PRICE & MYERS

Job No.	28373	Page	01	Rev	
Date	Sept 2020	Eng	AS	Chd	CA
Job	8 Oakhill Avenue				

No. 8

OAKHILL AVENUE

LONDON

STRUCTURAL CALCULATIONS

PRICE & MYERS

Job No.	28373	Page	02	Rev	
Date	Sept 2020	Eng	AS	Chd	CA
Job	8 Oakhill Avenue				

BASEMENT DESIGN

Design Loads

	DL	LL
• Roof		
- Slates, timber battens & felt	0.55	-
- Timber rafters & insulation	0.2	-
- Ceiling & services	0.15	-
- Snow	-	0.6
	0.9	0.6

• Typical floor		
- boards / ply	0.15	-
- joists	0.20	-
- Ceiling & services	0.15	-
- Domestic	-	1.5
	0.75	1.5

• Flat roof (Green)		
- Green extensive	1.78	
- boards & ply	0.2	
- joists	0.2	
- Ceiling & services	0.15	
- Snow	-	0.6
	2.33	0.6

PRICE & MYERS

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Date Sept 2020 Eng AS Chd CA

Job 8 Oakhill Avenue

Design Loads

	DL	LL
• Ground floor slab over basement		
- Assume 200 thk RC slab	5	-
- Assume 75 screed	1.875	-
- Assume 25 tiles	0.63	-
- Ceiling & services	0.3	-
- Domestic + partition	-	2.5
	7.81	2.5

• 350 THK WALL		
- 350 wall	7	-
- Plaster	0.15	-
	7.15	-

• 230 THK WALL		
- 230 Brk	4.6	-
- Plaster both sides	0.3	-
	4.9	-
• 100 THK wall		
- 100 Brk	2	-
- Plaster both sides	0.3	-
	2.3	-

PRICE & MYERS

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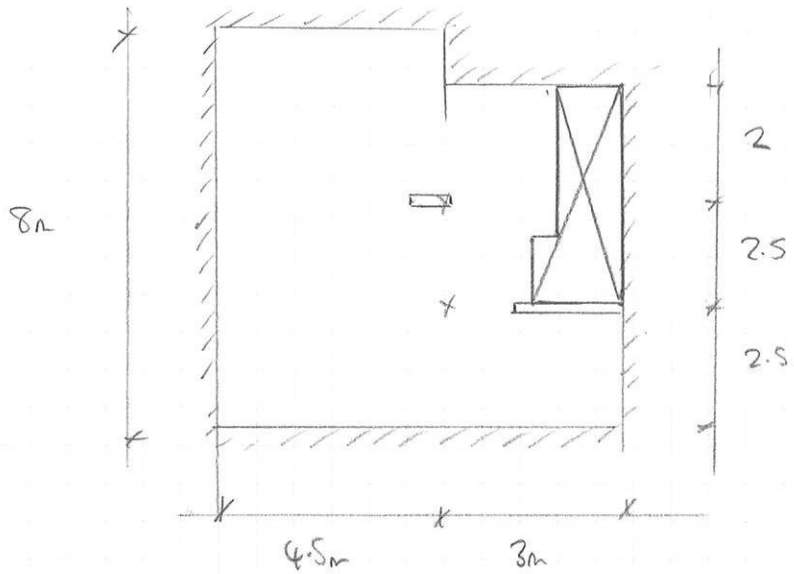
Job	8 Oakhill Avenue				

GROUND FLOOR SLAB OVER BASEMENT



Design loads $w_d = 7.81$ $w_l = 2.5$

Use 200 RC Slab
with A393 MESH T&B

Refer to spreadsheet

Project	8 Oakhill Avenue			REINFORCED CONCRETE COUNCIL	
Client	N/A			Made by: AS	Date: 28-Jan-20	Page: 06
Location	Ground Floor Slab	from grids 1	to 2	Checked: -	Revision: -	Job No: 28373

FLAT SLAB ANALYSIS & DESIGN to BS 8110:1997

MATERIALS

fcu	32	N/mm²	h agg	20	mm
fyl	460	N/mm²	γs	1.05	steel
fyv	460	N/mm²	γc	1.50	concrete

COVERS

	mm	TO LAYER
Top cover	25	1
Btm cover	25	1

SPANS

	L (m)
SPAN 1	4.500
SPAN 2	3.000
SPAN 3	
SPAN 4	
SPAN 5	
SPAN 6	

GEOMETRY

Bay type	EDGE	
Slab depth, h	200	mm
Edge Panel width, b	1000	mm
Edge distance	300	mm to C/L
End distance	300	from supt 1
End distance	300	from supt 3

PERIMETER LOADS *characteristic*

kN/m outside supports 1 & 3

kN/m along bay edge

LOADING PATTERN

	min	max
DEAD	1.0	1.4
IMPOSED		1.6

SUPPORTS

	ABOVE (m)	H (mm)	B (mm)	End Cond	BELOW (m)	H (mm)	B (mm)	End Cond
Support 1					1	200	800	E
Support 2					1	200	800	E
Support 3					1	200	800	E
Support 4								
Support 5								
Support 6								
Support 7								

LOADING

UDLs (kN/m²) PLs (kN/m) Position (m)

	Dead Load	Imposed Load	Position from left	Loaded Length
Span 1				
UDL	7.81	2.50	~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 2				
UDL	7.81	2.50	~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 3				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				

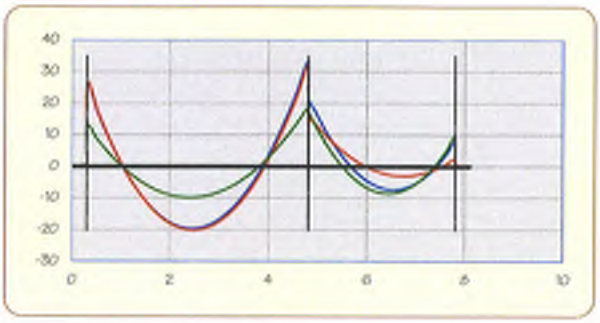
	Dead Load	Imposed Load	Position from left	Loaded Length
Span 4				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 5				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 6				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				

LOADING DIAGRAM

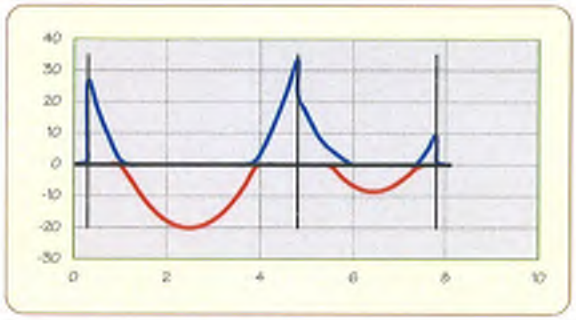
Project	8 Oakhill Avenue	REINFORCED CONCRETE COUNCIL		
Client	N/A	Made by: AS	Date: 28-Jan-20	Page: 07
Location	Ground Floor Slab, from grids 1 to 2	Checked: -	Revision: -	Job No: 28373
	FLAT SLAB ANALYSIS & DESIGN to BS 8110:1997			

Originated from RCC55.xls v2.2 on CD © 1999-2003 BCA for RCC

BENDING MOMENT DIAGRAMS (kNm)



Elastic Moments

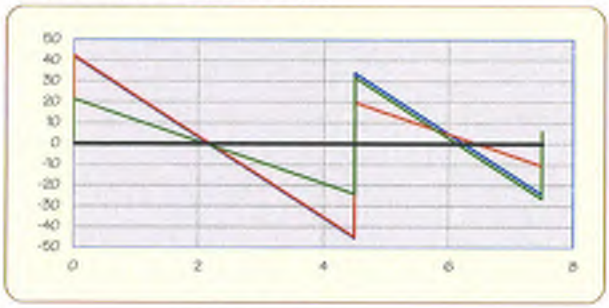


Redistributed Envelope

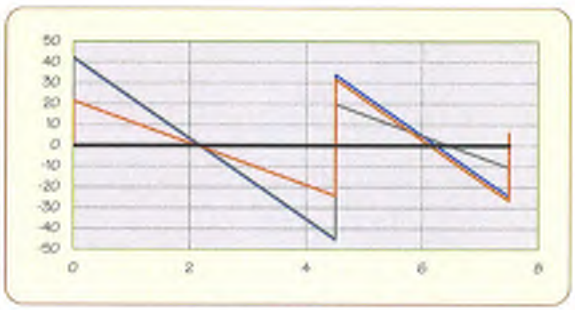
SUPPORT No	1	2	3				
Elastic M	26.2	33.3	9.4	~	~	~	~
Redistributed M	26.2	33.3	9.4	~	~	~	~
ßb	1.000	1.000	1.000	~	~	~	~
Redistribution							
End support reinf. Ø mm	12		12				

SPAN No	1	2				
Elastic M	20.1	8.5	~	~	~	~
Redistributed M	20.1	8.5	~	~	~	~
ßb	1.000	1.000	~	~	~	~

SHEARS FORCE DIAGRAMS (kN)



Elastic Shears



Redistributed Shears

SPAN No	1		2			
Elastic V	42.4	45.4	34.0	26.4	~	~
Redistributed V	42.4	45.4	34.0	26.4	~	~

SPAN No						
Elastic V	~	~	~	~	~	~
Redistributed V	~	~	~	~	~	~

REACTIONS (kN)

SUPPORT	1	2	3
ALL SPANS LOADED	47.8	79.3	30.1
ODD SPANS LOADED	48.3	64.8	13.6
EVEN SPANS LOADED	24.6	56.0	32.2
Veff for punching	60.3	111.3	40.2
Characteristic Dead	25.0	41.5	15.7
Characteristic Imposed	8.3	13.3	6.3

COLUMN MOMENTS (kNm)		1	2	3
ALL SPANS LOADED	Above			
	Below	24.9	-10.9	-7.0
ODD SPANS LOADED	Above			
	Below	25.8	-15.4	-1.7
EVEN SPANS LOADED	Above			
	Below	12.1	-1.2	-8.9

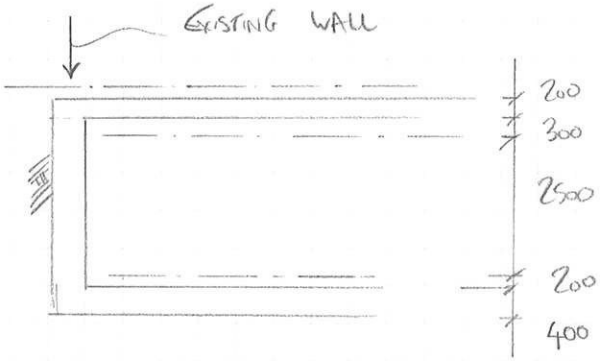
Project	8 Oakhill Avenue	REINFORCED CONCRETE COUNCIL		
Client	N/A	Made by: AS	Date: Jan-2020	Page: 08
Location	Ground Floor Slab, from grids 1 to 2	Checked: -	Revision: -	Job No: 28373
	FLAT SLAB ANALYSIS & DESIGN to BS 8110:1997			

Originated from RCC33.xls v2.2 on CD © 1998-2005 BCA for RCC

SPAN 1			LEFT	CENTRE	RIGHT
ACTIONS	βb		1.000	1.000	1.000
	Be		900		800
	Total M	kNm	22.1	20.1	28.9
	Mt max	kNm	123.4		109.7
MIDDLE STRIP	Width	mm	500	500	500
	M	kNm	0.3	9.1	7.2
	d	mm	169.0	169.0	169.0
	As	mm²/m	10	258	205
	As deflection	mm²/m		258	205
			Provide T12 @ 400 T1	Provide T12 @ 400 B1	Provide T12 @ 400 T1
	As prov	mm²/m	283	283	283
	Top steel			Provide T12 @ 400 T1	
	Deflection		L/d = 4,500 /169.0 = 26.627 < 26.0 x 1.622 x 1.053 x 0.9 = 39.968		OK
COLUMN STRIP	Width	mm	800	800	800
	M	kNm	22.1	11.1	21.6
	d	mm	169.0	169.0	169.0
	As	mm²/m	393	197	385
	As deflection	mm²/m		197	385
			Provide T12 @ 275 T1	Provide T12 @ 400 B1	Provide T12 @ 200:400 T1
	As prov	mm²/m	411	283	424
	Top steel			Provide T12 @ 400 T1	
	Deflection		L/d = 4,500 /169.0 = 26.627 < 26.0 x 2.000 x 1.053 x 0.9 = 49.272		OK
CHECKS	% As		ok	ok	ok
	Singly reinforced		ok	ok	ok
	max S		ok	ok	ok

SPAN 2			LEFT	CENTRE	RIGHT
ACTIONS	βb		1.000	1.000	1.000
	Be		800		900
	Total M	kNm	28.9	8.5	6.8
	Mt max	kNm	109.7		123.4
MIDDLE STRIP	Width	mm	500	500	500
	M	kNm	7.2	3.8	0.3
	d	mm	169.0	169.0	169.0
	As	mm²/m	205	109	10
	As deflection	mm²/m	205	109	
			Provide T12 @ 400 T1	Provide T12 @ 400 B1	Provide T12 @ 400 T1
	As prov	mm²/m	283	283	283
	Top steel			Provide T12 @ 400 T1	
	Deflection		L/d = 3,000 /169.0 = 17.751 < 26.0 x 2.000 x 1.053 x 0.9 = 49.272		OK
COLUMN STRIP	Width	mm	800	800	800
	M	kNm	21.6	4.7	6.8
	d	mm	169.0	169.0	169.0
	As	mm²/m	385	83	122
	As deflection	mm²/m	385	83	
			Provide T12 @ 200:400 T1	Provide T12 @ 400 B1	Provide T12 @ 425 T1
	As prov	mm²/m	424	283	266
	Top steel			Provide T12 @ 400 T1	
	Deflection		L/d = 3,000 /169.0 = 17.751 < 26.0 x 2.000 x 1.053 x 0.9 = 49.272		OK
CHECKS	% As		ok	ok	ok
	Singly reinforced		ok	ok	ok
	max S		ok	ok	ok

RETAINING WALL



Height = 3300 mm

Design loads

- Ground floor slab $w_{dl} = 7.81\ kN/m^2$, $w_{ll} = 2.5\ kN/m^2$

EXISTING BUILDING

element	width (m) / height	dl (kN/m²)	ll	DL (kN/m)	LL
Roof	3.7	0.9	0.6	3.33	2.22
Second	3.92/2 = 1.96	0.75	1.5	1.5	2.95
First	"	"	"	1.5	2.95
Ground	1m normal (assumed ground bearing) slab	3.75	1.5	3.75	1.5
Wall	6 + 1m bgl = 7	7.15	-	50	-
				60.1	9.62

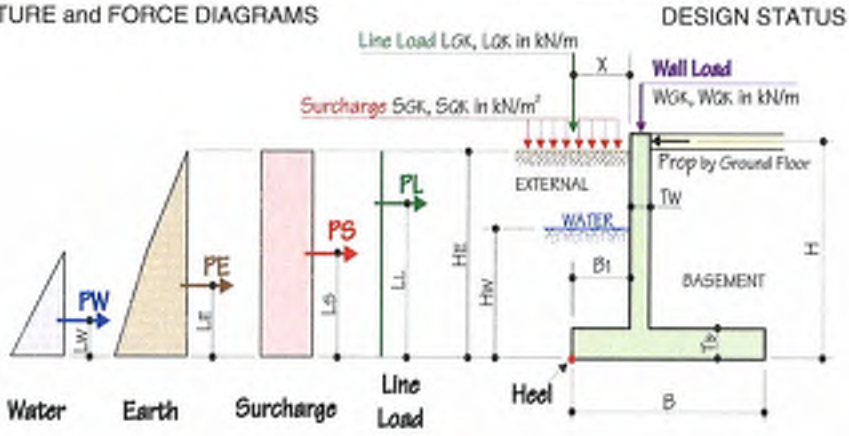
Project	Oakhill Avenue	REINFORCED CONCRETE COUNCIL		
Client		Made by: AS	Date: 28-Jan-2020	Page: 10
Location	Basement Retaining Wall	Checked	Revision: -	Job No: 28373

Basement wall design to BS8110:1997, BS8002:1994, BS 8004:1986 etc.

Originated from 'RCC81 Basement Wall.xls' v2.1 © 1999-2002 BCA for RCC

IDEALISED STRUCTURE and FORCE DIAGRAMS

DESIGN STATUS : VALID



DIMENSION (mm)

H =	3300	B =	5000	Tw =	250
Hw =	2300	B1 =	0	Tb =	400
He =	3300				

MATERIAL PROPERTIES

fcu =	35	N/mm²	γm =	1.50	concrete
fy =	460	N/mm²	γm =	1.05	steel
Cover to tension reinforcement (co) =				75	mm
Max. allowable design surface crack width (W) =				0.2	mm (0.2 or 0.3 mm only)
Concrete density =				24.0	kN/m3

Wall Geometry

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
Density of retained mat'l (q) =	19	kN/m3
Submerged Density of retained mat'l (qs) =	12.67	kN/m3
Design angle of int'l friction of base mat'l (Øb) =	25	degree
Design cohesion of base mat'l (Cb) =	0	kN/m2
Density of base mat'l (qb) =	19	kN/m3
Allowable gross ground bearing pressure (GBP) =	125	kN/m2

(Only granular backfill considered, ie "C" = 0)

(default=2/3 of q), only apply when Hw >0 = 12.67

LOADINGS (unfactored)

Surcharge load -- live (SQK) =	10	kN/m2
Surcharge load -- dead (SGK) =	0	kN/m2
Line load -- live (LQK) =	0	kN/m
Line load -- dead (LGK) =	0	kN/m
Distance of line load from wall (X) =	0	mm
Wall load -- live (WQK) =	60	kN/m
Wall load -- Dead (WGK) =	10	kN/m

ASSUMPTIONS

a) Wall friction is zero

b) Minimum active earth pressure = 0.25qH

c) Granular backfill

h) Design not intended for walls over 3.5 m high

i) Does **not** include check for temp or shrinkage effe

LATERAL FORCES

Ko = 0.40 default Ko = (1-SIN Ø) = 0.58

Kac = 1.26 = $2Ko^{0.5}$

Force (kN)		Lever arm (m)		γ_f	Ultimate Force (kN)
PE =	34.68	LE =	1.164	1.40	48.55
PS(GK) =	0.00	LS =	1.65	1.40	0.00
PS(QK) =	13.20	LS =	1.65	1.60	21.12
PL(GK) =	0.00	LL =	3.30	1.50	0.00
PL(QK) =	0.00	LL =	3.30	1.60	0.00
PW =	26.45	LW =	0.77	1.40	37.03
Total	74.33				106.70

Project	Oakhill Avenue	REINFORCED CONCRETE COUNCIL		
Client	0	Made by	Date	Page 11
Location	Basement Retaining Wall	AS	28-Jan-2020	
	Basement wall design to BS8110:1997, BS8002:1994. BS 8004:19	Checked	Revision	Job No
	Originated from 'RCC01 Basement Wall.xls' v2.1 © 1999-20002 RCA for RCC		-	28373

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

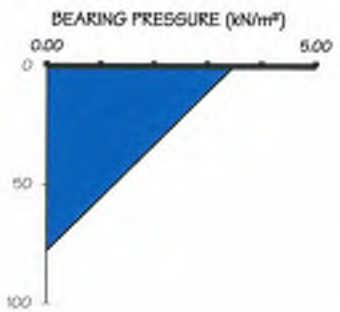
Lateral Force	Force (kN)	Lever arm to base (m)	Base MT. (kNm)	Wall MT. (kNm)	Reaction at Base (kN)	Reaction at Top (kN)	Estimated Elastic Deflection Δ (mm)
PE =	30.93	1.09	-12.90	6.50	24.18	6.75	0.3
PS(GK) =	0.00	1.55	0.00	#DIV/0!	0.00	0.00	0.0
PS(QK) =	12.40	1.55	-4.81	2.70	7.75	4.65	0.1
PL(GK) =	0.00	3.10	0.00	0.00	0.00	0.00	0.0
PL(QK) =	0.00	3.10	0.00	0.00	0.00	0.00	0.0
PW =	22.05	0.70	-8.66	3.15	19.86	2.19	0.1
Total	65.38		-26.36	#DIV/0!	51.80	13.59	0.5

GROUND BEARING FAILURE

LOAD CASE: Wall Load MAX
Surcharge MAX

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

Vertical FORCES (kN)		Lever arm (m	Moment (kNm)
Wall load =	70	2.37	166.2499993
Wall (sw) =	17.40	2.37	41.32
Base =	48.00	0.00	0.00
Earth =	0.00	2.50	0.00
Water =	0.00	2.50	0.00
Surcharge =	0.00	2.50	0.00
Line load =	0.00	2.50	0.00
Σ V =	135.40		Σ Mv = 207.58



MOMENT due to LATERAL FORCES, Mo = -26.36 kNm

RESULTANT MOMENT, M = Mv + Mo = 181.21 kNm

ECCENTRICITY FROM BASE CENTRE, M / V = 1.34 m

MAXIMUM GROSS BEARING PRESSURE = 77.71 kN/m² < 125 OK

SLIDING AT BASE

(using overall factor of safety instead of partial safety fact F.O.S = 1.00

SUM of LATERAL FORCES, P = 51.80 kN

BASE FRICTION, F_b = - (V TANØb + B.Cb) = -63.14 kN

Factor of Safety, F_b / P = 1.22 > 1.00 OK

Project	Oakhill Avenue	REINFORCED CONCRETE COUNCIL		
Client	0			
Location	Basement Retaining Wall	Made by: AS	Date: 28-Jan-2020	Page: 12
	Basement wall design to BS8110:1997, BS8002:1994. BS 8004:1986	Checked: 0	Revision: -	Job No: 28373
	Originated from 'RCC81 Basement Walls.xls' v2.1 © 1999-2002 BCA for RCC			

OUTER BASE (per metre length)

BS8110 reference

γ_f = 1.50 (ASSUMED)

Ult. Shear = 34.27 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 =	16	mm			
centres =	150	mm	< 725	OK	
As =	1340	mm^2	> 520	OK	

MOMENT of RESISTANCE :

d =	317	mm			
Z =	298	mm			3.4.4.4
As' =	0	mm^2			
Mres =	175.12	kNm	> 0.00	OK	

SHEAR RESISTANCE:

100As/bd =	0.80%				
vc =	0.56	N/mm^2			Table 3.8
Vres =	178.29	kN	> 34.27	OK	3.5.5.2

CHECK CRACK WIDTH IN ACCORDANCE WITH BS8100/80 Temp & shrinkage effects not included

X =	94.72	mm	εm =	-0.0008				BS8007
Acr =	103.87	mm	W =	-0.20	mm	< 0.20	OK	App. B.2

NO CRACKING

INNER BASE (per metre length)

Ult. Shear = -79.77 kN (AT *d* from FACE of WALL)

Ult. MT. = 39.54 kNm TENSION - BOTTOM FACE

BOTTOM REINFORCEMENT :

Min. As =	520	mm^2			Table 3.25
ϕ =	16	mm			
centres =	150	mm	< 725	OK	
As =	1340	mm^2	> 520	OK	

MOMENT of RESISTANCE :

d =	317	mm			
Z =	298	mm			
As' =	0	mm^2			
Mres =	175.12	kNm	> 39.54	OK	3.4.4.4

SHEAR RESISTANCE:

100As/bd =	0.42%				
vc =	0.56	N/mm^2			Table 3.8
Vres =	178.29	kN	> 79.77	OK	3.5.5.2

CHECK CRACK WIDTH IN ACCORDANCE WITH BS8100/80 Temp & shrinkage effects not included

X =	94.72	mm	εm =	-0.0003				BS8007
Acr =	103.87	mm	W =	-0.08	mm	< 0.20	OK	App. B.2

NO CRACKING

REINFORCEMENT SUMMARY for BASE

	Type	ϕ mm	centres mm	As mm^2	Min. As mm^2	
TOP	T	16	150	1340	520	OK
BOTTOM	T	16	150	1340	520	OK
TRANSVERSE	T	16	150	1340	520	OK

PRICE & MYERS

Job No.	28373	Page	13	Rev	
Date	Sept 2020	Eng	AS	Chd	CA
Job	8 Oakhill Avenue				

GROUND FLOOR – CENTRAL COLUMN ADJACENT TO BASEMENT STAIRS

Elenet	Area	dL	LL	DL	LL
Roof	-				
Second	5.5/2 × 7/2 = 9.63	0.75	1.5	7.22	14.5
First	9.63	"	"	7.22	14.5
Self weight steel work	(5.5/2 + 7/2) × 2 + 6	1	–	12.3	–
				26.74	29

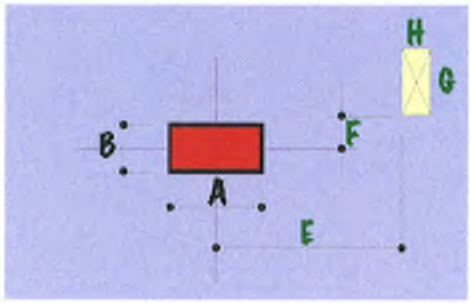
Project	Oakhill Avenue	REINFORCED CONCRETE COUNCIL	PRICE & MYERS
Client	-		Made by: AS | Date: 28-Jan-2020 | Page: 14
Location	Basement Central Column	INTERNAL COLUMN	Checked: | Revision: - | Job No: 28373
	PUNCHING SHEAR to BS8110:1997		
	Originated from RCCTSuite v2.2 on CD	© 1999-2003 BCA for RCC	

MATERIALS

fcu	N/mm²	40	
fyv	N/mm²	460	
link Ø	mm	10	

STATUS
VALID DESIGN

Legend



DIMENSIONS

A	mm	200	E	mm	0
B	mm	800	F	mm	0
G	mm	0	H	mm	0

LOADING

Vt	kN	113	Veff =	kN	113.0
ult UDL	kN/m²	78.80			

SLAB

h	mm	200	dx	mm	152.5	Asx	mm²/m 393
			dy	mm	127.5	Asy	mm²/m 393
			ave d	mm	140	ave As	% 0.283

RESULTS

Veff = 113.0 kN

At col. face, v max = 0.359 N/mm²

vc = 0.6309 N/mm² (Table 3.8)

At 1.5d perimeter, v = 0.1036 N/mm²

At 0d perimeter, v = 0.0308 N/mm²

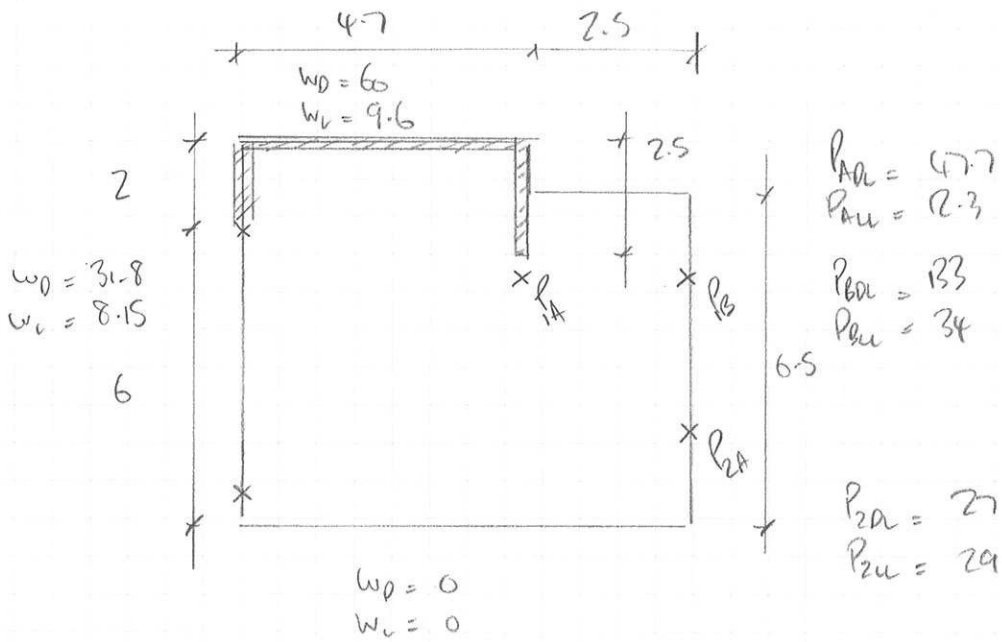
PROVIDE LINKS 0

Links not required

Plan

BASEMENT BUOYANCY

Basement excavation relative to external ground level = 3.3m



Superimposed loads on to basement not including basement & ground floor slab

ΣDL = $60 \times (4.7 + 2 + 2.5)$ = 950.5 kN

$31.8 \times (6)$	
47.7	
133	
27	

ΣLL = $9.6 \times (4.7 + 2 + 2.5)$ = 22.5 kN

$8.15 \times (6)$
12.3
34
29

Water uplift = $3.3 - 1.0 = 2m \times 10\ kN/m^3 = 20\ kN/m^2$

$\times$ Basement Area = $20 \times 53.9 = 1078$ kN

PRICE & MYERS

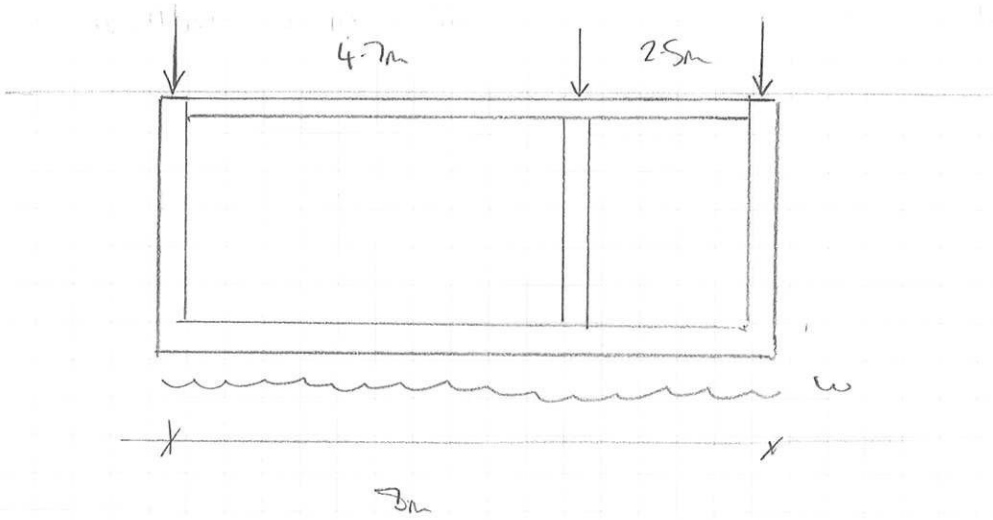
Job No.	28373	Page	16	Rev	
Date	Sept 2020	Eng	AS	Chd	CA
Job	8 Oakhill Avenue				

Resistance to uplift

Ground slab	$(4.7 \times 8) + (2.5 \times 6.5) = 53.9\ m^2$	7.81	2.5	421	134.8
Basement Slab	$53.9\ m^2$	12.81	2.5	421	134.8
Basement walls	$(4.7 + 2.5 + 1.5 + 6.5 + 7.2 + 8) \times 3 = 91.2$	7.5	-	684	-
				1526	270

1078 << 1526 (+950.5) ∴ OKAY

BASEMENT SLAB



$\Sigma DL = 1526 + 950 = 2476$

$\Sigma LL = 270 + 212 = 482$

$w_{DL} = \frac{2476}{53.9} = 46 \text{ kN/m}^2$

$w_{LL} = \frac{482}{53.9} = 9 \text{ kN/m}^2$

} Loads approximated as UDL spread across basement footprint

Check basement slab as flat slab, see spreadsheet over.

Use 400 THK

with H16's @ 200 CTRS / 100 CTRS over column hogging locations

Project	8 Oakhill Avenue		REINFORCED CONCRETE COUNCIL		
Client	N/A		Made by: AS	Date: 28-Jan-20	Page: 18
Location	Basement Floor Slab from grids 1 to 2		Checked: -	Revision: -	Job No: 28373
	FLAT SLAB ANALYSIS & DESIGN to BS 8110:1997				
	Originated from RCC35.xls v2.2 on CD	© 1999-2003 BCA for RCC			

MATERIALS

fcu	32	N/mm²	h agg	20	mm
fyl	460	N/mm²	γs	1.05	steel
fyv	460	N/mm²	γc	1.50	concrete

COVERS

	mm	TO LAYER
Top cover	75	1
Btm cover	50	1

SPANS

	L (m)
SPAN 1	4.700
SPAN 2	2.700
SPAN 3	
SPAN 4	
SPAN 5	
SPAN 6	

GEOMETRY

Bay type	EDGE	
Slab depth, h	400	mm
Edge Panel width, b	1000	mm
Edge distance	300	mm to C/L
End distance	300	from supt 1
End distance	300	from supt 3

PERIMETER LOADS *characteristic*

kN/m outside supports 1 & 3

kN/m along bay edge

LOADING PATTERN

	min	max
DEAD	1.0	1.4
IMPOSED		1.6

SUPPORTS

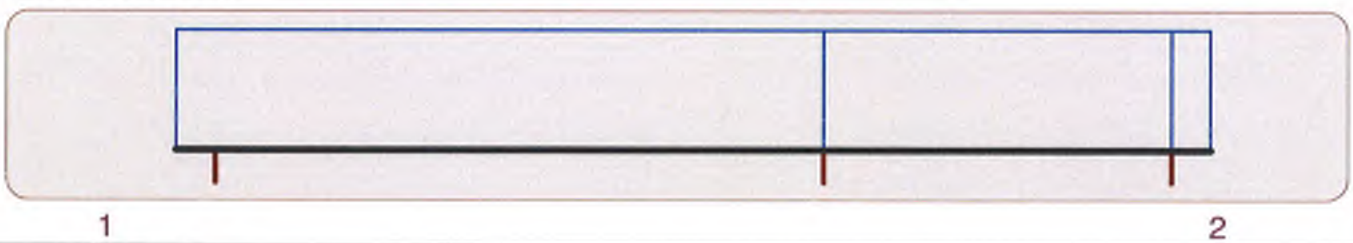
	ABOVE (m)	H (mm)	B (mm)	End Cond	BELOW (m)	H (mm)	B (mm)	End Cond
Support 1					1	200	800	E
Support 2					1	200	800	E
Support 3					1	200	800	E
Support 4								
Support 5								
Support 6								
Support 7								

LOADING *UDLs (kN/m²) PLs (kN/m) Position (m)*

	Dead Load	Imposed Load	Position from left	Loaded Length
Span 1				
UDL	46.00	9.00	~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 2				
UDL	46.00	9.00	~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 3				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				

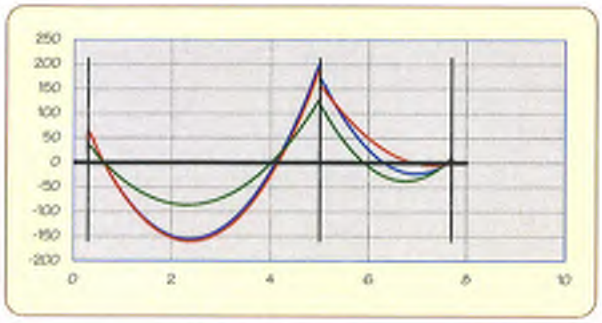
	Dead Load	Imposed Load	Position from left	Loaded Length
Span 4				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 5				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				
Span 6				
UDL			~~~~~	~~~~~
PL 1				~~~~~
PL 2				~~~~~
Part UDL				

LOADING DIAGRAM

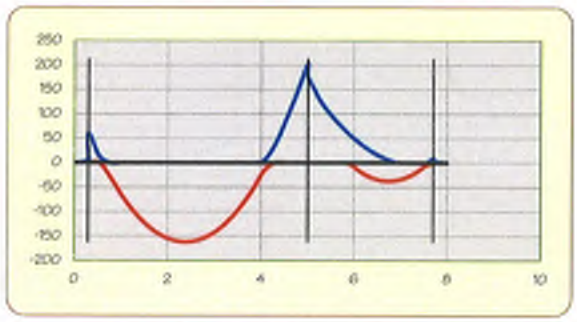


Project	8 Oakhill Avenue	REINFORCED CONCRETE COUNCIL		
Client	N/A	Made by: AS	Date: 28-Jan-20	Page: 19
Location	Basement Floor Slab, from grids 1 to 2	Checked: -	Revision: -	Job No: 28373
	FLAT SLAB ANALYSIS & DESIGN to BS 8110:1997			

BENDING MOMENT DIAGRAMS (kNm)



Elastic Moments

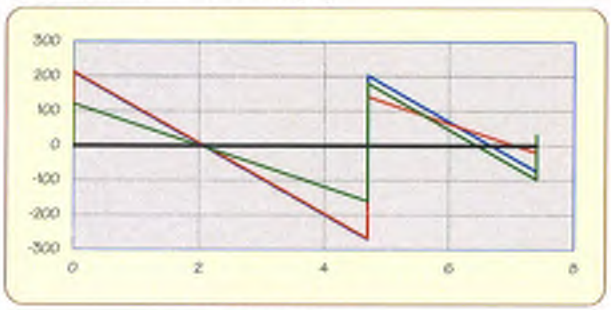


Redistributed Envelope

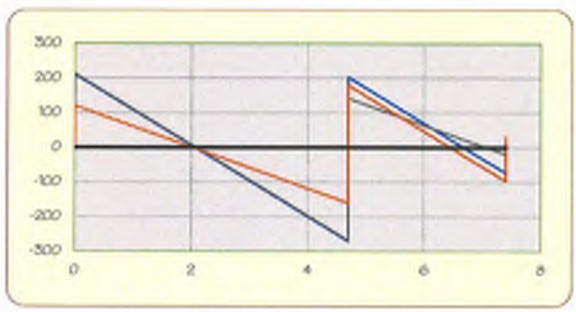
SUPPORT No	1	2	3				
Elastic M	62.8	201.9	9.3	~	~	~	~
Redistributed M	59.6	201.9	8.9	~	~	~	~
βb	0.950	1.000	0.950	~	~	~	~
Redistribution	5.0%		5.0%				
End support reinf. Ø mm	12		12				

SPAN No	1	2				
Elastic M	159.8	36.8	~	~	~	~
Redistributed M	161.5	37.1	~	~	~	~
βb	1.011	1.008	~	~	~	~

SHEARS FORCE DIAGRAMS (kN)



Elastic Shears



Redistributed Shears

SPAN No	1		2			
Elastic V	213.5	270.4	202.5	97.2	~	~
Redistributed V	212.9	271.0	202.5	97.0	~	~

SPAN No						
Elastic V	~	~	~	~	~	~
Redistributed V	~	~	~	~	~	~

REACTIONS (kN)

SUPPORT	1	2	3
ALL SPANS LOADED	241.2	473.5	104.9
ODD SPANS LOADED	243.6	409.9	38.1
EVEN SPANS LOADED	138.6	339.9	127.7
Veff for punching	304.5	613.5	159.7
Characteristic Dead	141.1	276.1	61.2
Characteristic Imposed	28.8	54.4	26.3

COLUMN MOMENTS (kNm)		1	2	3
ALL SPANS LOADED	Above			
	Below	57.6	-24.0	0.0
ODD SPANS LOADED	Above			
	Below	60.1	-29.2	6.6
EVEN SPANS LOADED	Above			
	Below	31.2	-8.7	-6.6

Project	Oakhill Avenue	REINFORCED CONCRETE COUNCIL	PRICE & MYERS		
Client	-		Made by: AS	Date: 28-Jan-2020	Page: 20
Location	Basement Central Column	INTERNAL	Checked:	Revision: -	Job No: 28373
	PUNCHING SHEAR to BS8110:1997	COLUMN			
	Originated from RCC13.xls v2.2 on CD	© 1999-2003 BCA for RCC			

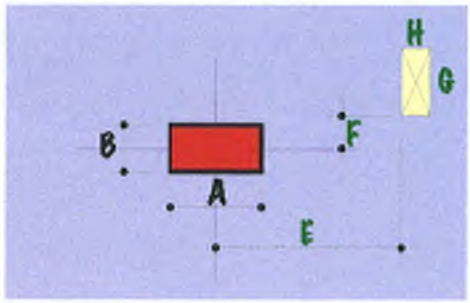
MATERIALS

fcu	N/mm²	40	
fyv	N/mm²	460	
link Ø	mm	10	

STATUS

VALID DESIGN

Legend



DIMENSIONS

A	mm	200	E	mm	0
B	mm	800	F	mm	0
G	mm	0	H	mm	0

LOADING

Vt	kN	700	Veff =	kN	700.0
ult UDL	kN/m²	78.80			

SLAB

h	mm	400	dx	mm	352.5	Asx	mm²/m 1508
			dy	mm	327.5	Asy	mm²/m 1508
			ave d	mm	340	ave As	% 0.444

RESULTS

Veff =	700.0	kN	vc =	0.5874	N/mm² (Table 3.8)
At col. face, v max =	1.011	N/mm²	At 1.5d perimeter, v =	0.2540	N/mm²
			At 0d perimeter, v =	0.1385	N/mm²

PROVIDE LINKS 0

Links not required

Plan