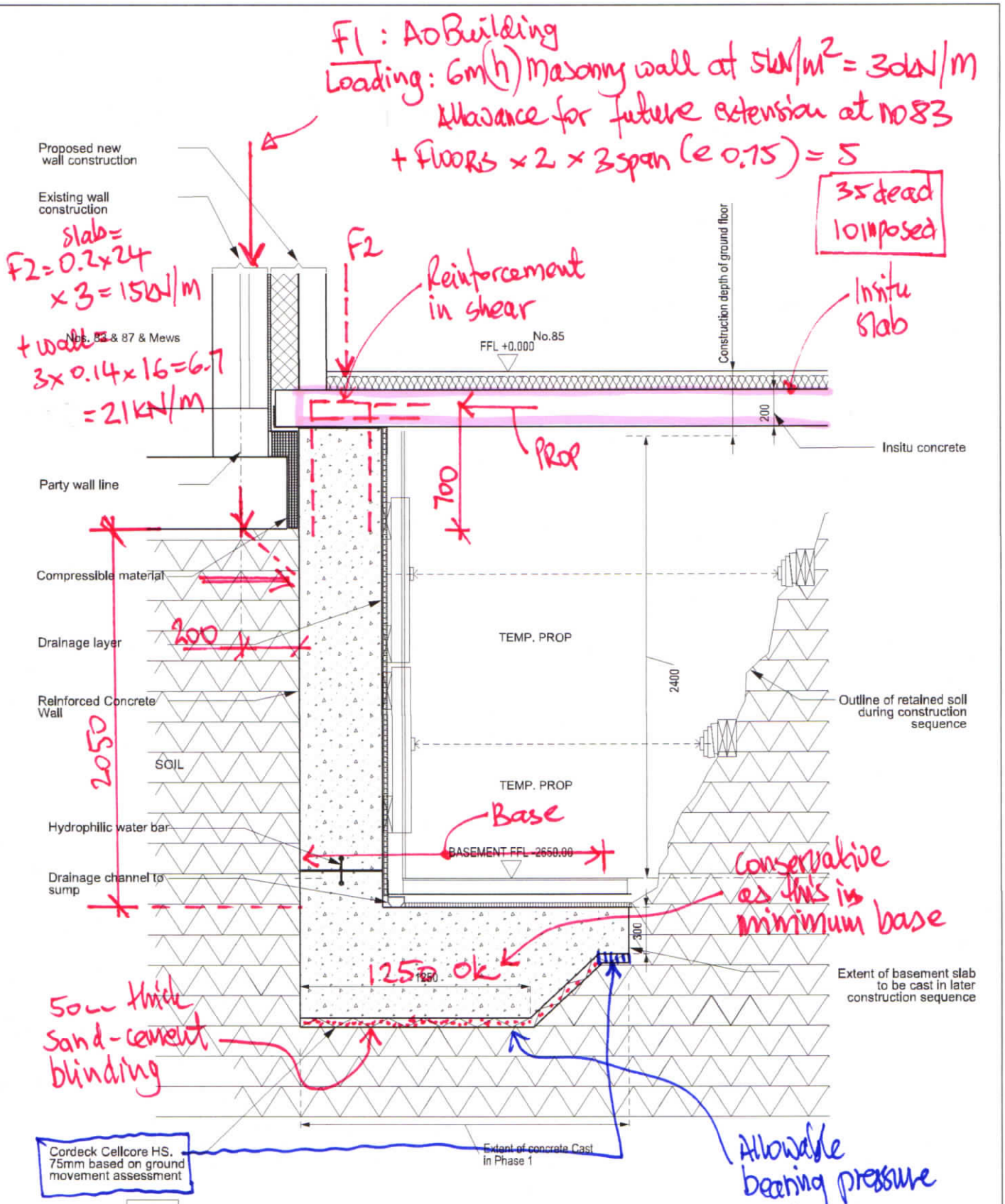
85 CAMDEN MEWS
LONDON

OUTLINE STRUCTURAL CALCULATIONS
RETAINING WALL –
BOUNDARY LINE - 83/85 CAMDEN MEWS

References: British Standards Codes of Practice

F1 : AoBuilding
Loading: 6m(h) Masonry wall at 5kN/m² = 30kN/m
Allowance for future extension at no83
+ Floors x 2 x 3span (e 0.75) = 5
35 dead
10 imposed



A	Detail Section through basement party walls
BIA_03	1:20 @ A3

DRAWING NUMBER	REVISION
85_CM_BIA_03	A

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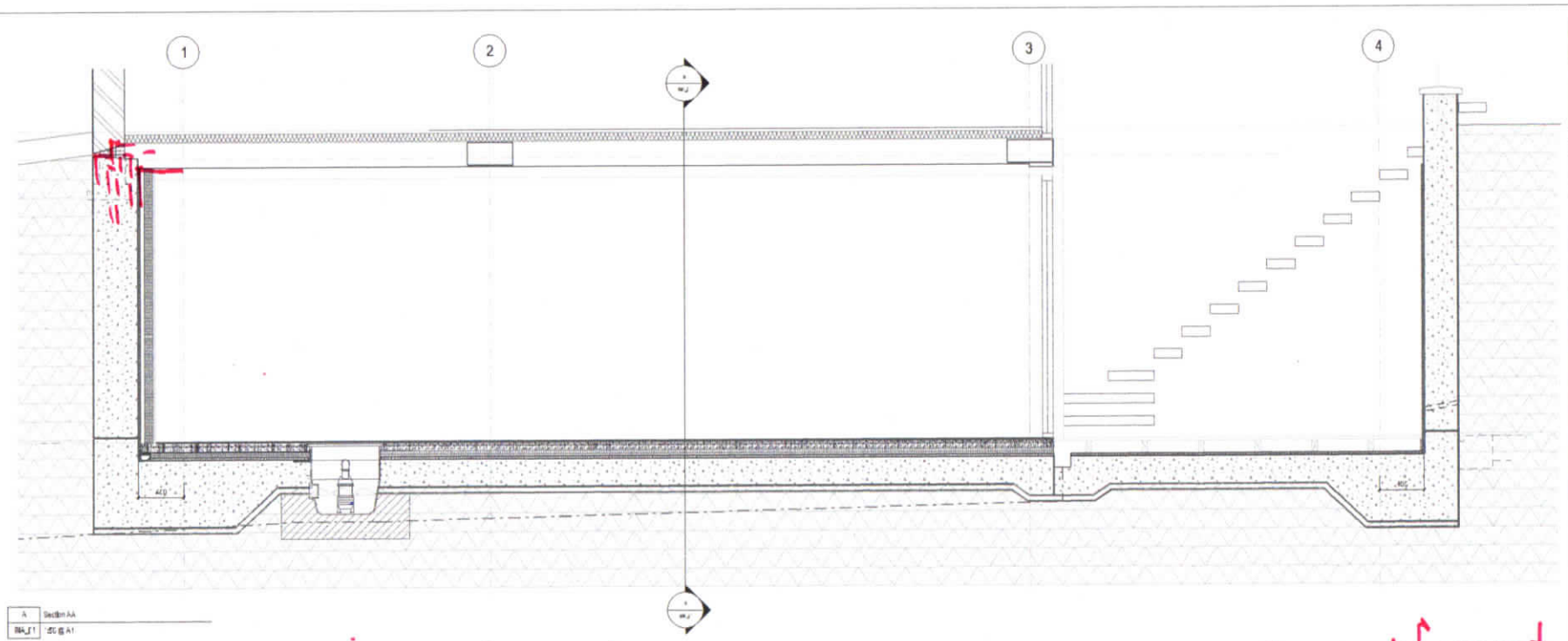
5 BALDWIN TERRACE LONDON N1 7RU TEL: 020 7704 1975
PROJECT EMAIL: ????@cullinanstudio.com

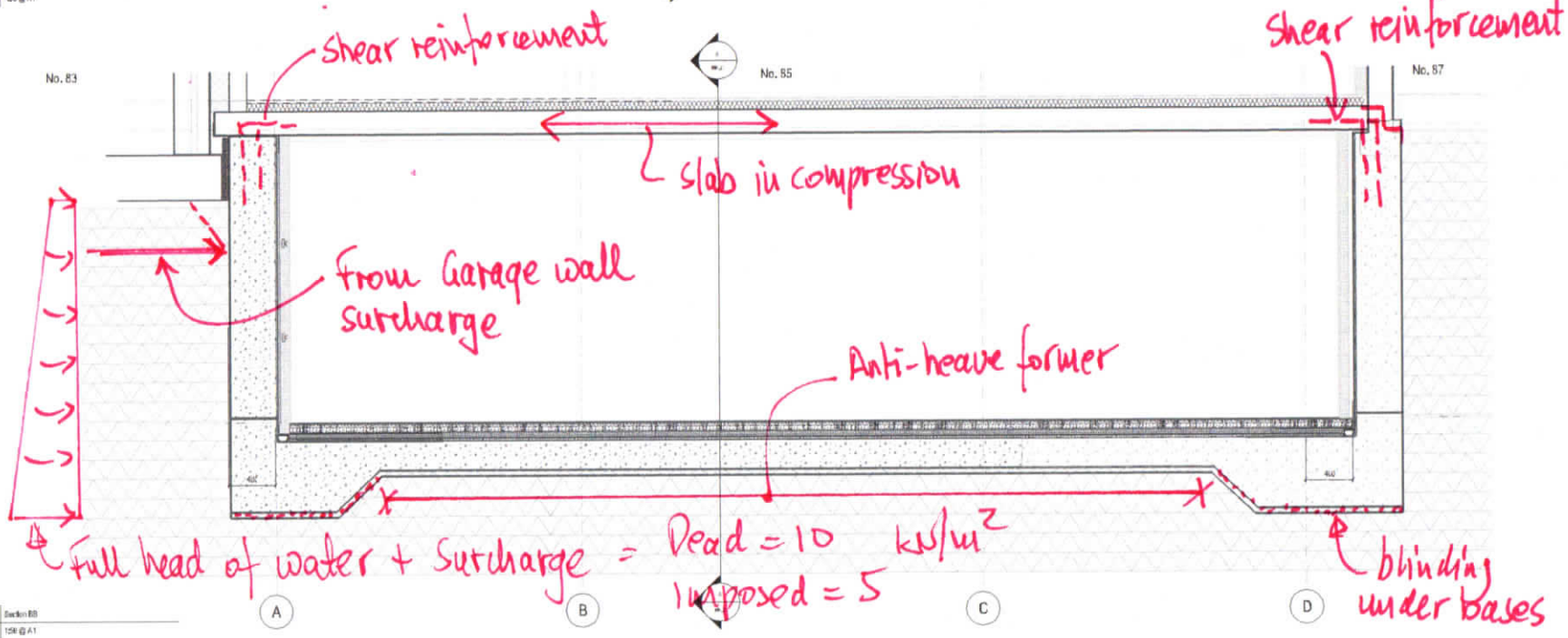
PROJECT TITLE	DATE
85 Camden Mews	19.02.15
	STATUS: INFO
DRAWING TITLE: Typical Sections: Basement Construction at Party Wall 83 / 85 Camden Mews	SCALE: 1:20 @A3
	DRAWN: LF / CHECKED: JW

Rev	Date	Revision	Drawn by	Checked by
A	27.2.15	Underpin placed adjacent to party wall		JW

Axiom Structural Comments



A Section AA
BIA_01 1:50 @ A1



B Section BB
BIA_02 1:50 @ A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

85 CAMDEN MEWS

Sections: Proposed

28.02.15

1:20
1:40

Information

LF

JW

85_CM_BIA_01

B

CULLINAN STUDIO

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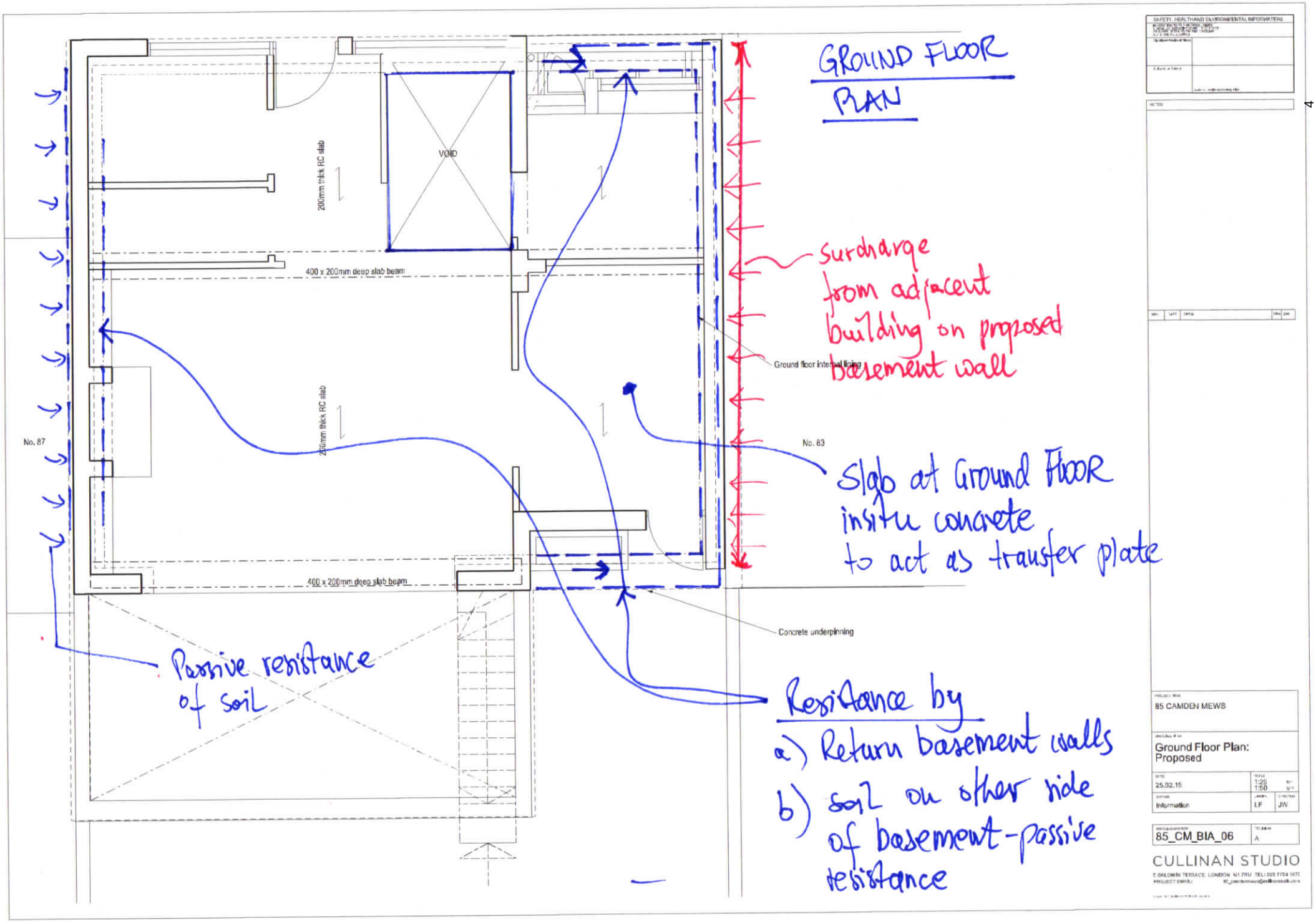
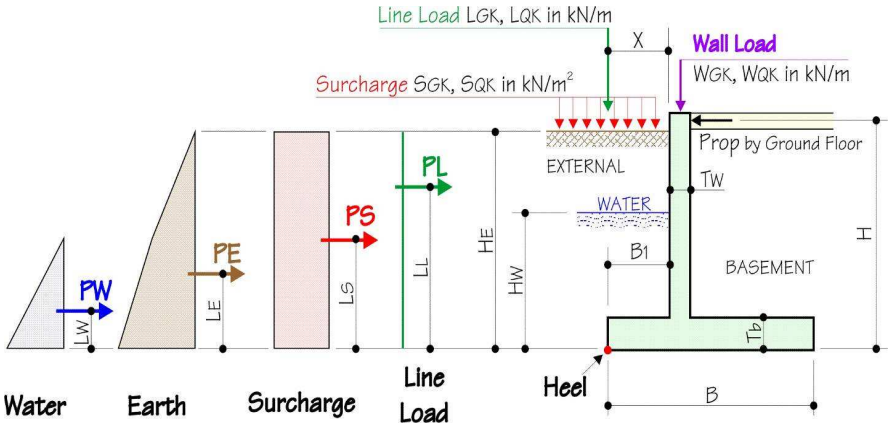

GROUND FLOOR PLAN
VOID
200mm thick RC slab
400 x 200mm deep slab beam
Ground floor internal lining
No. 87
No. 83
Concrete underpinning
Surcharge from adjacent building on proposed basement wall
Slab at Ground Floor insitu concrete to act as transfer plate
Passive resistance of soil
Resistance by
a) Return basement walls
b) soil on other side of basement - passive resistance
85 CAMDEN MEWS
Ground Floor Plan: Proposed
25.02.15
1:25
1:50
Information
LF
JW
85_CM_BIA_06
A
CULLINAN STUDIO

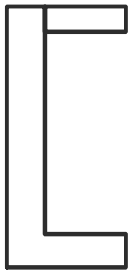
Project	85 Camden Mews	Axiom Structures		
Client	Private	Made by	Date	Page
Location	Basement wall design to BS8110:2005 &85	AP	27-Apr-2015	5
	Basement wall design to BS8110:2005	Checked	Revision	Job No
	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	AP	-	15005

IDEALISED STRUCTURE and FORCE DIAGRAMS DESIGN STATUS : VALID



DIMENSION (mm)

H =	3000	B =	1250	Tw =	400
Hw =	2400	Bl =	0	Tb =	400
He =	2400				



Wall Geometry

MATERIAL PROPERTIES steel class A

fcu =	30	N/mm²	γm =	1.50	concrete
fy =	500	N/mm²	γm =	1.15	steel
Cover to tension reinforcement (co) =				50	mm
Max. allowable design surface crack width (W) =				0.3	mm (0.2 or 0.3 mm only)
Concrete density =				24.0	kN/m3

SOIL PROPERTIES

Design angle of int'l friction of retained mat'l (Ø) =	25	degree	
Design cohesion of retained mat'l (C) =	0	kN/m2	(Only granular backfill considered, ie "C" = 0)
Density of retained mat'l (q) =	20	kN/m3	
Submerged Density of retained mat'l (qs) =	13.33	kN/m3	(default=2/3 of q), only apply when Hw >0
Design angle of int'l friction of base mat'l (Øb) =	20	degree	= 13.33
Design cohesion of base mat'l (Cb) =	0	kN/m2	ASSUMPTIONS
Density of base mat'l (qb) =	10	kN/m3	a) Wall friction is zero
Allowable gross ground bearing pressure (GBP) =	150	kN/m2	b) Minimum active earth pressure = 0.25qH
LOADINGS (unfactored)			c) Granular backfill
Surcharge load -- live (SQK) =	5	kN/m2	h) Design not intended for walls over 3.5 m high
Surcharge load -- dead (SGK) =	10	kN/m2	i)Does **not** include check for temp or shrinkage
Line load -- live (LQK) =	10	kN/m	
Line load -- dead (LGK) =	35	kN/m	
Distance of line load from wall (X) =	200	mm	
Wall load -- live (WQK) =	0	kN/m	
Wall load -- Dead (WGK) =	20	kN/m	

LATERAL FORCES Ko = 0.58 default Ko = (1-SIN Ø) 0.58

Kac = 1.52 = $2Ko^{0.5}$

Force (kN)		Lever arm (m)		γ_f	Ultimate Force (kN)
PE =	22.17	LE =	0.800	1.20	26.60
PS(GK) =	13.86	LS =	1.20	1.40	19.40
PS(QK) =	6.93	LS =	1.20	1.60	11.09
PL(GK) =	20.21	LL =	2.23	1.40	28.29
PL(QK) =	5.77	LL =	2.23	1.60	9.24
PW =	28.80	LW =	0.80	1.20	34.56
Total	97.73				129.17

EXTERNAL STABILITY

STABILITY CHECK : OK

ANALYSIS - Assumptions & Notes

1) Wall idealised as a propped cantilever (i.e. pinned at top and fixed at base)
2) Wall is braced.
3) Maximum slenderness of wall is limited to 15, i.e [0.9*(He-Tb/2)/Tw < 15]
4) Maximum Ultimate axial load on wall is limited to 0.1fcu times the wall cross-sectional area
5) Design Span (Effective wall height) = He - (Tb/2)
6) -ve moment is hogging (i.e. tension at external face of wall)
   +ve moment is sagging (i.e. tension at internal face of wall)
7) " Wall MT. " is maximum +ve moment on the wall.
8) Estimated lateral deflections are used for checking the **PΔ** effect .

UNFACTORED LOADS AND FORCES

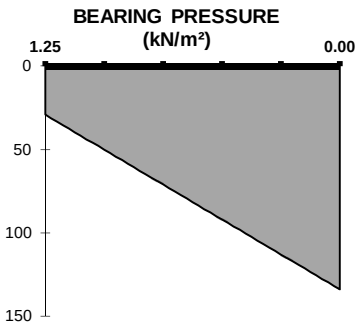
Lateral Force	Force (kN)	Lever arm to base (m)	Base MT. (kNm)	Wall MT. (kNm)	Reaction at Base (kN)	Reaction at Top (kN)	Estimated Elastic Deflection Δ (mm)
PE =	18.63	0.73	-6.87	2.74	16.20	2.42	0.0
PS(GK) =	12.70	1.10	-5.15	2.75	9.55	3.15	0.0
PS(QK) =	6.35	1.10	-2.58	1.38	4.78	1.58	0.0
PL(GK) =	20.21	2.03	-7.17	9.29	8.10	12.10	0.1
PL(QK) =	5.77	2.03	-2.05	2.66	2.32	3.46	0.0
PW =	24.20	0.73	-8.93	3.55	21.05	3.15	0.0
Total	87.86		-32.76	22.36	62.00	25.86	0.1

GROUND BEARING FAILURE

LOAD CASE: Wall Load **MIN**
Surcharge **MAX**

Taking moments about centre of base (anticlockwise "+")

Vertical FORCES (kN)		Lever arm (m)	Moment (kNm)
Wall load =	20	0.42	8.4999998
Wall (sw) =	24.96	0.42	10.61
Base =	12.00	0.00	0.00
Earth =	0.00	0.62	0.00
Water =	0.00	0.62	0.00
Surcharge =	0.00	0.62	0.00
Line load =	45.00	0.00	0.00
∑ V =	101.96		∑ Mv = 19.11



MOMENT due to LATERAL FORCES, Mo = -32.76 kNm

RESULTANT MOMENT, M = Mv + Mo = -13.65 kNm

ECCENTRICITY FROM BASE CENTRE, M / V = -0.13 m

MAXIMUM GROSS BEARING PRESSURE = 133.98 kN/m^2 < 150 OK

SLIDING AT BASE (using overall factor of safety instead of partial safety fa F.O.S = 1.50

SUM of LATERAL FORCES, **P** = 62.00 kN

BASE FRICTION, $\mathbf{F_b}$ = - (**V** TANØb + B.Cb) = -37.11 kN

Factor of Safety, F_b / P = 0.60 < 1.50 FAIL .. but

therefore, LATERAL RESISTANCE to be provided by BASEMENT SLAB = 55.89 kN

Project	85 Camden Mews	Axiom Structures		
Client	Private	Made by	Date	Page
Location	Basement wall design to BS8110:1997 83/85	AP	27-Apr-2015	7
	Basement wall design to BS8110:2005	Checked	Revision	Job No
	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	AP	-	15005

STRUCTURAL DESIGNS (ultimate)

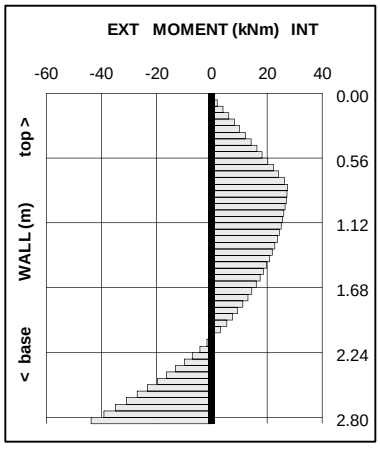
DESIGN CHECKS : OK

WALL (per metre length) — BS8110 reference

AXIAL LOAD CAPACITY (Limited to 0.1fcu) = 1200.00 kN > 28 OK 3.4.4.1

Lateral Force	Force (kN)	γ_f	Ultimate Force (kN)	Ult. Moment at base (kNm)	Ult. Shear at base (kN)	Ult. Shear at top (kN)
PE =	18.63	1.20	22.35	-8.25	19.44	2.91
PS(GK) =	12.70	1.40	17.78	-7.21	13.37	4.41
PS(QK) =	6.35	1.60	10.16	-4.12	7.64	2.52
PL(GK) =	20.21	1.40	28.29	-10.04	11.35	16.95
PL(QK) =	5.77	1.60	9.24	-3.28	3.70	5.53
PW =	24.20	1.20	29.04	-10.72	25.26	3.78
Total	87.86		116.87	-43.62	80.77	36.10

Design Bending Moments



On INTERNAL face due to lateral forces, M_{int} =	27.46	kNm
On EXTERNAL face due to lateral forces, M_{ext} =	-43.62	kNm
Eccentricity of Axial Loads =	125	mm
LATERAL DEFLECTION " Δ " =	0.1	mm
Due to eccentricity of axial loads, M_{ecc} =	3.5	kNm
Due to $P\Delta$ effect, M_p =	0.00	kNm
Total Mmt on INTERNAL face ($M_{int}+0.5M_{ecc}+M_p$) =	29.2	kNm
Total Mmt on EXTERNAL face ($M_{ext}+0.5M_{ecc}$) =	-45.4	kNm

		EXTERNAL FACE		INTERNAL FACE				
WALL REINFORCEMENT :	Min. As =	520		520		mm^2		Table 3.25
	ϕ =	12		12		mm		
	centres =	100	< 762	200	< 762	mm	OK	3.12.11.2.7(b)
	As =	1131	> 520	565	> 520	mm^2	OK	
MOMENT of RESISTANCE :	d =	344		344		mm		
	z =	326		327		mm		3.4.4.4
	As' =	0		0		mm^2		3.4.4.4
	M_{res} =	160.1	> 45.37	80.3	> 29.21	kNm	OK	

		BASE of WALL		TOP of WALL				
SHEAR RESISTANCE:	As =	1131	ϕ =	10	@100 mm	786	mm^2/m	
	100As/bd =	0.33%	=	0.23%				
	vc =	0.48		0.43		N/mm^2		Table 3.8
	V_{res} =	165.6	> 80.77	146.6	> 36.10	kN	OK	3.5.5.2

CRACK WIDTH to BS8100/8007	X =	95.59	mm	ε_m =	0.00002			BS8007
Temp & shrinkage effects not included	Acr =	69.07	mm	**W =**	0.00	< 0.30 mm	OK	App. B.2

REINFORCEMENT SUMMARY for WALL

	Type	ϕ mm	centres mm	As mm^2	Min. As mm^2	
INTERNAL FACE	H	12	200	565	520	OK
EXTERNAL FACE	H	12	100	1131	520	OK
TRANSVERSE	H	12	200	565	520	OK

Project	85 Camden Mews	Axiom Structures		
Client	Private	Made by	Date	Page
Location	Basement wall design to BS8110:1985	AP	27-Apr-2015	8
	Basement wall design to BS8110:2005	Checked	Revision	Job No
	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	AP	-	15005

mpa The Concrete Centre

OUTER BASE (per metre length) — BS8110 reference

γ_f = 1.50 (ASSUMED)

Ult. Shear = 31.82 kN (AT d from FACE of WALL)

Ult. MT. = 0.00 kNm TENSION - TOP FACE

BOTTOM REINFORCEMENT :

Min. As =	520	mm^2		Table 3.25
ϕ =	12	mm		
centres =	200	mm	< 762	OK
As =	565	mm^2	> 520	OK

MOMENT of RESISTANCE :

d =	344	mm		
Z =	327	mm		3.4.4.4
As' =	0	mm^2		
Mres =	80.35	kNm	> 0.00	OK

SHEAR RESISTANCE:

100As/bd =	0.16%			
vc =	0.38	N/mm^2		Table 3.8
Vres =	131.42	kN	> 31.82	OK 3.5.5.2

CHECK CRACK WIDTH IN ACCORDANCE WITH BS8100/8 Temp & shrinkage effects not included

X = 70.88 mm ε_m = -0.00117 — BS8007

Acr = 108.61 mm W = -0.28 mm < 0.30 OK App. B.2

NO CRACKING

INNER BASE (per metre length)

Ult. Shear = -9.57 kN (AT d from FACE of WALL)

Ult. MT. = 49.14 kNm TENSION - BOTTOM FACE

BOTTOM REINFORCEMENT :

Min. As =	520	mm^2		Table 3.25
ϕ =	12	mm		
centres =	100	mm	< 762	OK
As =	1131	mm^2	> 520	OK

MOMENT of RESISTANCE :

d =	344	mm		
Z =	326	mm		
As' =	0	mm^2		
Mres =	160.13	kNm	> 49.14	OK 3.4.4.4

SHEAR RESISTANCE:

100As/bd =	0.33%			
vc =	0.48	N/mm^2		Table 3.8
Vres =	165.58	kN	> 9.57	OK 3.5.5.2

CHECK CRACK WIDTH IN ACCORDANCE WITH BS8100/8 Temp & shrinkage effects not included

X = 95.59 mm ε_m = 1.9E-05 — BS8007

Acr = 69.07 mm W = 0.00 mm < 0.30 OK App. B.2

REINFORCEMENT SUMMARY for BASE

	Type	ϕ mm	centres mm	As mm^2	Min. As mm^2	
TOP	H	12	200	565	520	OK
BOTTOM	T	12	100	565	520	OK
TRANSVERSE	T	12	200	565	520	OK