APPENDIX D

DESIGN CALCULATIONS

	Project		Job Ref	
GSE GREEN STRUCTURAL ENGINEERING	34 Queens Grove NW8 6HN		12686	
	Drawing Ref	Calculations by	Checked by	Sheet of
		EA		
	Part of Structure		Date	
	Assumptions		March 2015	

Assumptions.

* Timber floors to all levels spanning from front to back
* Party wall build up as per CIRIA 111
* Adjoining property has similar loading regime.
* Adjoing property does not have a basement.
* Assume half width loads when considering party wall load run downs.

	Project		Job Ref	
GSE STRUCTURAL ENGINEERING	34 Queens Grove NW8 6HN		12686	
	Drawing Ref	Calculations by	Checked by	Sheet
		EA		
	Part of Structure		Date	
	Loadings		March 2015	

Loadings Used (Unfactored SLS)

Flat Roof	
Dead Loads	
Felt and chippings	0.45 kN/m²
Boards and joists	0.20 kN/m²
Ceiling	0.20 kN/m²
Services	0.15 kN/m²
Total Dead Load	**1.00 kN/m²**
Imposed Load	**0.75 kN/m²**
Pitched Roof	
Dead Loads	
Slate and felt	0.30 kN/m²
Boards and joists	0.25 kN/m²
Ceiling	0.25 kN/m²
Services	0.15 kN/m²
Total Dead Load	**1.00 kN/m²**
Imposed Load Roof (maintenance)	0.75 kN/m²
Imposed Load Ceiling	0.25 kN/m²
Total Imposed Loading	**1.00 kN/m²**
Timber Floors	
Dead Loads	
Boards and joists	0.35 kN/m²
Ceiling	0.25 kN/m²
Services	0.20 kN/m²
Total Dead Load	**0.80 kN/m²**
Imposed Load	**1.50 kN/m²**
Partitions (on plan)	**0.60 kN/m²**
Beam & Block Floors	
Dead Loads	
Screed	1.80 kN/m²
Floor swt	3.50 kN/m²
Services	0.30 kN/m²
Total Dead Load	**5.60 kN/m²**
Imposed Load	**1.50 kN/m²**

	Project		Job Ref	
GSE GREEN STRUCTURAL ENGINEERING	34 Queens Grove NW8 6HN		12686	
	Drawing Ref	Calculations by	Checked by	Sheet
		EA		
	Part of Structure		Date	
	Loadings		March 2015	

Walls Loads (on elevation)

Stud Partions	1.00 kN/m^2
100/100/100 Cavity Wall	4.70 kN/m^2
215 Brickwork + Plaster	5.30 kN/m^2
330 Brickwork + Plaster	7.40 kN/m^2
450 Brickwork + Plaster	10.10 kN/m^2

3.3.2 Wall slenderness and restraints

Regulations[2] for the thickness of external and internal or party walls depended on the number of storeys and the storey height. The minimum thicknesses specified in the Metropolitan Buildings Acts of 1844 for 'first class' buildings are reproduced in Figure 6. The slendernesses of the walls were cautious by modern design standards if the wall was restrained effectively at a storey height of 8 to 10 ft (2.5 to 3.0 m) in a typical house.

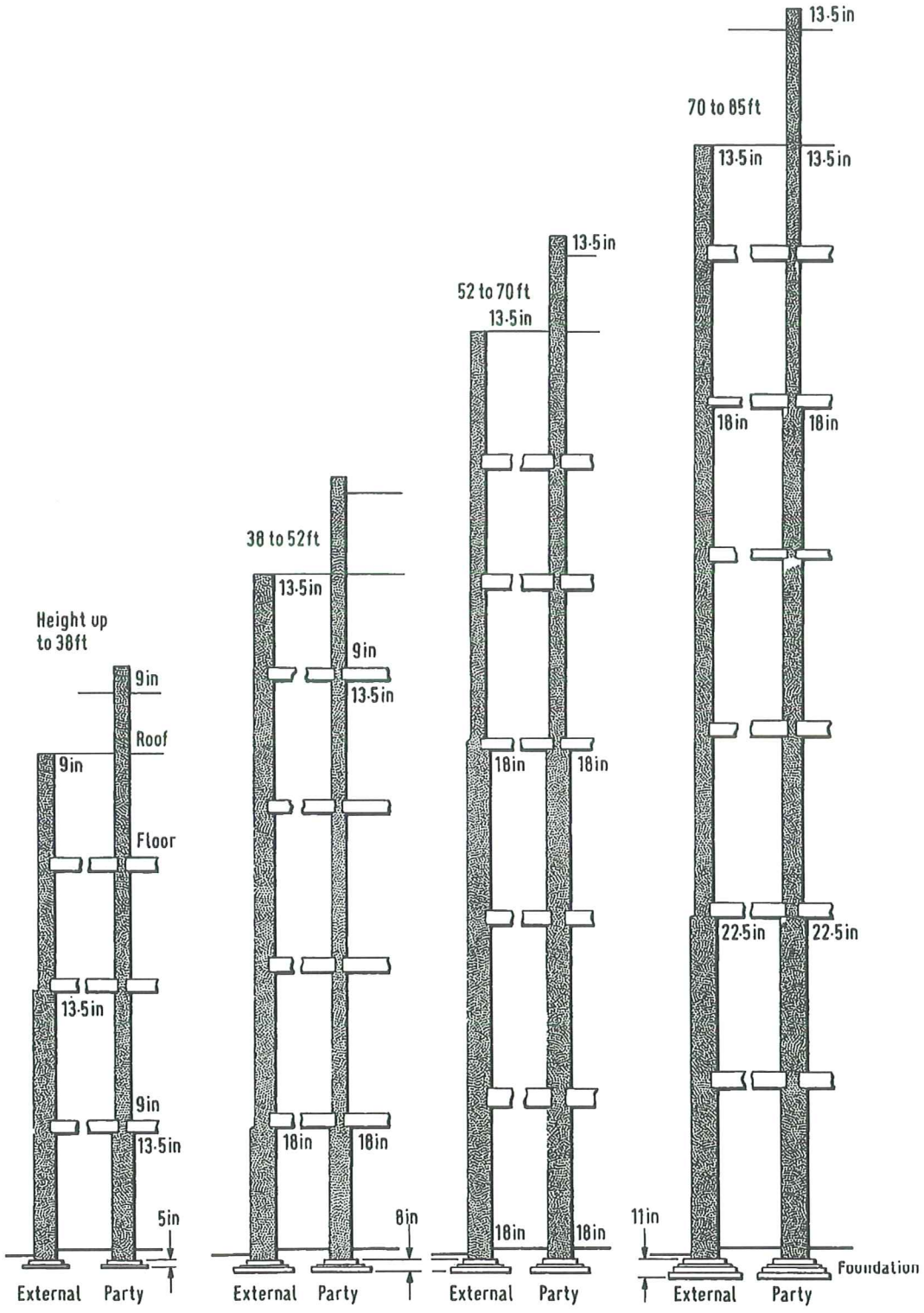


Figure 6 *Thickness of walls in accordance with the London Building Acts of 1844*

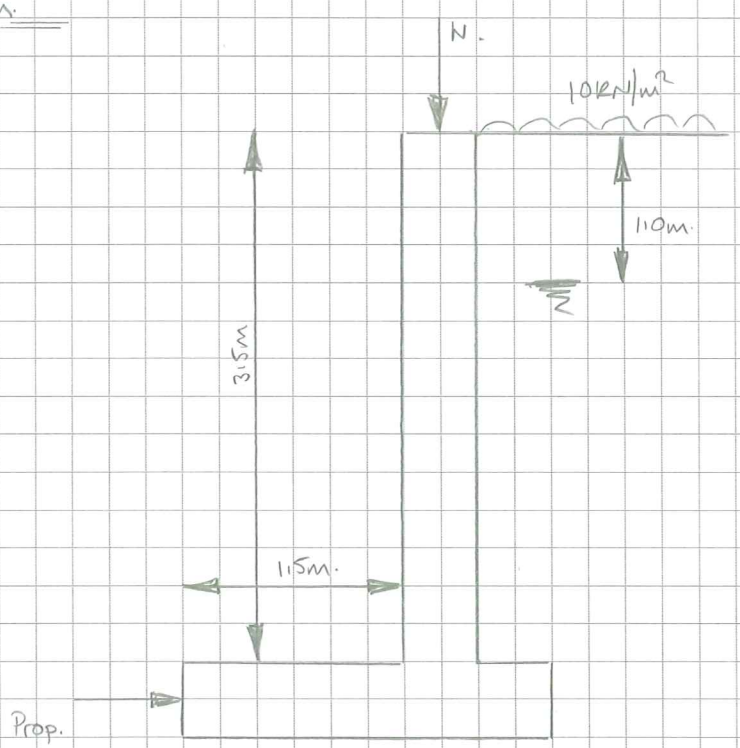
	Project	Job Ref
GSE GREEN STRUCTURAL ENGINEERING	34 Queens Grove NW8 6HN	12686
	Drawing Ref / Calculations by: EA	Checked by / Sheet No.
	Part of Structure: Existing Property Load Run Down	Date: March 2015

Party Wall Load Run Down.

	LOADING DEAD	LOADING LIVE
* Roof DL=1KN/m² LL=1KN/m² Span = 7.0m.		
$G_k = 1 \times \frac{7}{2} =$	3.5	
$Q_k = 1 \times \frac{7}{2} =$		3.5
* Lower Ground → 5th DL=0.8KN/m² LL=2.1KN/m² Span = 7.0m		
$G_k = 6 \times [0.8 \times \frac{7}{2}] =$	16.8.	
$Q_k = 6 \times [2.1 \times \frac{7}{2}] =$		44.1
* Party Wall S/W.		
Lower ground → ground. (450 Bwk) DL=10.1KN/m²		
$G_k = 10.1 \times 3 =$	30.3	
Ground → third (330 Bwk) DL=7.4KN/m²		
$G_k = 7.4 \times 9 =$	66.6	
Third → Roof (215 Bwk) DL=5.3KN/m²		
$G_k = 5.3 \times 6 =$	32.	
* Total =	150	48.

	Project		Job Ref	
GSE GREEN STRUCTURAL ENGINEERING	34 Queens Grove NW8 6HN		12686	
	Drawing Ref	Calculations by: EA	Checked by	Sheet of
	Part of Structure: Retaining Wall Design.		Date: March 2015	

Retaining Wall Design.



Permenant State.

* W. G_k = 150kN/m Q_k = 48kN/m.
* G.W.L 1.0m below ground.
* Prop at base.
* Surcharge = 10kN/m²

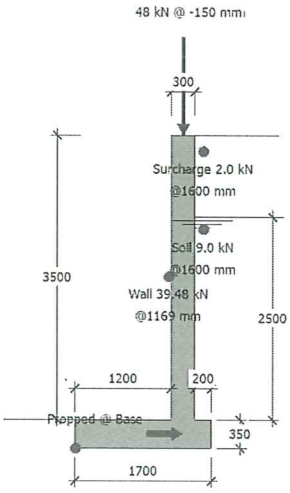
Temporary State.

* No G.W.L
* W. G_k = 130kN/m (Party wall S/W).

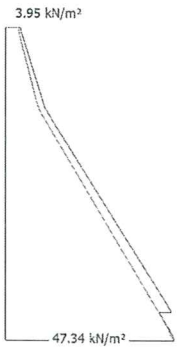
Green Structural Engineering Ltd
Unit 5 Quayside Lodge
William Morris Way
Fulham, SW6 2UZ

Job ref	: 12686
Sheet	: C/
Made By	: EA
Date	: March 2015
Checked	:
Approved	:

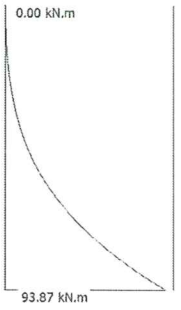
MASTERKEY : RETAINING WALL DESIGN TO BS 8002 AND BS 8110 : 1997
Basic RC Retaining Wall
Reinforced Concrete Retaining Wall with Reinforced Base
Party Wall Underpin Design (Perm State)



Passive Pressure Diagram



Pressure Diagram



Bending Moment Diagram per m run

Summary of Design Data

Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³)	Dry Soil 18.00, Saturated Soil 20.80, Submerged Soil 10.80, Concrete 24.00
Concrete grade	fcu 30 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 30 mm, Wall outer cover 30 mm, Base cover 50 mm
Reinforcement design	fy 460 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 10.00 kN/m², Water table level 2500 mm

† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

Additional Loads

Wall Propped at Base Level	Therefore no sliding check is required
Vertical Line Loads	150 kN/m @ X -150 mm and Y 0 mm - Load type Dead 48 kN/m @ X -150 mm and Y 0 mm - Load type Live
† Dimensions	Ties, line loads and partial loads are measured from the inner top edge of the wall

Soil Properties

Soil bearing pressure	Allowable pressure @ front 175.00 kN/m², @ back 175.00 kN/m²
Back Soil Friction and Cohesion	ϕ = Atn(Tan(30)/1.2) = 25.69°
Base Friction and Cohesion	δ = Atn(0.75xTan(Atn(Tan(30)/1.2))) = 19.84°
Front Soil Friction and Cohesion	ϕ = Atn(Tan(30)/1.2) = 25.69°

Loading Cases

G_{Soil}- Soil Self Weight, G_{Wall}- Wall & Base Self Weight, Fv_{Heel}- Vertical Loads over Heel,
P_a- Active Earth Pressure, $P_{surcharge}$- Earth pressure from surcharge

Case 1: Geotechnical Design	1.00 G_{Soil}+1.00 G_{Wall}+1.00 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$
Case 2: Structural Ultimate Design	1.40 G_{Soil}+1.40 G_{Wall}+1.60 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$

Geotechnical Design

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising	110.264/331.058	0.333	OK

Wall Sliding - Virtual Back Pressure

$Fx/(Rx_{Friction}+ Rx_{Passive})$	0.000/(89.663+0.000)	0.000	OK
Prop ReactionCase 2 (Serviceability)	87.4 kN @ Base		

Soil Pressure

Virtual Back (No uplift)	Max(126.262/175, 166.067/175) kN/m²	0.949	OK
Wall Back (No uplift)	Max(155.810/175, 136.520/175) kN/m²	0.890	OK

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Approved	:

Structural Design

Prop Reaction

Maximum Prop Reaction (Ultimate)	95.5 kN @ Base

Wall Design (Inner Steel)

Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	Main B12@125 (30 mm) Dist. B10@200 (42 mm)	905 mm²	OK
Compression Steel Provided (Cover)	Main B10@300 (30 mm) Dist. B10@300 (40 mm)	262 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	264 mm, 1000 mm, 905 mm², 460 N/mm², 30.0 N/mm²	249 mm	
Mr=fn(above,As',d',x,x/d)	262 mm², 35 mm, 33 mm, 0.12	98.6 kN.m	
Moment Capacity Check (M/Mr)	M 93.9 kN.m, Mr 98.6 kN.m	0.952	OK
Wall Axail Design (N/Ncap)	N 322.1 kN, Ncap 3600.0 kN	0.089	OK
Wall Slenderness λ	Leff/tk =2.00x3500.0/300.0	23.3	OK
Kmin = (Nuz-N)/(Nuz-Nbal)	Min(1.0, 4000.0 - 322.1)/(4000.0 - 1555.0)	1.0	
M_{add}= N.Kmin.h.λ²/2000	322.1x1.0x300.0x23.3²/2000	26.1kN.m	
$(M+Madd)/Mr_{Axial}$	M+Madd 120.0 kN, Mr_{Axail}133.5 kN.m	0.899	OK
Shear Capacity Check	F 79.7 kN, vc 0.521 N/mm², Fvr 137.7 kN	0.58	OK

Base Top Steel Design

Steel Provided (Cover)	Main B10@150 (50 mm) Dist. B10@150 (60 mm)	524 mm²	OK
Compression Steel Provided (Cover)	Main B20@100 (50 mm) Dist. B10@150 (70 mm)	3142 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	295 mm, 1000 mm, 524 mm², 460 N/mm², 30 N/mm²	280 mm	
Mr=fn(above,As',d',x,x/d)	3142 mm², 60 mm, 19 mm, 0.06	64.1 kN.m	
Moment Capacity Check (M/Mr)	M 0.0 kN.m, Mr 64.1 kN.m	0.000	OK
Shear Capacity Check	F 0.0 kN, vc 0.407 N/mm², Fvr 120.1 kN	0.00	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main B20@100 (50 mm) Dist. B10@150 (70 mm)	3142 mm²	OK
Compression Steel Provided (Cover)	Main B10@150 (50 mm) Dist. B10@150 (60 mm)	524 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	290 mm, 1000 mm, 3142 mm², 460 N/mm², 30 N/mm²	239 mm	
Mr=fn(above,As',d',x,x/d)	524 mm², 55 mm, 114 mm, 0.39	327.9 kN.m	
Moment Capacity Check (M/Mr)	M 104.8 kN.m, Mr 327.9 kN.m	0.320	OK
Shear Capacity Check	F 203.0 kN, vc 0.747 N/mm², Fvr 216.8 kN	0.94	OK

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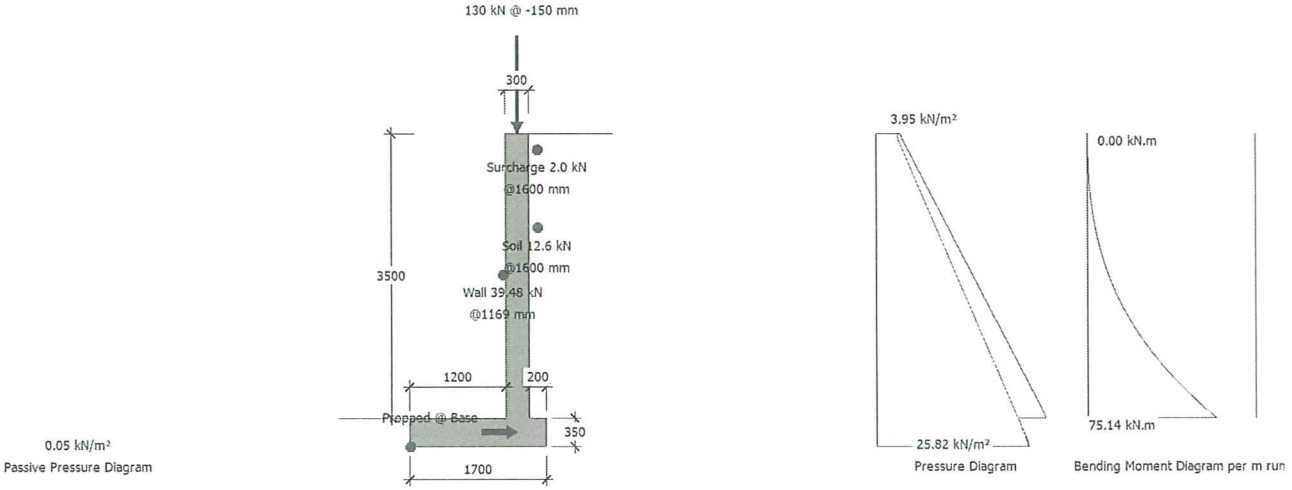
Approved	:

MASTERKEY : RETAINING WALL DESIGN TO BS 8002 AND BS 8110 : 1997

Basic RC Retaining Wall

Reinforced Concrete Retaining Wall with Reinforced Base

Party Wall Underpin Design (Temp State)



Summary of Design Data

Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³)	Soil 18.00, Concrete 24.00
Concrete grade	fcu 30 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 30 mm, Wall outer cover 30 mm, Base cover 50 mm
Reinforcement design	fy 460 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 10.00 kN/m², Fully drained

† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

Additional Loads

Wall Propped at Base Level	Therefore no sliding check is required
Vertical Line Load	130 kN/m @ X -150 mm and Y 0 mm - Load type Dead
† Dimensions	Ties, line loads and partial loads are measured from the inner top edge of the wall

Soil Properties

Soil bearing pressure	Allowable pressure @ front 175.00 kN/m², @ back 175.00 kN/m²
Back Soil Friction and Cohesion	ϕ = Atn(Tan(30)/1.2) = 25.69°
Base Friction and Cohesion	δ = Atn(0.75xTan(Atn(Tan(30)/1.2))) = 19.84°
Front Soil Friction and Cohesion	ϕ = Atn(Tan(30)/1.2) = 25.69°

Loading Cases

G_{Soil}- Soil Self Weight, G_{Wall}- Wall & Base Self Weight, Fv_{Heel}- Vertical Loads over Heel,
P_a- Active Earth Pressure, $P_{surcharge}$- Earth pressure from surcharge

Case 1: Geotechnical Design	1.00 G_{Soil}+1.00 G_{Wall}+1.00 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$
Case 2: Structural Ultimate Design	1.40 G_{Soil}+1.40 G_{Wall}+1.60 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$

Geotechnical Design

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising	80.623/245.018	0.329	OK

Wall Sliding - Virtual Back Pressure

Fx/($Rx_{Friction}$+ $Rx_{Passive}$)	0.000/(66.424+0.000)	0.000	OK
Prop ReactionCase 2 (Serviceability)	56.4 kN @ Base		

Soil Pressure

Virtual Back (No uplift)	Max(91.825/175, 124.739/175) kN/m²	0.713	OK
Wall Back (No uplift)	Max(125.256/175, 91.308/175) kN/m²	0.716	OK

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Job ref	: 12686
Sheet	: C/
Made By	: EA
Date	: March 2015
Checked	:
Approved	:

Structural Design

Prop Reaction

Maximum Prop Reaction (Ultimate) 66.1 kN @ Base

Wall Design (Inner Steel)

Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	Main B12@125 (30 mm) Dist. B10@200 (42 mm)	905 mm²	OK
Compression Steel Provided (Cover)	Main B10@300 (30 mm) Dist. B10@300 (40 mm)	262 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	264 mm, 1000 mm, 905 mm², 460 N/mm², 30.0 N/mm²	249 mm	
Mr=fn(above,As',d',x,x/d)	262 mm², 35 mm, 33 mm, 0.12	98.6 kN.m	
Moment Capacity Check (M/Mr)	M 75.1 kN.m, Mr 98.6 kN.m	0.762	OK
Wall Axail Design (N/Ncap)	N 217.3 kN, Ncap 3600.0 kN	0.060	OK
Wall Slenderness λ	Leff/tk =2.00x3500.0/300.0	23.3	OK
Kmin = (Nuz-N)/(Nuz-Nbal)	Min(1.0, 4000.0 - 217.3)/(4000.0 - 1555.0)	1.0	
M_{add}= N.Kmin.h.λ²/2000	217.3x1.0x300.0x23.3²/2000	17.7kN.m	
(M+Madd)/Mr_{Axial}	M+Madd 92.8 kN, Mr_{Axail}123.1 kN.m	0.754	OK
Shear Capacity Check	F 57.4 kN, vc 0.521 N/mm², Fvr 137.7 kN	0.42	OK

Base Top Steel Design

Steel Provided (Cover)	Main B10@150 (50 mm) Dist. B10@150 (60 mm)	524 mm²	OK
Compression Steel Provided (Cover)	Main B20@100 (50 mm) Dist. B10@150 (70 mm)	3142 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	295 mm, 1000 mm, 524 mm², 460 N/mm², 30 N/mm²	280 mm	
Mr=fn(above,As',d',x,x/d)	3142 mm², 60 mm, 19 mm, 0.06	64.1 kN.m	
Moment Capacity Check (M/Mr)	M 0.0 kN.m, Mr 64.1 kN.m	0.000	OK
Shear Capacity Check	F 0.0 kN, vc 0.407 N/mm², Fvr 120.1 kN	0.00	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main B20@100 (50 mm) Dist. B10@150 (70 mm)	3142 mm²	OK
Compression Steel Provided (Cover)	Main B10@150 (50 mm) Dist. B10@150 (60 mm)	524 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	290 mm, 1000 mm, 3142 mm², 460 N/mm², 30 N/mm²	239 mm	
Mr=fn(above,As',d',x,x/d)	524 mm², 55 mm, 114 mm, 0.39	327.9 kN.m	
Moment Capacity Check (M/Mr)	M 79.1 kN.m, Mr 327.9 kN.m	0.241	OK
Shear Capacity Check	F 147.9 kN, vc 0.747 N/mm², Fvr 216.8 kN	0.68	OK

APPENDIX E

CONSTRUCTION PRINCIPAL DRAWINGS

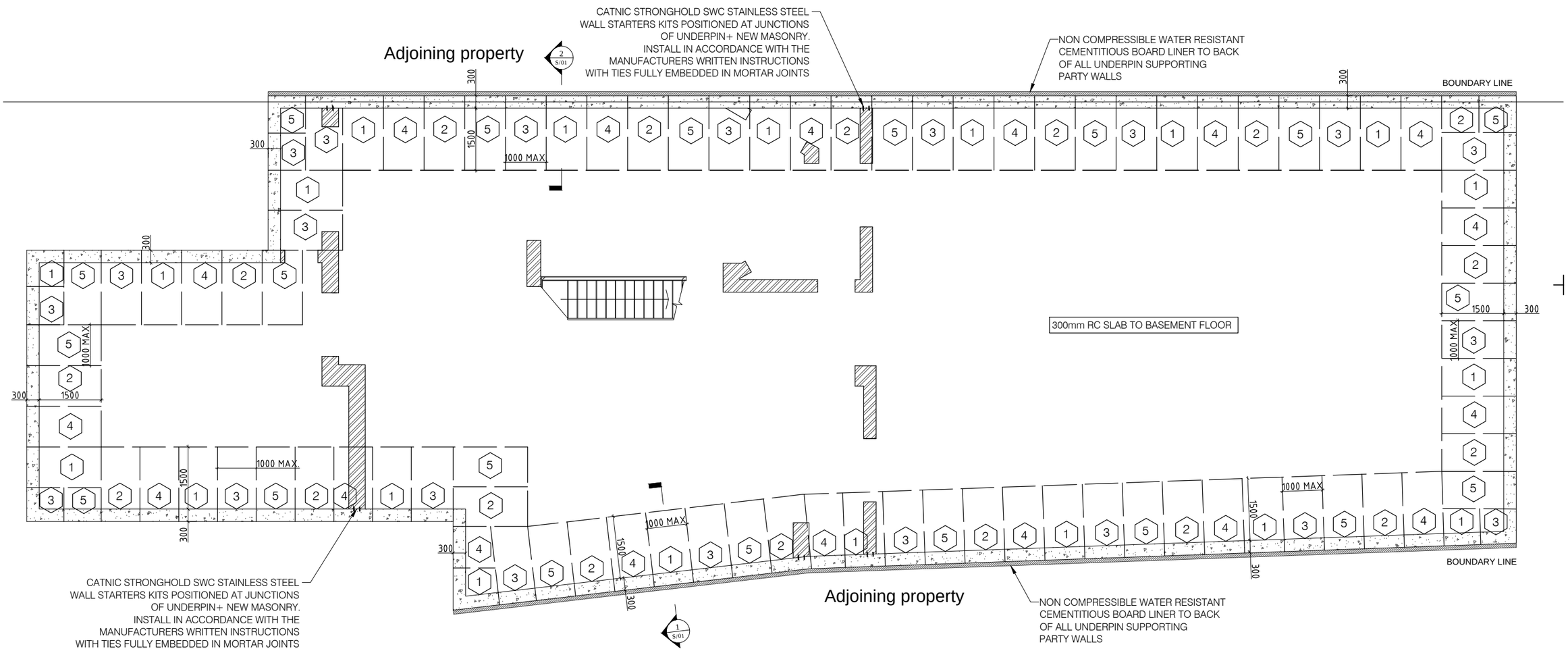
NOTES:

1. UNDERPINS WILL NOT BE STABLE WHILST UNDER CONSTRUCTION. CONTRACTOR MUST PROVIDE ADEQUATE LATERAL SUPPORT TO ALL PINS UNTIL BASEMENT SLAB HAS BEEN CAST.
2. BELOW GROUND WATERPROOFING AND DRAINAGE BY OTHERS.
3. CATNIC STRONGHOLD SWC STAINLESS STEEL WALL STARTER KITS POSITIONED AT JUNCTIONS OF EXISTING MASONRY WALL AND NEW MASONRY. INSTALL IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION WITH TIES FULLY EMBEDDED IN MORTAR JOINTS.
4. NON COMPRESSIBLE WATER RESISTANT CEMENTITIOUS BOARD LINER TO BACK OF ALL UNDERPIN SUPPORTING PARTY WALLS.
5. ALL TIMBER JOISTS TO BE RECESSED & STRAPPED TO BEAM USING 30x5 900 LONG GALVANIZED STRAPS @ 1200 CRS MAX TO BE SCREWED TO JOISTS IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION.
6. RETAINING WALL RAISED UP LOCALLY TO SUPPORT NEW STEEL WORK (440 LONG x 100 WIDE)

ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE

KEY

- EXISTING WALL
- NEW LOAD BEARING BRICKWORK
- NEW LOAD BEARING BLOCKWORK
- NEW LOAD BEARING CONCRETE WALL
- NEW LOAD BEARING STUD PARTITION
- NEW NON LOAD-BEARING STUD WALL



BASEMENT LAYOUT
WITH SUGGESTED UNDERPIN SEQUENCE

UNDERPINS WILL NOT BE STABLE WHILST UNDER CONSTRUCTION.
CONTRACTOR MUST PROVIDE ADEQUATE LATERAL SUPPORT TO ALL PINS UNTIL BASEMENT SLAB HAS BEEN CAST

BELOW GROUND DRAINAGE BY OTHERS

THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

12686

34 QUEEN'S GROVE, NW8

REV	DATE	DESCRIPTION
P1	30.03.15	INITIAL ISSUE

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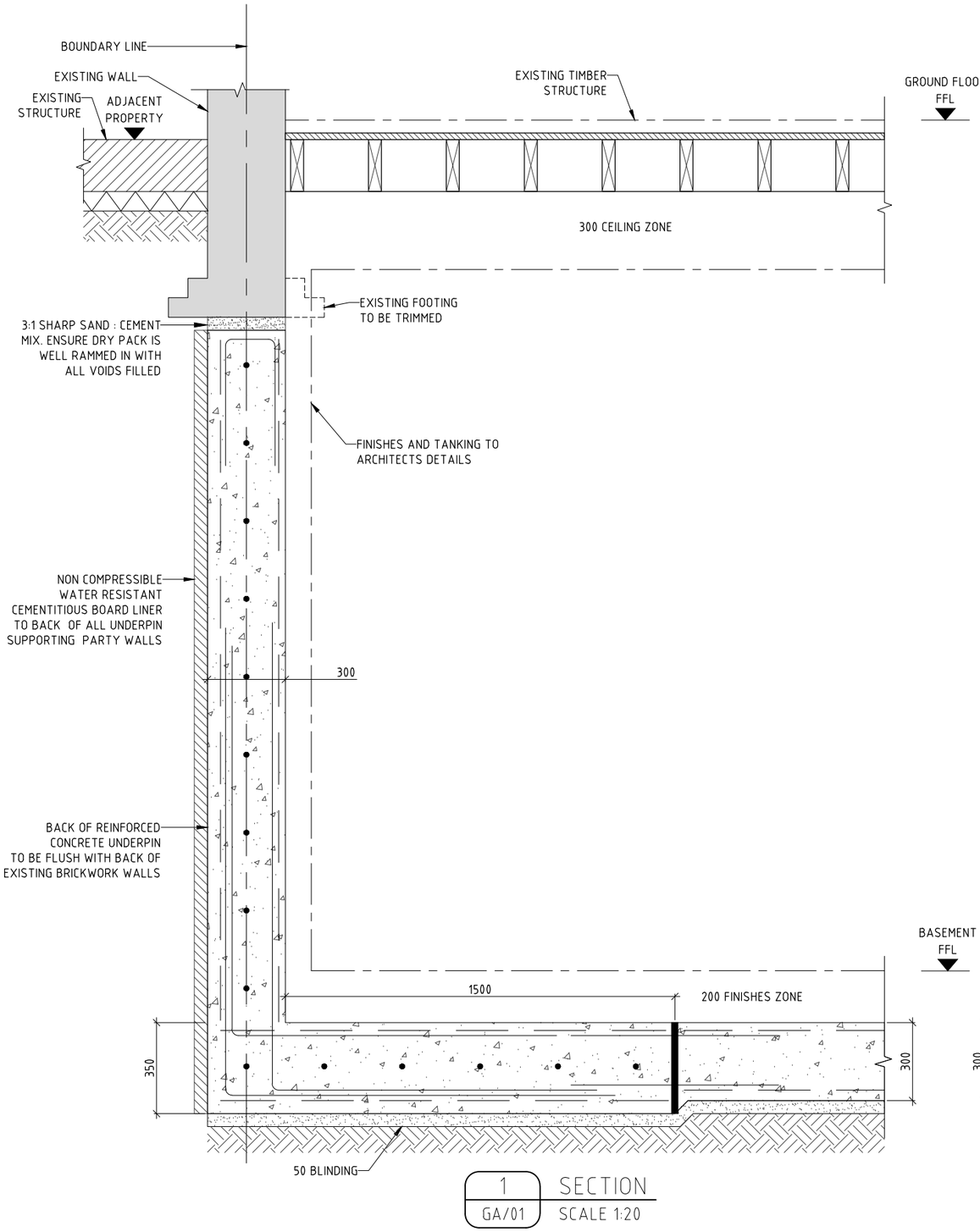
Unit 5 Quayside Lodge, William Morris Way, Fulham, SW6 2UZ
020 3405 3120

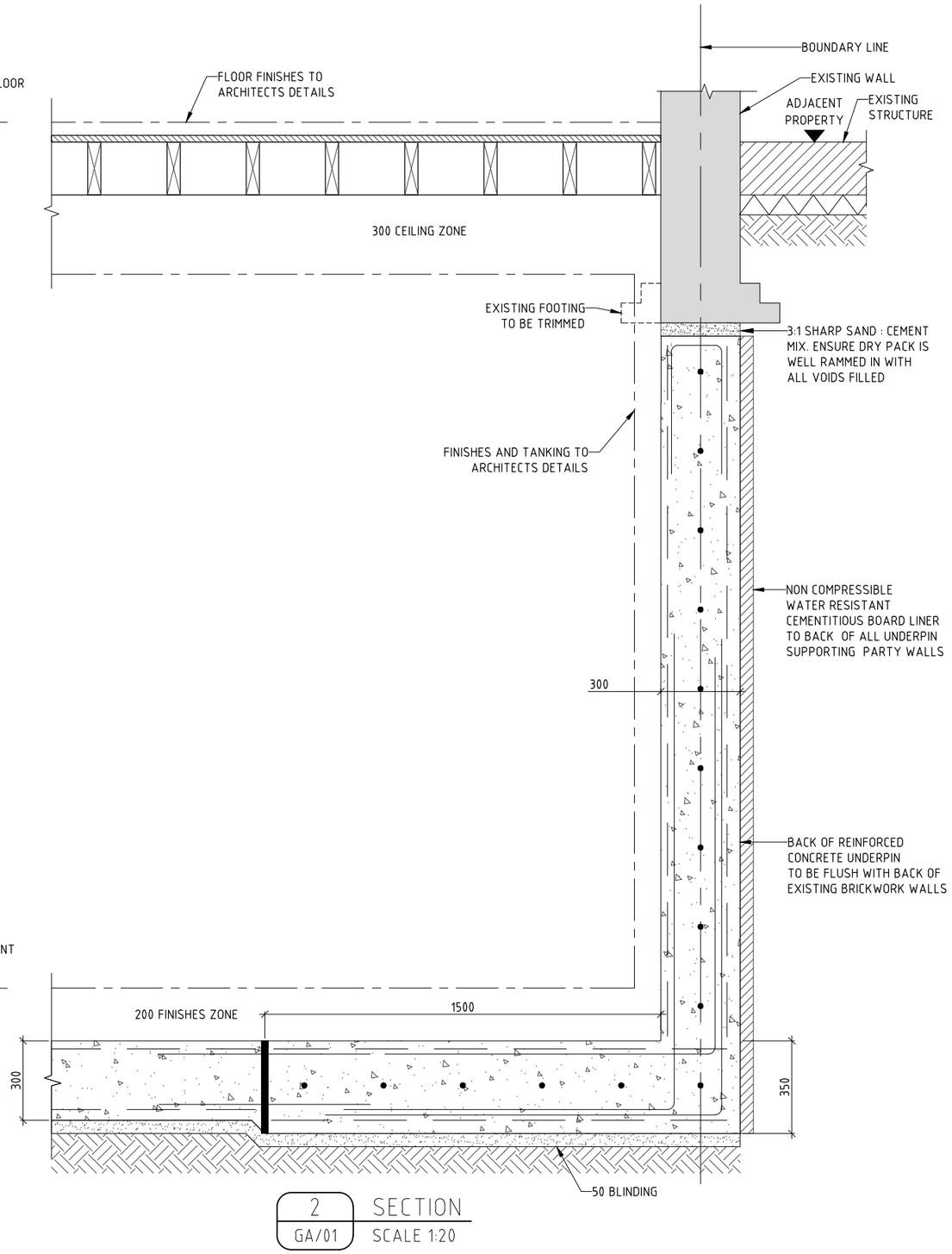
BASEMENT LAYOUT

DRAWN	CHECKED	DATE	PAPER SIZE	SCALE	
KM	GG	30.03.15	A3	AS SHOWN	GA/01 P1

ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE



1 SECTION
GA/01 SCALE 1:20



2 SECTION
GA/01 SCALE 1:20

THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

12686

34 QUEEN'S GROVE, NW8

REV	DATE	DESCRIPTION
P1	30.03.15	INITIAL ISSUE

GREEN STRUCTURAL ENGINEERING
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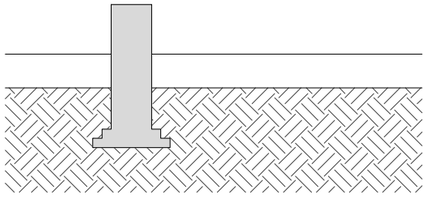
Unit 5 Quayside Lodge,
William Morris Way,
Fulham, SW6 2UZ
020 3405 3120

SECTIONS THROUGH UNDERPINS

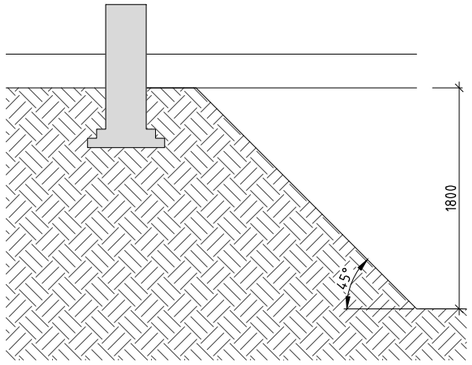
DRAWN	CHECKED	DATE	PAPER SIZE	SCALE
KM	GG	30.03.15	A3	AS SHOWN

S/01 **P1**

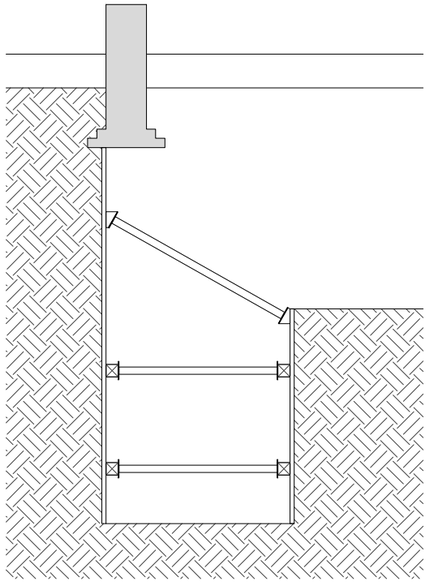
ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE



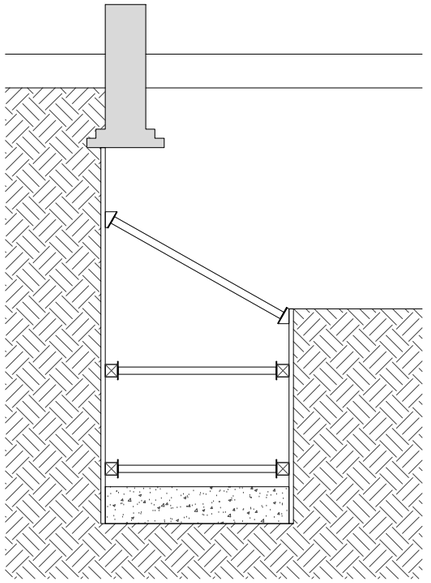
STAGE 0
EXISTING CONDITION



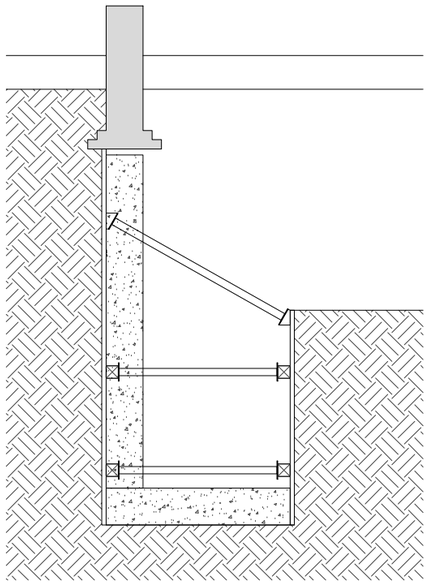
STAGE 1
GENERAL LEVEL REDUCTION



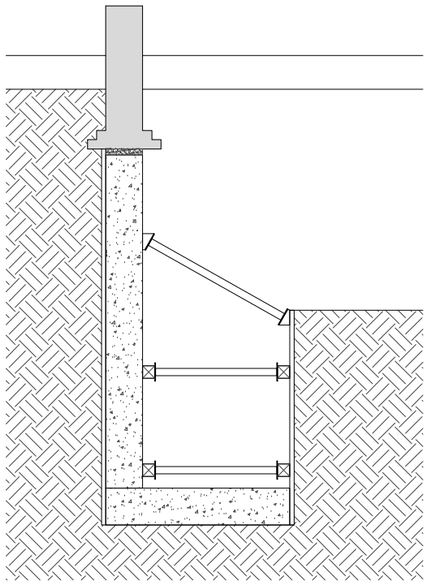
STAGE 2
EXCAVATE TO FORM UNDERPIN



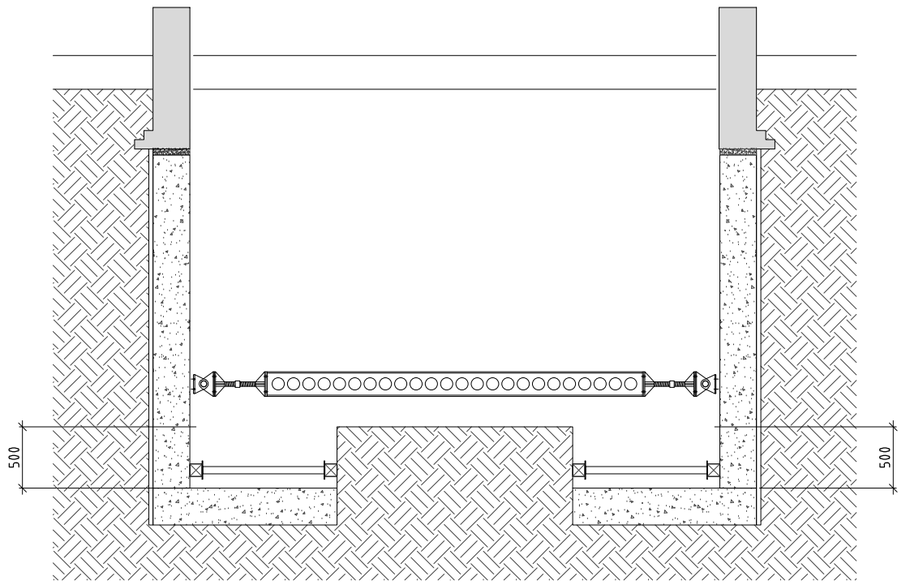
STAGE 3
CONCRETE BASE OF UNDERPIN



STAGE 4
ERECT SHUTTER
CONCRETE STEM OF UNDERPIN



STAGE 5
STRIKE SHUTTER WHEN CONCRETE HAS
GAINED SUFFICIENT STRENGTH, DRYPACK,
TRIM - OFF PROJECTING FOOTING, RE-PROP
UNTIL BASEMENT SLAB IS CAST.



STAGE 6
COMMENCE EXCAVATION OF CENTRAL BERM.
ONCE EXCAVATION IS 500mm ABOVE FORMATION LEVEL
INSTALL SUPER SLIM SOLDIER ACROSS SITE AT LOW LEVEL.

THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

12686

34 QUEEN'S GROVE, NW8

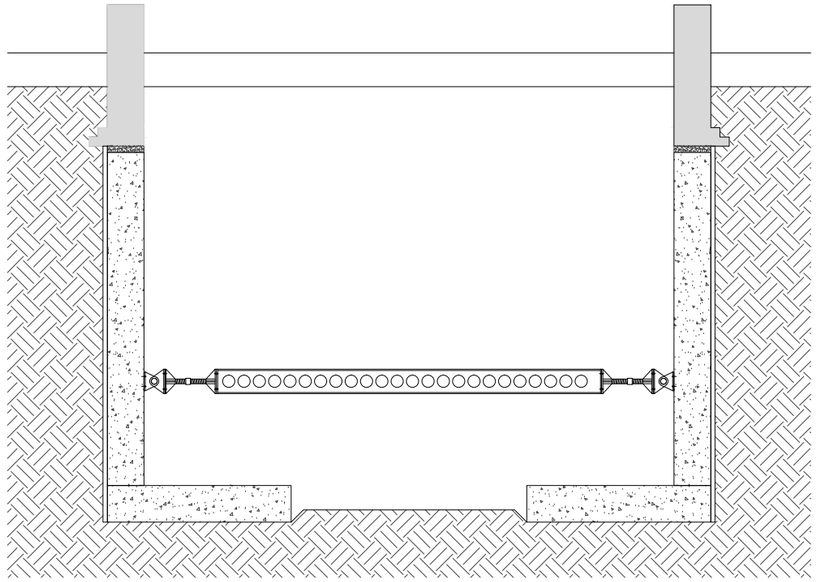
REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION
P1	30.03.15	INITIAL ISSUE						

GSE GREEN STRUCTURAL ENGINEERING
www.gseltd.co.uk
Unit 5 Quayside Lodge,
William Morris Way,
Fulham, SW6 2UZ
020 3405 3120

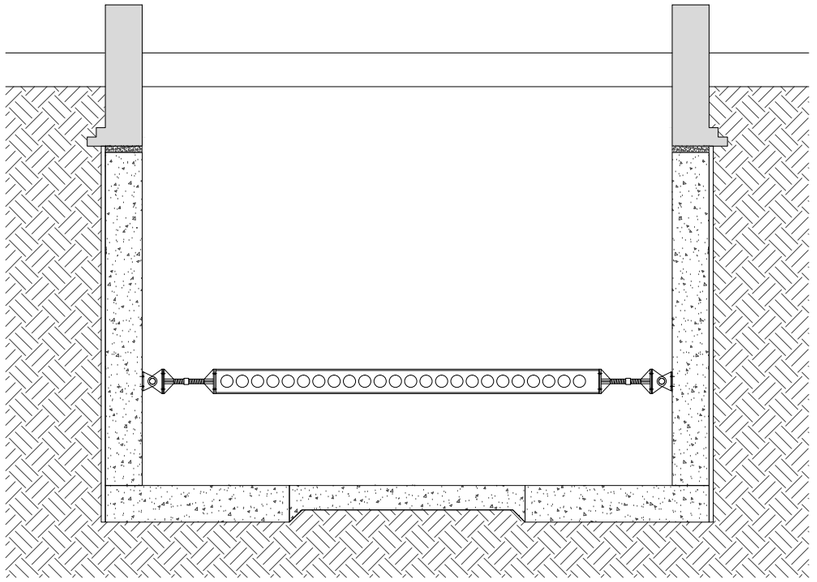
CONST. SEQ. FOR A TYPICAL UNDERPIN SECTION

DRAWN	CHECKED	DATE	PAPER SIZE	SCALE		
KM	GG	30.03.15	A3	AS SHOWN	MS/01	P1

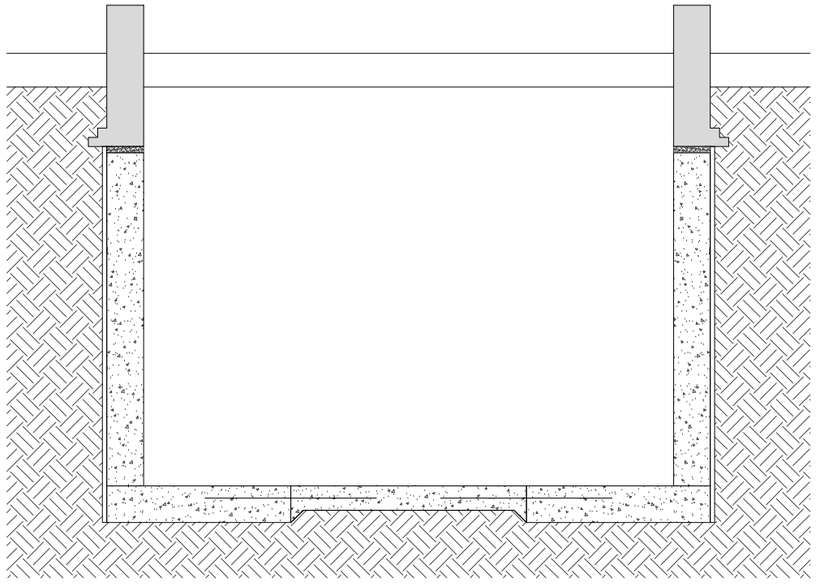
ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE



STAGE 7
COMPLETE EXCAVATION TO FORMATION LEVEL



STAGE 8
CAST BASEMENT SLAB AND LET CURE



STAGE 9
ALL PROPS REMOVED

DO NOT SCALE FROM THIS DRAWING

THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

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APPENDIX F

UNDERPINNING SPECIFICATION

GREEN STRUCTURAL ENGINEERING

Specification: **Underpinning**

Project: **34 Queens Grove**

Date of issue: **March 2015**

Prepared by: **E. Alexander**

Revision: **-**

General Underpinning Specification

1. The walls to the perimeter of the new basement shall be underpinned in reinforced concrete. The underpins shall take the vertical loads from the walls and horizontal loads from the earth.
2. Underpinning bases shall be excavated in short sections not exceeding 1000mm in width.
3. The sequence of the underpinning shall be such that any given underpin will be completed, dry-packed and a minimum period of 48 hours lapsed before an adjacent excavation commenced to form another underpin.
4. In the event that the existing foundations to the wall are found to be unstable, sacrificial steel jacks shall be installed underneath the foundation to prop the bottom few courses of bricks. These steel jacks shall be left in place and shall be incorporated into the concrete stem.
5. In the event that the ground is unstable, lateral propping shall be provided as required to the rear of the excavation and to the sides of the excavated working trench. The front and side faces of the excavation shall be propped using trench sheeting or plywood, timber boards and acrow props as appropriate. Sacrificial back – shutters shall be used to the rear face of the excavation (i.e. underneath the wall) if required. Cementitious grout will be poured behind the back – shutters to fill up the voids behind the back – shutters.
6. Excavation for an underpin section shall be dug in a day, and the concrete to the base shall be poured by the end of the same day.
7. The concrete to the stem of the underpin shall be poured the following day. This shall be poured up to within 50 – 75mm of the underside of the existing wall foundations.
8. On the following day, the gap between the concrete and the underside of the existing foundation shall be drypacked with C35 concrete using 5 – 10mm coarse aggregate and “Combex 100” expanding admixture by Fosroc UK Ltd in accordance with their instructions.
9. Once the drypack has gained sufficient strength, any protrusions of the footings into our site shall be carefully trimmed back using hand tools to avoid causing any damage to the foundation. The protrusions shall be trimmed back to be flush in-line with the face of the wall above.
10. A minimum of 48 hours shall be allowed before adjacent sections are excavated to form a new underpin.
11. Adjacent underpins shall be connected using T12 dowel bars 800mm long, 400mm embedment each side, at 300mm vertical centres.
12. Concrete cover to reinforcement shall be 35mm for cast against shutter or the top surface of the basement slab, 50mm for cast against blinding and 75mm for cast against earth.
13. Grade of concrete shall be C35 with minimum cement content 300kg/m^3, maximum free water to cement ratio 0.60, slump 100mm.