjacent pins are constructed within a 48 hour period, with local excavation to construct each of the pins;
5. Drawing MS01 indicates the sequence of works to construct a typical underpin bay;
6. Upon completion of the underpinning any permanent support, such as new columns, to the new supporting structure not already in place will be installed;
7. Excavate locally and install the new below slab drainage, to details by others, for foul & ground water including all sumps and pumps. The basement drainage will pump into a new manhole within the front light-well which will discharge, under gravity, into the existing sewer system to the front of the property;
8. Construct the new RC basement slab, to be cast over the new bases, and install all waterproofing, insulation and finishes to architects details.

POTENTIAL IMPACT ON 23 HOWIT ROAD AND ADJOINING PROPERTIES

The proposed basement under the existing property will be formed using an underpinning method, constructed in sections each no wider than 1000mm with no adjacent underpins constructed within a 48 hour period. This method of construction reduces the amount of potential ground movement and so minimises the effects of settlement of the adjacent structures.

Expected settlement is zero provided an experienced contractor is appointed who undertakes the works using good practice in accordance with the structural design and follows all agreed method statements, installing all necessary temporary vertical and lateral supports required. In practice some settlement is possible but this should be no worse than 'very slight', according to the BRE's definition.

If these conditions are met any settlement that occurs will be minimal and will be accommodated in the elasticity of the superstructure. This is borne out by past projects on similar properties.

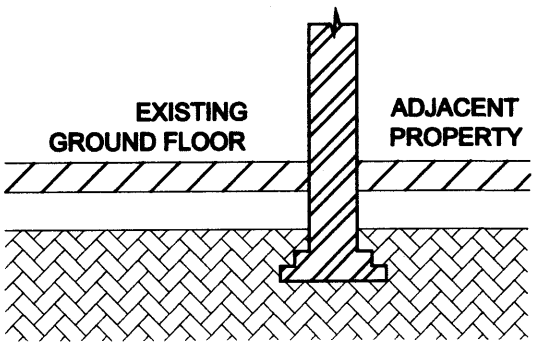
The design and construction methodology, as described above, deals with the potential risks and ensures the excavation and construction of the proposed basement will not affect the structural integrity of 23 Howitt Road and the adjoining properties.

Brian Cochrane BEng, CEng, MIStructE
Green Structural Engineering Ltd

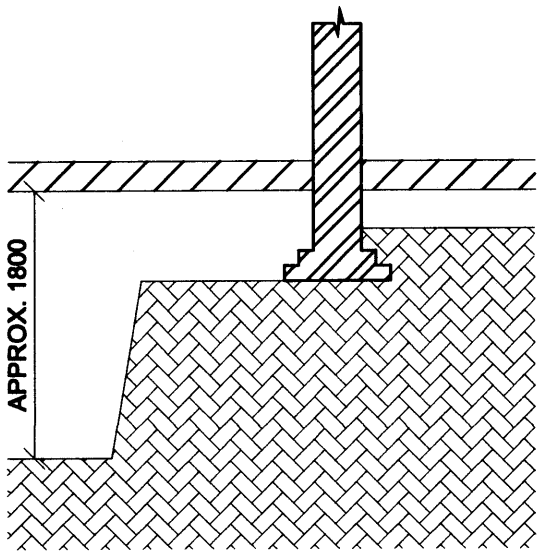
11187/BC November 2013

APPENDICES

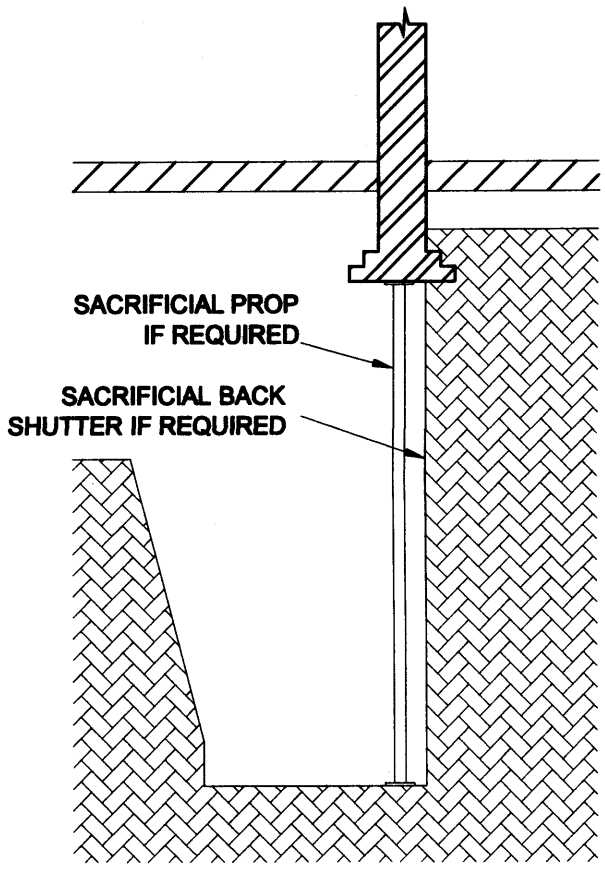
- Retaining wall design calculations
- GSE drawings Sk001i - Section showing the proposed structural works
- GSE Drawing MS01i – Sequence of Works for Underpinning



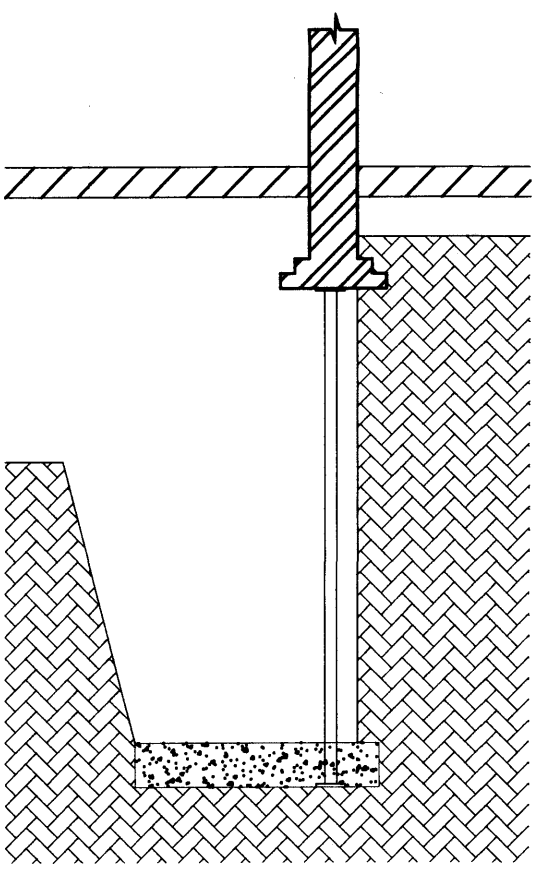
STAGE 0
EXISTING CONDITION



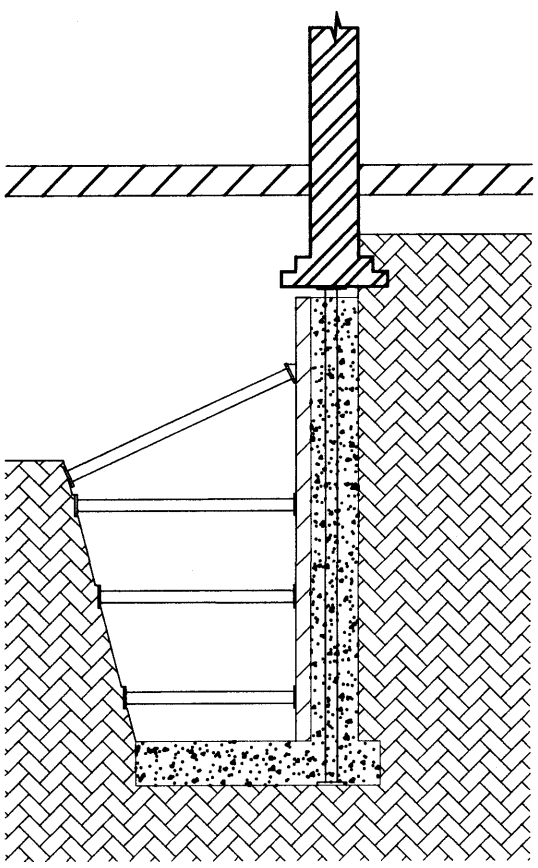
STAGE 1
GENERAL LEVEL REDUCTION



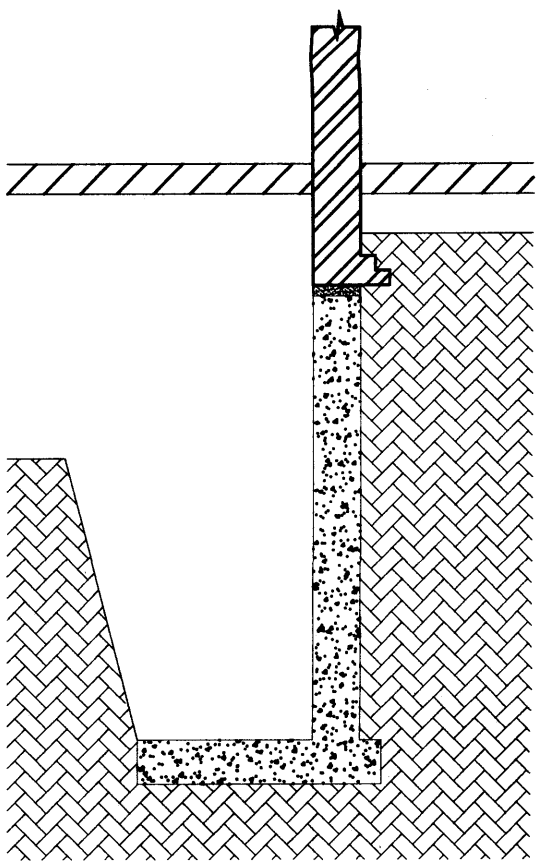
STAGE 2
EXCAVATE TO FORM UNDERPIN 1m WIDE



STAGE 3
CONCRETE BASE OF UNDERPIN



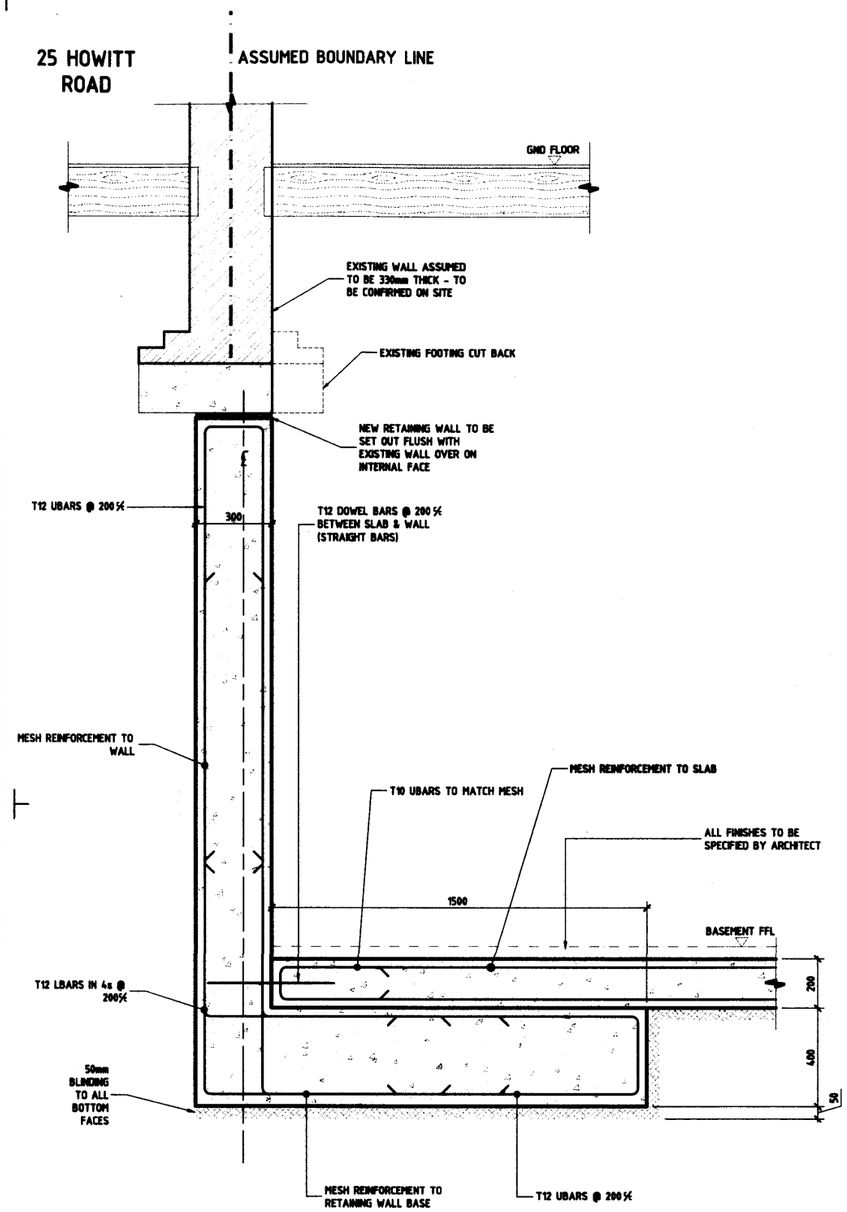
STAGE 4
CONCRETE STEM OF UNDERPIN



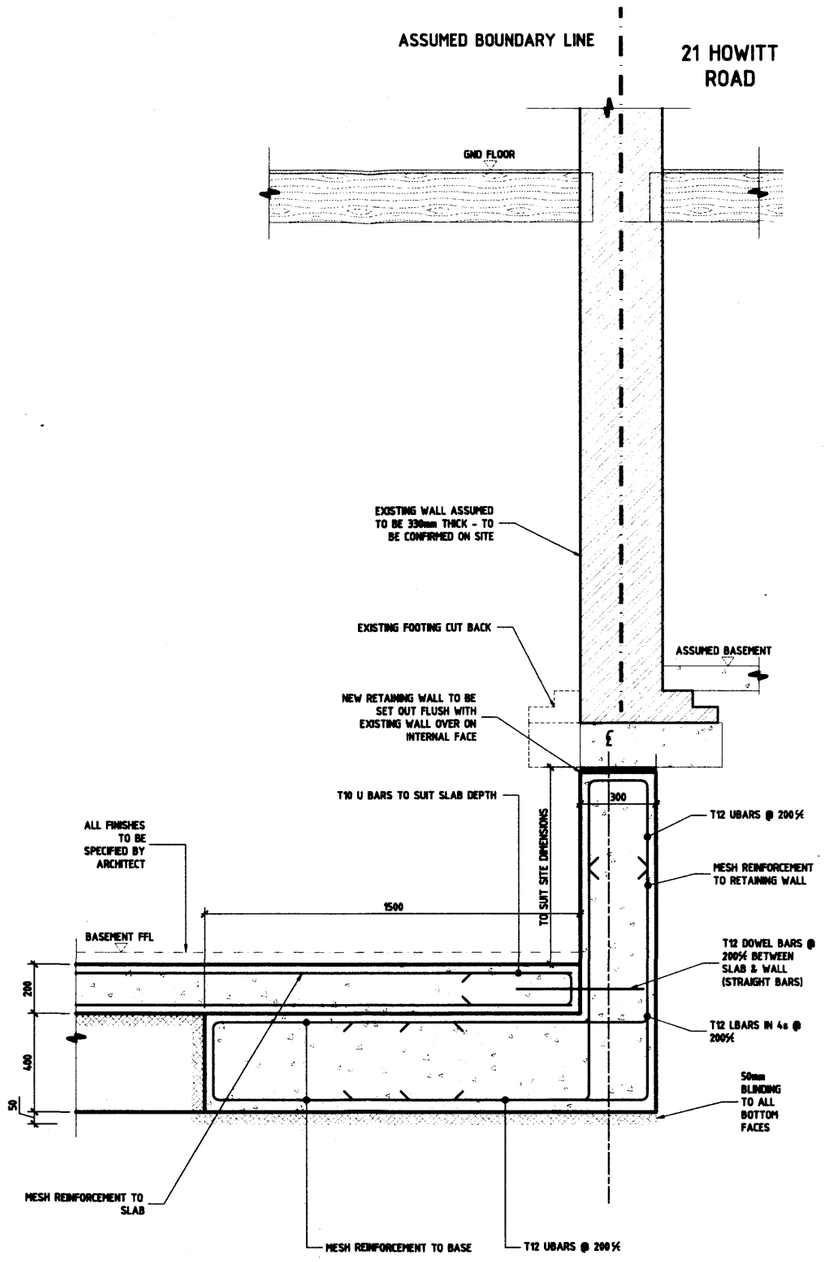
STAGE 5
STRIKE SHUTTER WHEN CONCRETE HAS
GAINED SUFFICIENT STRENGTH, DRYPACK,
TRIM - OFF PROJECTING FOOTING

- THIS DRAWING ILLUSTRATES THE CONSTRUCTION SEQUENCE ONLY AND DOES NOT INCLUDE CONSTRUCTION DETAILS
- PROPPING TO EXISTING GROUND FLOOR NOT SHOWN FOR CLARITY

11187			23HOWIT RD NW3 4LT			Green Structural Engineering Ltd Unit 19 Farm Lane Trading Estate 101 Farm Lane Fulham SW6 1QJ 020 3406 3120 www.gseltd.co.uk	CONSTRUCTION SEQUENCE FOR A TYPICAL UNDERPIN SECTION				- MS / 01i -
REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION		DRAWN	CHECKED	DATE	P_SIZE	SCALE
P1	AUG 11	ISSUE FOR INFORMATION					KT	BC	NOV 2013	A3	1 : 50



SECTION A-A
SCALE 1:25 @ A3



SECTION B-B
SCALE 1:25 @ A3

PRELIMINARY RETAINING WALL - NOT FOR CONSTRUCTION PURPOSES

Do not scale from this drawing
The contractor is responsible for verifying all site dimensions before commencing any work

11187			23 HOWITT ROAD						Green Structural Engineering Ltd	PARTY WALL RETAINING WALLS					PRELIMINARY	
REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION		DRAWN	CHECKED	DATE	P_SIZE	SCALE	Sk001i	P1
										CPW	BC	NOV 2013	A3	AS NOTED		

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Address:	Unit 1b, Farm Lane Trading Estate 101 Fram Lane Fulham, London SW6 1QJ		
		Made by	Date	Page No
		BC	August 2011	
Project:	23 Howitt Road - CMS	Checked	Job No	Revision
Client:	Preliminary Retaining Wall Design		11187	
Element:	(Not for construction / BCo Approval)			

Retaining Wall Under Earth Pressure & Other Loads

Retaining Wall Store No: 1006

Title: Party wall retaining walls - No existing basement - No25

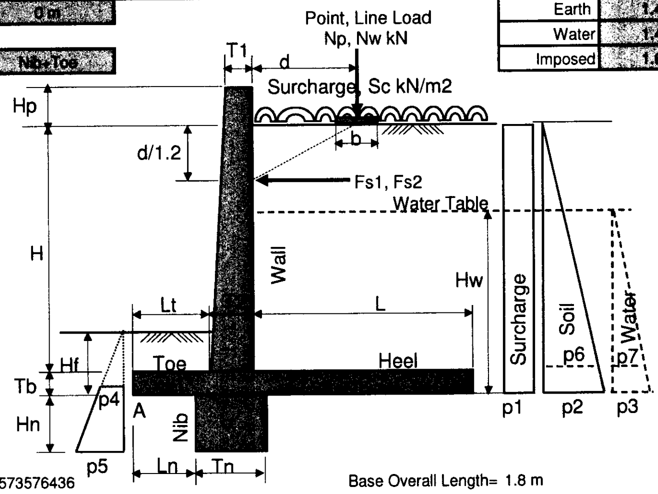
Surcharge, Sc	5 kN/m2
Parapet Height, Hp	7.6 m
Wall Height, H	5.1 m
Wall Top Thickness, T1	0.3 m
Wall Bot Thickness, T2	0.3 m
Base Thickness, Tb	0.4 m
Heel Length, L	0 m
Toe Length, Lt	1.5 m
Front fill Height, Hf	0.4 m
Nib Height, Hn	0 m
Nib Thickness, Tn	0 m
Nib Lateral Location, Ln	0 m
Wall & Base Density, Wc	24 kN/m3
Earth density, We	20 kN/m3
Allowable Pressure, pa	75 kN/m2
Coefficient of Friction υ	0.45
Angle of Repose φ	35Deg
Water Density, Ww	10 kN/m3
Water-table depth, Hw	1.5 m

Point Load acting over width b	
Np	0 kN
Distance, d1	0 m
Width, b	0 m

Line Load, Nw kN /m	
Nw	0 kN/m
Distance, d2	0 m

Passive Earth: Nib+Toe

Safety Factors Against	
Sliding	1
Overturning	1.75
Load Factors (RC Design)	
Earth	1.4
Water	1.4
Imposed	1.6



Coefficient of active pressure ka is:

ka=(1- Sin φ)/(1+ Sin φ)= 0.2710

Coefficient of passive pressure kp is:

kp=(1+ Sin φ)/(1- Sin φ)= 3.6902 where Sin φ = 0.573576436

Base Overall Length= 1.8 m

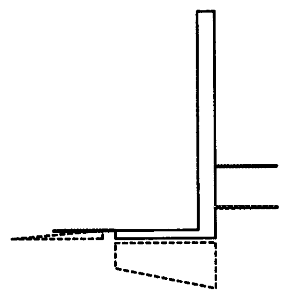
Wall cg from its earth face = 0.15 m

Sliding Force & Overturning Moment About Point A

Overturning Item	Pressure	Sliding Force	Height	Moment
Soil Pressure p2	18.969 kN/m2	33.196 kN	1.167 m	38.729 kNm
Water Pressure p3	6.870 kN/m2	5.153 kN	0.500 m	2.576 kNm
Surcharge Pressure p1	1.355 kN/m2	4.742 kN	1.750 m	8.299 kNm
Point Load Force, Fs1		0.000 kN	3.500 m	0.000 kNm
Line Load Force Fs2		0.000 kN	3.500 m	0.000 kNm
Total Lateral Force, Fa kN		43.091 kN		49.604 kN

Stabilising Moment About Point A & Eccentricity Moment About Mid Base

Stabilising Item	Load from Elements, P	About Point A		About Mid Base	
		Distance	Moment	Distance	Moment
Weight of Wall	77.040 kN	1.650 m	127.116 kNm	-0.750 m	-57.780 kNm
Weight of Base	17.280 kN	0.900 m	15.552 kNm	0.000 m	0.000 kNm
Weight of Earth	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
Surcharge	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
Point Load at d1	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
Line Load at d2	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
	94.320 kN		142.668 kNm		-57.780 kNm



Wall Diagram Showing Back Fill, Front Fill & Water Levels, Induced Vertical & Horizontal Ground Pressures

Check for Overturning About Point A:

Loading Condition	Moments, kNm		Factor Safety	Check Result
	Overturning	Stabilising		
Earth Only	38.729 kNm	142.668 kNm	3.68	>1.75, Hence OK
All Loads	49.604 kNm	142.668 kNm	2.88	>1.75, Hence OK

Analysis Formulae Source: Table 20, "Pressure due to Surcharge", RC Designer's Handbook, 10th Edition, Charles E Reynolds and James C Steedman, 1988

Ground Bearing Pressure Below Base:

Lateral Loading Moment	-57.780 kNm
Vertical Loading Moment	49.604 kNm

P/A	M/Z
52.4	-15.13994901

Total Moment -8.176 kNm

LHS Pressure = P/A + M/z 37.260 kN/m2 < 75, Hence OK

RHS Pressure = P/A - M/z 67.540 kN/m2 < 75, Hence OK

Base in compression

Loading Applied	
Surcharge:	5 kN/m2
Active Earth:	Yes
Water:	Yes
Point Load:	Nil
Line Load:	Nil
Passive Earth:	Nib+Toe

Check for Sliding:

Resistance Item	Pressure	Height	Force
Top Passive Pressure p4	0.000 kN/m2	0.4 m	0.000 kN
Bot Passive Pressure p5	29.521 kN/m2	0.4 m	5.904 kN
	Total Nib resistance =		5.904 kN
	Frictional Resistance= 0.450*94.320 =		42.444 kN
	Total resistance against sliding =		48.348 kN

The factor of safety against sliding is = 48.348 / 43.091 = 1.1220 > 1, Hence OK

Factored Design Shear & Moment at Wall & Base Junction

Lateral Load Item	Pressure	Load factor	Lateral Force	Height	Moment
Soil Pressure p6	16.801 kN/m2	1.4	36.459 kN	1.033 m	37.674 kNm
Water Pressure p7	5.038 kN/m2	1.4	3.879 kN	0.367 m	1.422 kNm
Surcharge Pressure p1	1.355 kN/m2	1.6	6.721 kN	1.550 m	10.417 kNm
Point Load at d1		1.6	0.000 kN	3.100 m	0.000 kNm
Line Load at d2		1.6	0.000 kN	3.100 m	0.000 kNm
		Shear:	47.059 kN	**Moment:**	49.514 kNm

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	Fulham, London SW6 1QJ	Made by	Date	Page No
Project:	23 Howitt Road - GMS	BC	August 2011	
Client:	Preliminary Retaining Wall Design	Checked	Job No	Revision
Element:	(Not for construction / BCo Approval)		11487	

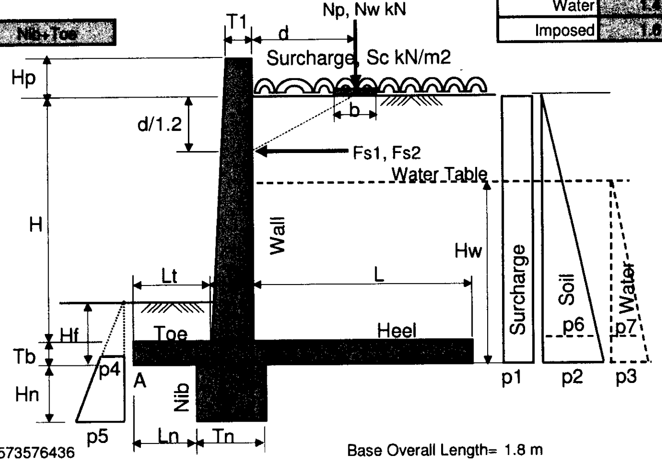
Retaining Wall Under Earth Pressure & Other Loads

Retaining Wall Store No: 1007

Title: Party Wall Retaining Walls - Existing Basement No21

Surcharge, Sc	5 kN/m2	Point Load acting over width b		Line Load, Nw kN /m	
Parapet Height, Hp	0 m	Np	55 kN	Nw	0 kN/m
Wall Height, H	1.4 m	Distance, d1	-0.15 m	Distance, d2	0 m
Wall Top Thickness, T1	0.3 m	Width, b	0.3 m		
Wall Bot Thickness, T2	0.3 m				
Base Thickness, Tb	0.4 m	Passive Earth:	Nib+Toe		
Heel Length, L	0 m				
Toe Length, Lt	1.5 m				
Front fill Height, Hf	0 m				
Nib Height, Hn	0 m				
Nib Thickness, Tn	0 m				
Nib Lateral Location, Ln	0 m				
Wall & Base Density, Wc	24 kN/m3				
Earth density, We	20 kN/m3				
Allowable Pressure, pa	75 kN/m2				
Coefficient of Friction υ	0.45				
Angle of Repose φ	35Deg				
Water Density, Ww	10 kN/m3				
Water-table depth, Hw	1.2 m				

Safety Factors Against	
Sliding	1
Overturning	1.75
Load Factors (RC Design)	
Earth	1.4
Water	1.4
Imposed	1.6



Coefficient of active pressure ka is:

ka=(1- Sin φ)/(1+ Sin φ)= 0.2710

Coefficient of passive pressure kp is:

kp=(1+ Sin φ)/(1- Sin φ)= 3.6902 where Sin φ = 0.573576436

Base Overall Length= 1.8 m

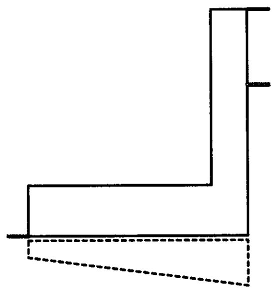
Wall cg from its earth face = 0.15 m

Sliding Force & Overturning Moment About Point A

Overturning Item	Pressure	Sliding Force	Height	Moment
Soil Pressure p2	9.756 kN/m2	8.780 kN	0.600 m	5.268 kNm
Water Pressure p3	5.496 kN/m2	3.298 kN	0.400 m	1.319 kNm
Surcharge Pressure p1	1.355 kN/m2	2.439 kN	0.900 m	2.195 kNm
Point Load Force, Fs1		14.904 kN	1.925 m	28.691 kNm
Line Load Force Fs2		0.000 kN	1.800 m	0.000 kNm
Total Lateral Force, Fa kN		29.421 kN		37.473 kN

Stabilising Moment About Point A & Eccentricity Moment About Mid Base

Stabilising Item	Load from Elements, P	About Point A		About Mid Base	
		Distance	Moment	Distance	Moment
Weight of Wall	10.080 kN	1.650 m	16.632 kNm	-0.750 m	-7.560 kNm
Weight of Base	17.280 kN	0.900 m	15.552 kNm	0.000 m	0.000 kNm
Weight of Earth	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
Surcharge	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
Point Load at d1	55.000 kN	1.650 m	90.750 kNm	-0.750 m	-41.250 kNm
Line Load at d2	0.000 kN	1.800 m	0.000 kNm	-0.900 m	0.000 kNm
	82.360 kN		122.934 kNm		-48.810 kNm



Wall Diagram Showing Back Fill, Front Fill & Water Levels, Induced Vertical & Horizontal Ground Pressures

Check for Overturning About Point A:

Loading Condition	Moments, kNm		Factor Safety	Check Result
	Overturning	Stabilising		
Earth Only	5.268 kNm	32.184 kNm	6.11	>1.75, Hence OK
All Loads	37.473 kNm	122.934 kNm	3.28	>1.75, Hence OK

Analysis Formulae Source: Table 20, "Pressure due to Surcharge", RC Designer's Handbook, 10th Edition, Charles E Reynolds and James C Steedman, 1988

Ground Bearing Pressure Below Base:

Lateral Loading Moment	-48.810 kNm
Vertical Loading Moment	37.473 kNm

P/A	M/Z
45.75555556	-20.99400859

Total Moment -11.337 kNm

LHS Pressure = P/A + M/z 24.762 kN/m2 < 75, Hence OK

RHS Pressure = P/A - M/z 66.750 kN/m2 < 75, Hence OK

Base in compression

Loading Applied	
Surcharge:	5 kN/m2
Active Earth:	Yes
Water:	Yes
Point Load:	55 kN
Line Load:	Nil
Passive Earth:	Nil

Check for Sliding:

Resistance Item	Pressure	Height	Force
Top Passive Pressure p4	0.000 kN/m2	0 m	0.000 kN
Bot Passive Pressure p5	0.000 kN/m2	0 m	0.000 kN
		Total Nib resistance =	0.000 kN
	Frictional Resistance= 0.450*82.360 =		37.062 kN
		Total resistance against sliding =	37.062 kN

The factor of safety against sliding is = 37.062 / 29.421 = 1.2597 > 1, Hence OK

Factored Design Shear & Moment at Wall & Base Junction

Lateral Load Item	Pressure	Load factor	Lateral Force	Height	Moment
Soil Pressure p6	7.588 kN/m2	1.4	7.436 kN	0.467 m	3.470 kNm
Water Pressure p7	3.664 kN/m2	1.4	2.052 kN	0.267 m	0.547 kNm
Surcharge Pressure p1	1.355 kN/m2	1.6	3.035 kN	0.700 m	2.125 kNm
Point Load at d1		1.6	23.847 kN	1.525 m	36.367 kNm
Line Load at d2		1.6	0.000 kN	1.400 m	0.000 kNm
		Shear:	36.370 kN	**Moment:**	42.509 kNm

Find below information regarding the 16 points for the Lifetime Homes Standards:

1. **Car parking width:** Not applicable.
2. **Access from car parking:** Not applicable.
3. **Approach gradients:** There are steps leading to the approach of the ground floor entrance
4. **External entrance:** The existing external entrance to the ground floor is not levelled with the street level. Difference in levels is to be maintained as exists.
5. **Communal stairs and lifts:** There are existing internal communal staircases. There is no room to facilitate a lift.
6. **Doorways and Hallways:** The width of internal doorways and hallways comply with this requirement.
7. **Wheelchair accessibility:** The flat will not be wheelchair accessible due to the internal staircase leading down to the entrances of the units.
8. **Living rooms:** Not applicable.
9. **Entrance level bedspace:** Not applicable
10. **Entrance level WC & Shower drainage:** Not applicable
11. **Bathroom & WC walls:** These walls will be capable of taking adaption's such as handrails.
12. **Stair lift/ through-floor lift:** A lift complying with this standard can not be provided due to lack of space within the proposed units.
13. **Tracking hoist route:** Not applicable
14. **Shower room layout:** The shower room will be designed for ease of access to the shower, WC and wash basin.
15. **Window Specification:** The windows will sit less than 800mm above floor level.
16. **Controls, Fixtures & fittings:** All switches, sockets, ventilation and service controls will be at a height useable by all (between 450mm and 1200mm from the floor).