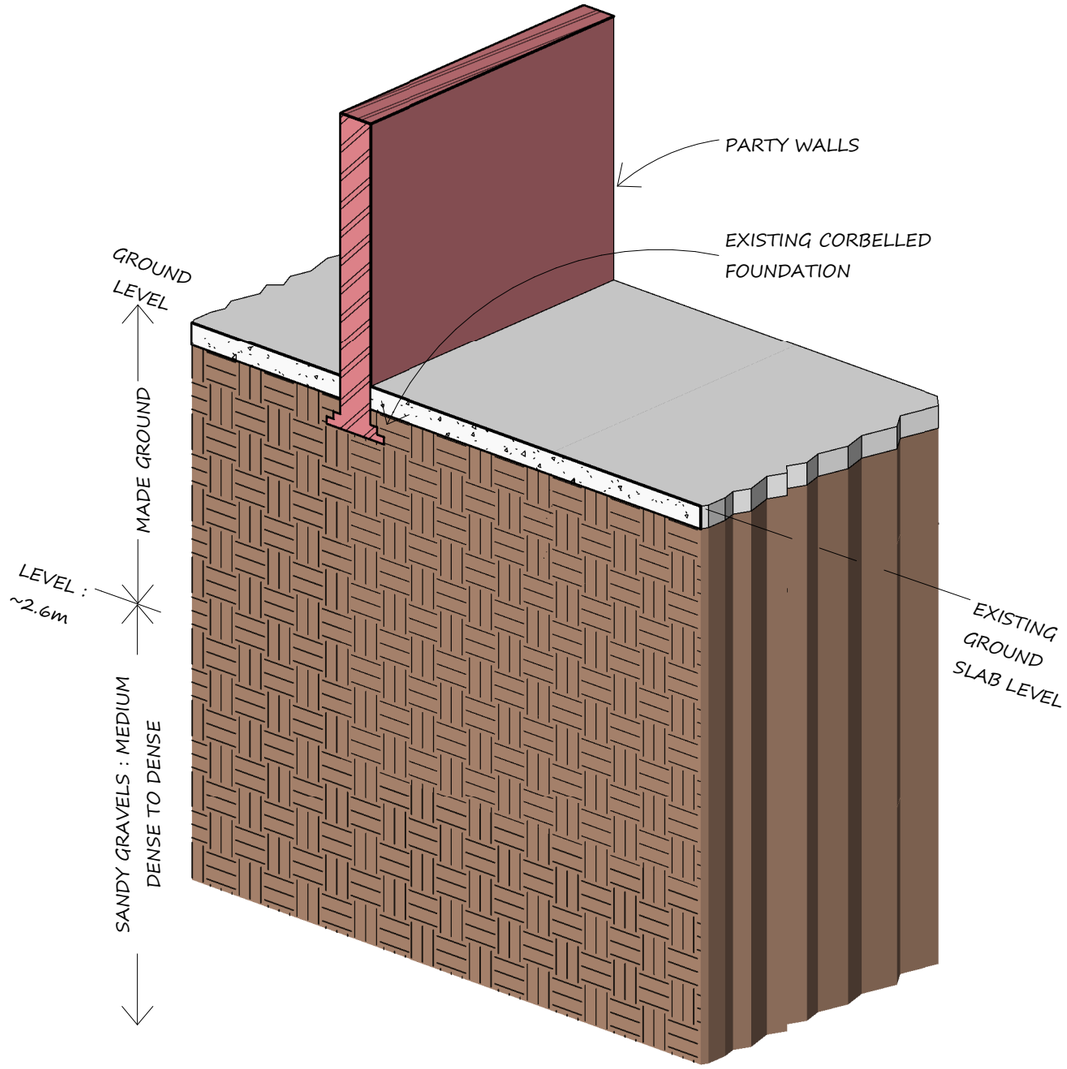
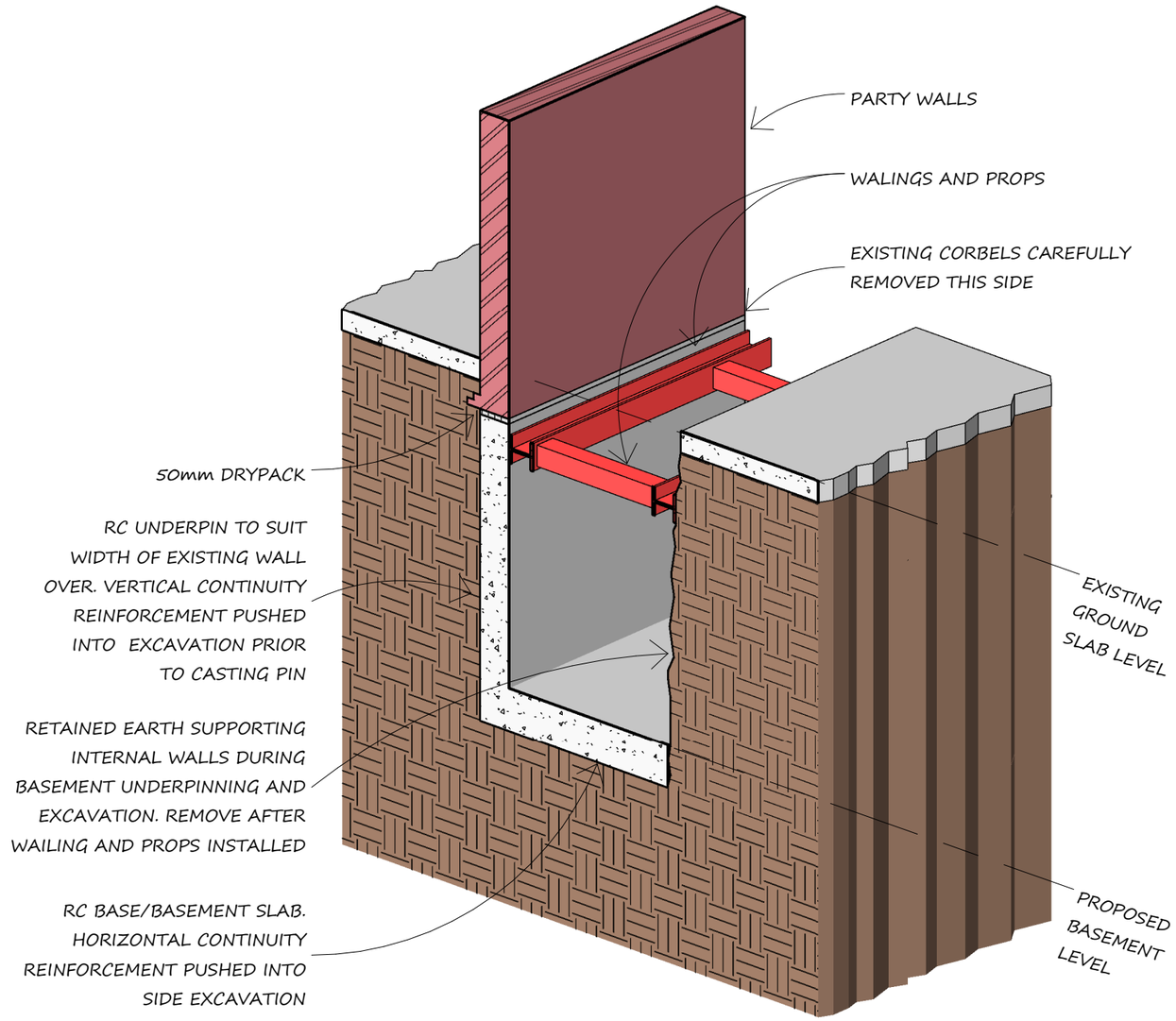




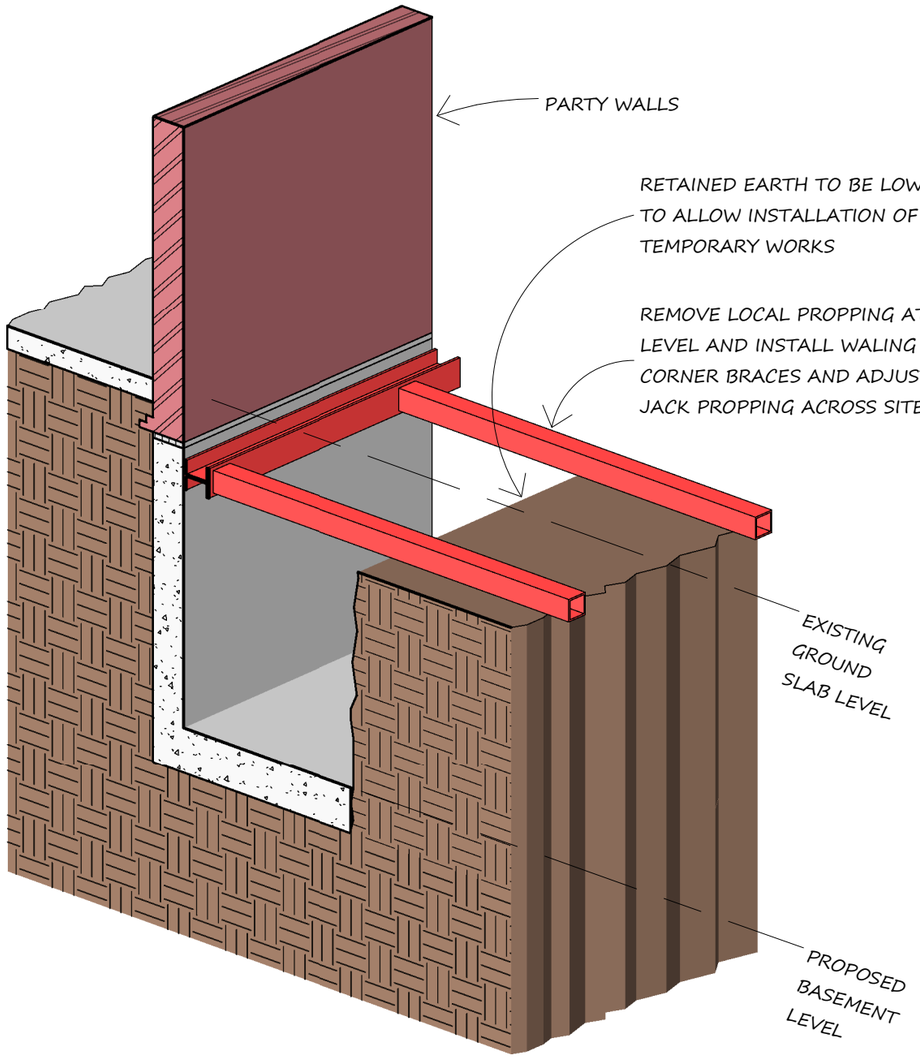
STAGE 1:

- EXCAVATE DOWN TO BASEMENT FORMATION LEVEL.
- UNDERPIN ALL ROUND.
- CAST EDGE OF RC BASE/SLAB TYING INTO UNDERPIN REINFORCEMENT.
- HORIZONTAL CONTINUITY REINFORCEMENT BARS PUSHED INTO SIDE OF EXCAVATION.
- PROVIDE PROPS BETWEEN PINS AT UNEXCAVATED EARTH BLOCK.

EXISTING FOUNDATION

STAGE 1 BASEMENT CONSTRUCTION

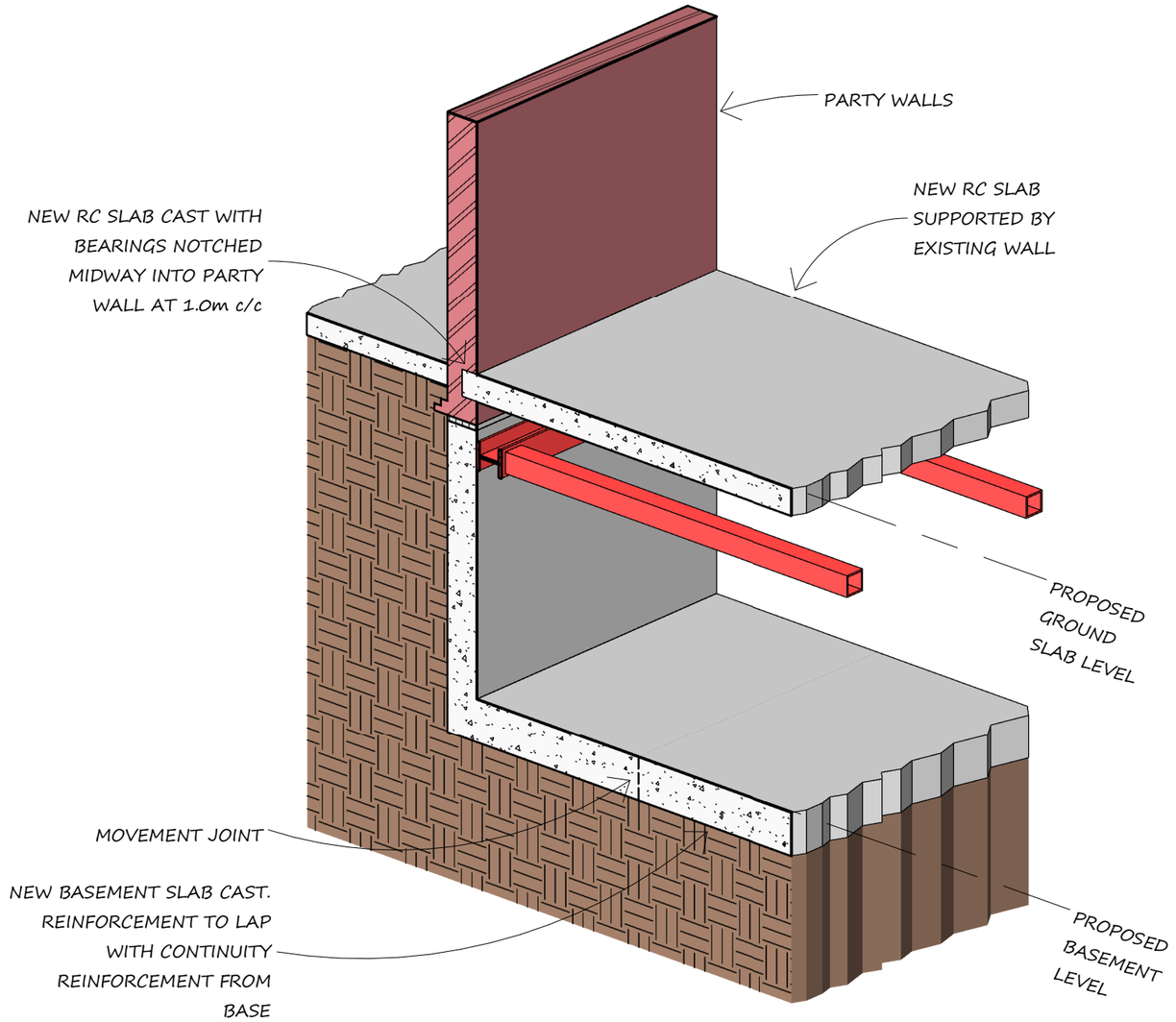
MBP Michael Barclay Partnership
consulting engineers



STAGE 2:

- REDUCE LEVEL ACROSS SITE, INCLUDING EXISTING SLAB, BY 500mm.
- INSTALL TEMPORARY WORKS STRUCTURE, WALING BEAMS/CORNER BRACING/PROPS

STAGE 2 BASEMENT CONSTRUCTION



STAGE 3:

- EXCAVATE RETAINED EARTH DOWN TO BASEMENT LEVEL FORMATION LEVEL

STAGE 4:

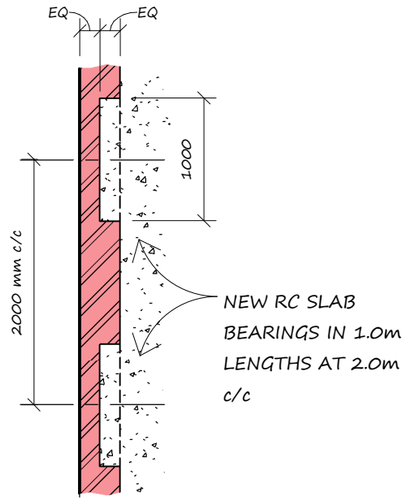
- CAST BASEMENT RC SLAB.

STAGE 5:

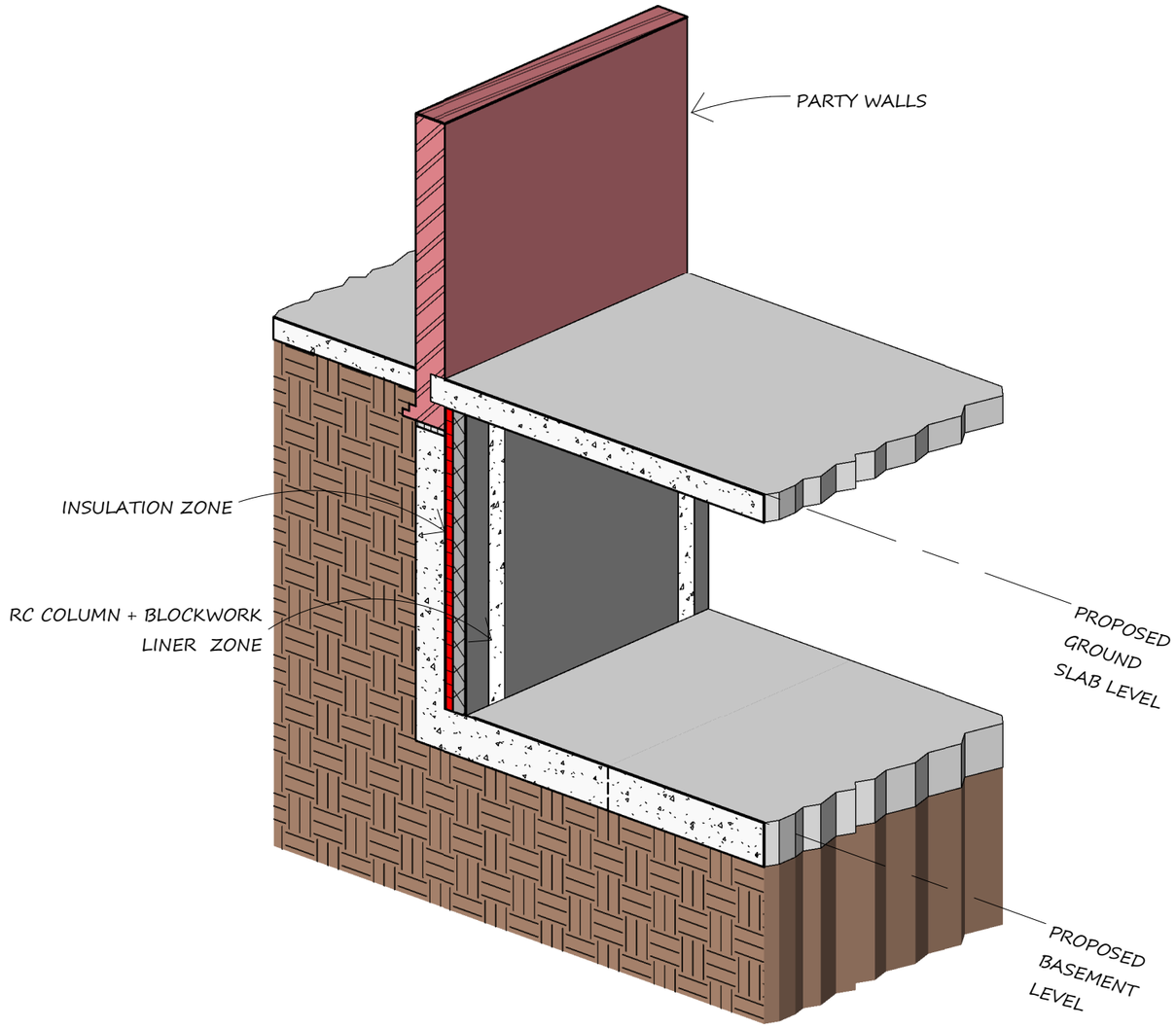
- CAST GROUND FLOOR SLAB WITH HIT & MISS BEARING.

STAGE 3 TO 5 BASEMENT CONSTRUCTION

MBP Michael Barclay Partnership
consulting engineers



PLAN ON GROUND SLAB BEARING



STAGE 6:

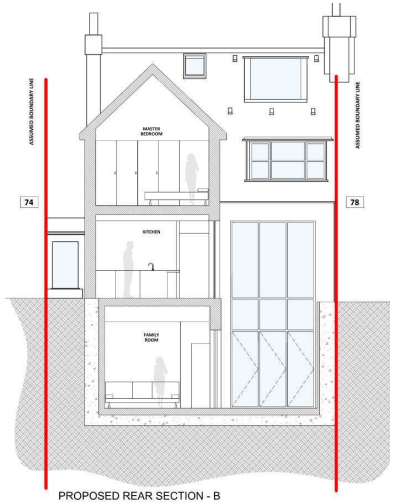
- REMOVE TEMPORARY WORKS STRUCTURE.
- CONSTRUCT INSULATED RC COLUMN + BLOCKWORK LINER WALL.

STAGE 6 COMPLETED BASEMENT CONSTRUCTION

APPENDIX C MBP CALCULATION SET 7009

MBP Michael Barclay Partnership consulting engineers 105-109 Strand London WC2R 0AA T: 020 7240 1191	Project: 76 Fitzjohn Avenue				Job Ref.: MBP-7009		
	Section: Basement Wall				Sheet no./rev.: 1		
	Calc. by: MB	Date: 05/02/2017	Chk'd by	Date	App'd by	Date	

DESIGN PARAMETERS AND LOADS FOR WALL UNDERPINS



Dead Load of Pitched Roof	$G_{K1\_PitchedRoof}$ = **0.8** kN/m^2
Dead Load of Solid Masonry Walls	$G_{K2\_SolidMasonryWalls}$ = **4.42** kN/m^2
Dead Load of Timber Floors	$G_{K3\_TimberFloors}$ = **0.55** kN/m^2
Dead Load of RC Floor	$G_{K4\_RCFloor}$ = **8.00** kN/m^2
No Access Imposed Load	$Q_{K1\_NoAccess}$ = **0.7** kN/m^2
Cat A Occupancy Load	Q_{K1_CatA} = **1.5** kN/m^2
Width of Roof Supported	$L_{W\_SupportedRoof}$ = **5.0** m
Height of Solid Wall Supported	$H_{SupportedWall}$ = **9.0** m
Width of Floor Supported	$W_{SupportedFloors}$ = **5.0** m

Dead Load to top of Underpin $N_{G\_TopOfUnderpin} = (G_{K1\_PitchedRoof} \times L_{W\_SupportedRoof}) + (G_{K2\_SolidMasonryWalls} \times H_{SupportedWall}) + (2 \times G_{K3\_TimberFloors} + G_{K4\_RCFloor}) \times W_{SupportedFloors}$ = **89.28** kN/m

Imp Load to top of Underpin $N_{Q\_TopOfUnderpin} = Q_{K1\_NoAccess} \times L_{W\_SupportedRoof} + 3 \times (Q_{K1\_CatA} \times W_{SupportedFloors})$ = **26.00** kN/m

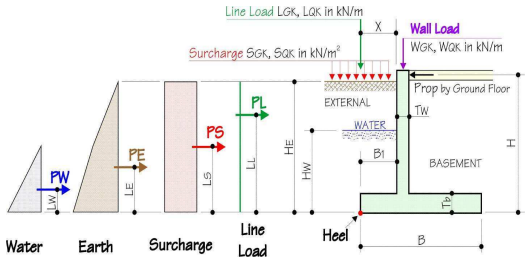
Project	76 Fitzjohn Avenue	The **Concrete** Centre	
Client	Underpinning Retaining Wall	Made by: MB	Date: 05-Feb-2017	Page: B1
Location	Side Wall	Checked	Revision: -	Job No: MBP-7009

mpa The Concrete Centre

Basement wall design to BS8110:2005

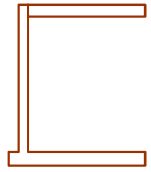
Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC

IDEALISED STRUCTURE and FORCE DIAGRAMS — DESIGN STATUS : NOT VALID



DIMENSION (mm)

H =	4000	B =	3500	Tw =	250
Hw =	2000	Bl =	250	Tb =	350
He =	3500				


Wall Geometry

MATERIAL PROPERTIES — steel class: A

fcu =	35	N/mm^2	γm =	1.50	concrete
fy =	500	N/mm^2	γm =	1.15	steel
Cover to tension reinforcement (co) =				40	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) =	30	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) =	165	kN/m2	b) Minimum active earth pressure = 0.25qH
LOADINGS (unfactored)			c) Granular backfill
Surcharge load -- live (SQK) =	10	kN/m2	h) Design not intended for walls over 3.5 m high
Surcharge load -- dead (SGK) =	2.5	kN/m2	i)Does **not** include check for temp or shrinkage
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) =	26	kN/m	
Wall load – Dead (WGK) =	90	kN/m	

LATERAL FORCES

Ko =	0.50	default Ko = (1-SIN Ø) 0.50
Kac =	1.41	= 2Ko$^{0.5}$

Force (kN)		Lever arm (m)		γ_f	Ultimate Force (kN)
PE =	54.58	LE =	1.228	1.40	76.41
PS(GK) =	4.37	LS =	1.75	1.40	6.12
PS(QK) =	17.50	LS =	1.75	1.60	28.00
PL(GK) =	0.00	LL =	3.50	1.40	0.00
PL(QK) =	0.00	LL =	3.50	1.60	0.00
PW =	20.00	LW =	0.67	1.40	28.00
Total	96.45				138.54

Project	76 Fitzjohn Avenue	The Concrete Centre		
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	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	0	-	MBP-7009

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

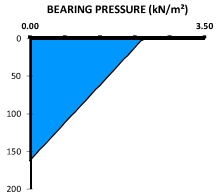
Lateral Force	Force (kN)	Lever arm to base (m)	Base MT. (kNm)	Wall MT. (kNm)	Reaction at Base (kN)	Reaction at Top (kN)	Estimated Elastic Deflection Δ (mm)
PE =	49.72	1.16	-25.98	11.73	41.38	8.34	0.7
PS(GK) =	4.16	1.66	-2.21	1.22	2.93	1.23	0.1
PS(QK) =	16.62	1.66	-8.83	4.88	11.71	4.92	0.2
PL(GK) =	0.00	3.33	0.00	0.00	0.00	0.00	0.0
PL(QK) =	0.00	3.33	0.00	0.00	0.00	0.00	0.0
PW =	16.65	0.61	-6.85	1.95	15.80	0.86	0.0
Total	87.16		-43.88	19.77	71.81	15.34	1.0

GROUND BEARING FAILURE

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

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

Vertical FORCES (kN)		Lever arm (m	Moment (kNm)
Wall load =	116	1.38	159.5
Wall (sw) =	21.90	1.38	30.11
Base =	29.40	0.00	0.00
Earth =	13.00	1.63	21.12
Water =	4.13	1.63	6.70
Surcharge =	0.63	1.63	1.02
Line load =	0.00	1.50	0.00
∑ V =	185.05		**∑ Mv =** 218.45



MOMENT due to LATERAL FORCES, Mo = -35.04 kNm

RESULTANT MOMENT, M = Mv + Mo = 183.41 kNm

ECCENTRICITY FROM BASE CENTRE, M / V = 0.99 m

MAXIMUM GROSS BEARING PRESSURE = 162.57 kN/m² < 165 OK

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

SUM of LATERAL FORCES, **P** = 71.81 kN

BASE FRICTION, F_b = - (**V** TANØb + B.Cb) = -67.35 kN

Factor of Safety, F_b / P = 0.94 < 1.50 FAIL .. but

therefore, LATERAL RESISTANCE to be provided by BASEMENT SLAB = 40.37 kN

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STRUCTURAL DESIGNS (ultimate)

DESIGN CHECKS : OK

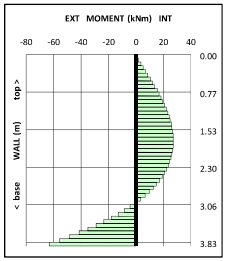
BS8110 reference

WALL (per metre length)

AXIAL LOAD CAPACITY (Limited to 0.1fcu) = 875.00 kN > 167.6 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 =	49.72	1.40	69.61	-36.38	57.94	11.68
PS(GK) =	4.16	1.40	5.82	-3.09	4.10	1.72
PS(QK) =	16.62	1.60	26.60	-14.13	18.73	7.87
PL(GK) =	0.00	1.40	0.00	0.00	0.00	0.00
PL(QK) =	0.00	1.60	0.00	0.00	0.00	0.00
PW =	16.65	1.40	23.31	-9.59	22.11	1.20
Total	87.16		125.35	-63.19	102.88	22.46

Design Bending Moments



On INTERNAL face due to lateral forces, M_{int} = 27.13 kNm

On EXTERNAL face due to lateral forces, M_{ext} = -63.19 kNm

Eccentricity of Axial Loads = 50 mm

LATERAL DEFLECTION " Δ " = 1.0 mm

Due to eccentricity of axial loads, M_{ecc} = 8.4 kNm

Due to **PΔ** effect, M_p = 0.17 kNm

otal Mmt on INTERNAL face (M_{int}+0.5M_{ecc}+M_p) = 31.5 kNm

Total Mmt on EXTERNAL face (M_{ext}+0.5M_{ecc}) = -67.4 kNm

		EXTERNAL FACE		INTERNAL FACE				
WALL REINFORCEMENT :	Min. As =	325		325		mm²		Table 3.25
	ϕ =	16		12		mm		
	centres =	200	< 362	200	< 624	mm	OK	3.12.11.2.7(b)
	As =	1005	> 325	565	> 325	mm²	OK	
MOMENT of RESISTANCE :	d =	202		204		mm		
	z =	188		194		mm		3.4.4.4
	As' =	0		0		mm²		3.4.4.4
	M_{res} =	82.2	> 67.38	47.6	> 31.50	kNm	OK	

		BASE of WALL		TOP of WALL			
SHEAR RESISTANCE:	As =	1005	ϕ =	10	@200 mm	393	mm²/m
	100As/bd =	0.50%	=	0.19%			
	vc =	0.66		0.48		N/mm²	Table 3.8
	V_{res} =	134.3	> 102.88	98.6	> 22.46	kN	OK 3.5.5.2

CK WIDTH to BS8100/8007	X =	64.51	mm	εm =	0.00122		BS8007
Temp & shrinkage effects not included	Acr =	102.92	mm	**W =**	0.22	< 0.30 mm	OK App. B.2

REINFORCEMENT SUMMARY for WALL

	Type	ϕ mm	centres mm	As mm²	Min. As mm²	
INTERNAL FACE	H	12	200	565	325	OK
EXTERNAL FACE	H	16	200	1005	325	OK
TRANSVERSE	H	10	200	393	325	OK

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	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	0	-	MBP-7009

OUTER BASE (per metre length) — BS8110 reference

γ_f = 1.50 (ASSUMED)

Ult. Shear = 2.39 kN (AT d from FACE of WALL)

Ult. MT. = 4.34 kNm TENSION - BOTTOM FACE

BOTTOM REINFORCEMENT : — Table 3.25

Min. As =	455	mm^2		
ϕ =	16	mm		
centres =	200	mm	< 766	OK
As =	1005	mm^2	> 455	OK

MOMENT of RESISTANCE : — 3.4.4.4

d =	302	mm		
Z =	287	mm		
As' =	0	mm^2		
Mres =	125.40	kNm	> 4.34	OK

SHEAR RESISTANCE:

100As/bd =	0.50%			
vc =	0.53	N/mm^2		Table 3.8
Vres =	158.75	kN	> 2.39	OK 3.5.5.2

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

X = 81.67 mm ε_m = -0.00048 — BS8007

Acr = 102.92 mm W = -0.10 mm < 0.30 OK — App. B.2

NO CRACKING

INNER BASE (per metre length)

Ult. Shear = -80.87 kN (AT d from FACE of WALL)

Ult. MT. = 70.15 kNm TENSION - BOTTOM FACE

BOTTOM REINFORCEMENT : — Table 3.25

Min. As =	455	mm^2		
ϕ =	12	mm		
centres =	200	mm	< 762	OK
As =	565	mm^2	> 455	OK

MOMENT of RESISTANCE : — 3.4.4.4

d =	304	mm		
Z =	289	mm		
As' =	0	mm^2		
Mres =	71.01	kNm	> 70.15	OK

SHEAR RESISTANCE:

100As/bd =	0.19%			
vc =	0.43	N/mm^2		Table 3.8
Vres =	131.41	kN	> 80.87	OK 3.5.5.2

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

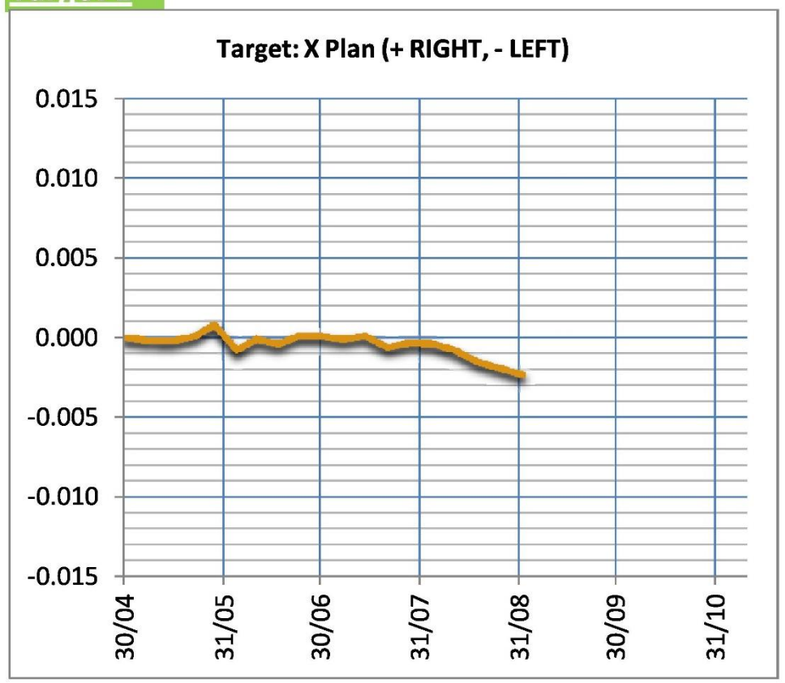
X = 63.94 mm ε_m = 0.00074 — BS8007

Acr = 104.07 mm W = 0.16 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	455	OK
BOTTOM	T	12	200	1005	455	OK
TRANSVERSE	T	12	200	565	455	OK

Target 1



APPENDIX D PROCEDURE FOR MONITORING ADJACENT BUILDINGS

The contractor will monitor the adjacent structures and party walls for movements throughout the principal demonstration & construction works and, in the event of any movements exceeding the agreed target levels the method of works will be reviewed and altered as necessary.

- The proposed monitoring points will be agreed with the contractor
- The Green/Amber trigger level will be 3mm
- The Amber/Red trigger level will be 5mm

The monitoring regime and frequency proposed is:

Activity	Frequency of monitoring
Site set up	Bi-Weekly
Demolition & Excavation	Weekly
Underpinning & Ground Works	Weekly
Principal Construction Works	Bi-Weekly

Target monitoring will monitor the party walls and front and rear elevations with an accuracy of +/- 2mm. The results of the monitoring are to be recorded and issued by email to the project engineer, CA and engineers for the adjoining properties, on the day that the results are taken. The results are to be presented both in table and graphical form with the graphs for each point plotting the readings taken against time. The following actions will be taken if the trigger levels are exceeded:

Trigger Level	Action
Green/Amber	Immediately notify the engineers. Increase frequency of monitoring to a daily basis.
Amber/Red	Contractor to stop all works and immediately notify the engineers. Contractor and project engineer to put forward proposals, such as additional propping, to limit further movement to an acceptable level.

APPENDIX E PROCEDURES FOR CONTROL OF NOISE, DUST & NUISANCE

To control the disturbance do to noise and vibrations, all works on site will be restricted to the hours of Monday to Friday 8am to 6pm, Saturdays 8am to 1pm. Works that create excessive noise and/or vibration are prohibited, as are any works on Sundays and the bank holidays. The contractor employed to undertake the work will be a member of the considerate constructor scheme.

Appropriate measures will be taken to keep dust pollution to a minimum. These measures are compliant with the RBKC draught Basements SPD. Such measures will include the use of water to suppress dust and soil being excavated from basement level, covers for conveyors and skips, and barriers installed around dusty activities that are undertaken externally.

All work will be carried out in accordance with BS 5228-1:2009 and BS 5228-2:2009. All works will employ Best Practicable Means as defined by section 72 of the Control of Pollution Act 1972 to minimise the effects of noise and vibration. All means of managing and reducing noise and vibration which can be practicably applied at reasonable cost will be implemented.

The following measures will be taken:

- Consultation/ communication with neighbours/affected others prior to the start of the works.
- Use only of modern, quiet and well-maintained equipment, all of which will comply with the EC Directives and UK regulations set out in BS 5228-1:2009
- Use of electrically powered hand tools rather than air powered tools and a compressor will be used for to the minimum extent practicable
- Avoidance of unnecessary noise (such as engines idling between operations or excessive engine revving, no radios, no shouting)
- Use of screws and drills rather than nails for fixing hoarding.
- Careful handling of materials, so no dropping off materials from an excessive height (no more than 2m) into skip etc.
- Ensuring that the conveyor is well maintained with rollers in good working order and well oiled.
- Isolating the neighbouring properties from vibration /breaking out work where practicable. In particular, the edges of the existing concrete slab at ground floor will be broken out first (isolating the remaining slab at ground floor) before the main part of the existing ground floor slab is removed.
- Collection /delivery times will be as given in the CTMP

Collection/delivery vehicles will not loiter/wait in the area before the allowed times

- No site run-off of water or mud until the water has been left to settle and is free from particles
- During Demolition:
- Special Care to ensure the site is closed-over
- Dust suppression with water if necessary if needed (recommended)
- Cutting equipment to use water suppressant or local extraction & ventilation

If measures to control dust are unsuccessful works will be stopped and alternative methods proposed and implemented

A detailed CTMP will be required for the execution of these works