Dr Shanthi Thomas

124 St Pancras Way, NW1

Structural Planning Calculations

ENTUITIVE

# Dr Shanthi Thomas 124 St Pancras Way, NW1 Structural Planning Calculations

April 2017

# ENTUITIVE

143 Crownstone Road, London 5W2 1NB

- (t) +44 (0)20 7733 6837
- (e) mail@entuitive.com

Entuitive is a trading name of Tall Engineers Ltd Company No. 5393264 Registered address: 149A Southampton Way, London, SE5 7EW Project Number: 4369

### INTRODUCTION

The full address is:

124 St Pancras Way London NW1 9NB

The house is a terraced building over three storeys, including a single below ground storey of reduced head height. There is also a small three storey rear addition to the back of the main house. The external walls are loadbearing masonry walls and the floors are of timber construction as is the roof. The foundations are traditional stepped brick.

### **SCOPE OF WORK**

The proposed alterations involve the formation of a basement extension, within the rear garden, to the rear of the existing property. We propose that this work be undertaken via the formation of the reinforced concrete underpins constructed in a hit and miss sequence.

Stability to the rear of the house and the new rear extension will be provided by a steel box frame.

The attached calculation pages A00-A12 confirm the outline structural calculations required to achieve the above work. Drawings 4369/P-SK-01 to 05 show the required structural intervention to construct the works.

Sincerely, Entuitive

John Maguire Senior Engineer John.maguire@entuitive.com D: 020 3519 9309

# ENTUITIVE

Project	Project 124 St Pancras, NW1					
Project N	0.	Made by	Checked	Date	Revision	
	4369	JM		April 2017		

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Description:

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Design of retaining walls

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decen 'U		Project No.	Made by	Checked	Date	Revision
		4369	JM		April 2017	
OADING	(BS 6399 - 1 & 3)					
S	DEAD LOAD (on plan)		LIVE LOAD	(on plan)		
Roof (existing)	Description	Weight (kN/m²)	Description		Weight (kN/m²)	
existing	Slates:	0.6	Snow/Mai		0.60	
	Rafters + Battens	0.1	Silowyiviai	incliance	0.00	
	Insulation:	0.01				
	Deck etc	0.1				
	Ceiling joists	0.05				
	Ceiling:	0.19				
	Other:	0.13				
	Other.	V				
	Total:	1.05 kN/m²	Total:		0.60 kN/m²	
	Partial factor on dead	load =	1.4 Partial fac	tor on live lo	ad =	1.6
	W <sub>sls</sub> = 1.6	55 kN/m²	w <sub>ufs</sub> =	2.4	3 kN/m²	
Roof	DEAD LOAD (on plan)		LIVE LOAD	(on plan)		
(flat)	Description	Weight (kN/m²)	Descriptio		Weight (kN/m²)	
,	Finishes	0.50	Snow/Mai	ntenance	0.75	
	Joists	0.10				
	Insulation	0.01				
	Deck etc	0.10				
	Ceiling + Services	0.19				
	Other	0.00				
	Total:	0.9 kN/m²	Total:		0.75 kN/m²	
	Partial factor on dead	load =	1.4 Partial fac	tor on live lo	ad =	1.6
		65 kN/m²	w <sub>uls</sub> =	2.4	16 kN/m²	
	vv sis —		ziù			
Floors	DEAD LOAD		LIVE LOAD	)		
	Description	Weight (kN/m²)	Descriptio	n	Weight (kN/m²)	
	Finishes	0.12	Domestic		1.50	
	Floating floor	0.00				
	Boards/deck	0.10				
	Joists	0.13				
	Insulation	0.01				
	Ceiling + Services	0.24				
	Other	0.00				
					a ro late-2	
	Total:	<b>0.60</b> kN/m²	Total:		1.50 kN/m²	
	Partial factor on dead	load =	1.4 Partial fac	tor on live lo	oad =	1.6
	$W_{sis} = 2$	2.1 kN/m²	w <sub>uls</sub> =	3.2	24 kN/m²	

### Project 124 St Pancras Way, NW1 ENTUITIVE Project No. Made by Checked Date 4369 JM April 2017 LOADING (BS 6399 - 1 & 3) Walls **DEAD LOAD** (internal) Weight (kN/m²) Description Finishes (face 1) 0.6 30mm thick, 20kN/m³ plaster Studwork/masonry 3.87 18kN/m<sup>3</sup> 215-thick brickwork wall Insulation 0 Finishes (face 2) 0.3 Total: 4.77 kN/m<sup>2</sup> Partial factor on dead load = 1.4 4.77 kN/m<sup>2</sup> $w_{sis} =$ $w_{uls} =$ 6.678 kN/m<sup>2</sup> Walls **DEAD LOAD** (stud) Weight (kN/m²) Description Finishes (face 1) 0.2 Studwork/masonry 0.05 Insulation 0 Finishes (face 2) 0.2

0.45 kN/m<sup>2</sup>

1.4

w<sub>uls</sub> =

0.63 kN/m<sup>2</sup>

Total:

 $w_{sis} =$ 

Partial factor on dead load =

0.45 kN/m<sup>2</sup>

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Revision

ENTUITIVE    Project No.   Made by   Checked   Date   Revision   Mar 17   Revision     1369   MM   Checked   Date   Revision     126		Project	124 Saint Pa	Incrae May NM	71	Page
Proper Service Date Mar 17 Revision  LONDING ON SIX WALLS:  NO. 126 SIDE  GR.S. FLOOR  DL = 1.05 x 3.7/2  LOS OF 3.72/2  LOS OF 3.72/2  LOS OF SIDE  GR.S. FLOOR  DL = 1.05 x 3.7/2  LOS OF SIDE  LOS OF	ENTUITIVE			ilicias vvay, IVV	<u>'</u>	403
LOADING ON SIX WALLS:  NO. 126 SIDE.  GRD. FLOOR  U. = 1.05 x 3 1/2  LI = 0.6 x 3 2/2  LI = 0.5 x 20x 28  LOSUM.  LOADING ON EXTERNAL WALL TO LEAF ADDITION:  1 th Floor  LI = 1.0 x 1.05 = 1.05 LUT.  WILL BL = 0.25 x 26 x 20  LI = 1.0 x 1.05 = 1.0 CLUT.  WILL BL = 0.6 x 10 = 0.6 LUT.  GRD. DL = 1.0 x 1.05 = 1.0 CLUT.  LOADING DL = 1.0 x 1.05 = 1.0 CLUT.  LOADING DL = 1.0 x 1.05 = 1.0 CLUT.  LI = 1.0 x 0.05 = 1.0 CLUT.		·	<u> </u>	Checked		Revision
NO. 126 SIDE  GRD. FLOOR.  DL = 1.05 x = 3/2  Ll = 0.6 x + 3/2  Ll = 0.6 x + 3/2  Ll = 0.5 x 20x 28  16. SLW  wall = 0. 3x 20x 28  16. SLW  wall = 0. 3x 20x 28  16. SLW  LEADING ON EXTERNAL WALL TO LEAR ADDITION:  1 " FLOOR  LEADING ON EXTERNAL WALL TO LEAR ADDITION:  1 " FLOOR  LO X 0 6 = 0 6 LW  WILL DL = 0.25x 26x20  LU = 0.0x 20 = 0.6 LW  FLOOR  LU = 0.0x 20 = 0.6 LW  LU & WALL  THOOR  LU = 0.0x 20 = 0.6 LW  WALL  THOOR  TH		4369	l nw		Mar '17	
NO. 126 SIDE  GRD. FLOOR.  DL = 1.05 x = 3/2  Ll = 0.6 x + 3/2  Ll = 0.6 x + 3/2  Ll = 0.5 x 20x 28  16. SLW  wall = 0. 3x 20x 28  16. SLW  wall = 0. 3x 20x 28  16. SLW  LEADING ON EXTERNAL WALL TO LEAR ADDITION:  1 " FLOOR  LEADING ON EXTERNAL WALL TO LEAR ADDITION:  1 " FLOOR  LO X 0 6 = 0 6 LW  WILL DL = 0.25x 26x20  LU = 0.0x 20 = 0.6 LW  FLOOR  LU = 0.0x 20 = 0.6 LW  LU & WALL  THOOR  LU = 0.0x 20 = 0.6 LW  WALL  THOOR  TH	1-01AD/NG-0	1) 5/1/2/	M165:			
GRS. FLOOR  DL = 1.05 x 33/2  LL = 0.6 x 33/2  Null = 0.3 x 20 x 28  No shul-  Null = 0.3 x 20 x 28  No shul-  Leaden of a contract of the property of the pro				-   -   -   -		
DL = 1.05 x 3 1/2  Ll = 0 6 x 3 1/2  Wall = 0.3 x 20 x 28  Wall = 0.3 x 20 x 28  Wall = 0.3 x 20 x 28  Wall = 0.5 x 20 x 28  Wall = 1.0 x 1.05 = 10 < 64  Wall = 1.0 x 0.05 = 0.6 twl  First DL = 1.0 x 1.05 = 10 < 64  Wall DL = 0.5 x 26 x 20  Gra Frook  Ll = 1.0 x 0.5 = 0.6 twl  First DL = 0.6 x 10 = 0.6 twl  Wall DL = 0.5 x 25 x 28 x 0.8 x 20 = 11 5  DL = 26 O twl  DL = 26						
LI = 0 6 x 3 2/2  Well = 0.3 x 20 x 28  16.8 Levy  Wandenpinning  DL = 1.5 x 20 x 0.45  10.5 Levy  Longenpa ON External wall to lear admitted  1 th Floor  Loop DL = 1.0 x 1.05 = 10 < Levy  Well DL = 0.25 x 2 8 x 20  Levy  Theorem DL = 0.6 x 10 = 0.6 Levy  Froor DL = 0.6 x 10 = 0.6 Levy  Li column  Li column				26	1-25	
well = 0.3x 20x28 16.864  under index  DL - 1.5x 24x0.45 16.564  SS. 16U - 1.06M  LONDONG DU EXTERNAL WALL TO LEAR ADDITION:  1 " FROOK  LOOF DL = 1.0x 1.05 = 1.0 < 64  LOOF DL = 1.0x 1.05 = 1.0 < 64  LOOF DL = 0.0x 1.05 = 0.664  Well DL = 0.25x 28x20  LOOK DL = 0.6x 20 = 0.664  LOOK S- 1.560  Grap FOOR  FLOOK DL = 0.664  U = 1.564  Well DL = 0.25x 28 x0.8 * 20=11.5				1.75 WL		
undemining  DL - 15x22x0.45  16.56 N - 100 N -					1.0 60	
DC = 1.5x 24x 0.45  25.16U	wall = 0.3	x 20x 2.8	3	16.86W		
25.16U/ - 1.06M  LOADING ON EXTERNAL WALL TO LEAR ADDITION:  1 "E FLOOR  POOF DI = 1.0 × 1.05 = 1.0 < 64/2 mmm	undeminning					
LONDING ON EXTERNAL WALL TO LEAR ADDITION-  1 " THE FLOOR  LOX 0-6 = 0.66 V - 6.60 - 6.60 V -	DC - 1.5x	24x0.45		16.56N		
LONDING ON EXTERNAL WALL TO LEAR ADDITION:  1 " THE FLOOR  LOND G = 1.0 × 1.05 = 1.0 < 6.6   2.5   2.6   2.5				35.16V	1.061	
1 th Floor  POOF DL = 1.0 x 1.05 = 1.0 5 CM - 2000 105  CL = 1.0 x 0.6 = 0.6 LW - 2000 105  WILL DL = 0.25 x 2.6 x 20  CL = 1.0 x 10 = 0.6 LW - 10 - 10 - 10 - 10 - 10  CL = 1.0 x 1.5 = 1.5 CW - 10  GRAF-LOOR  FLOOR DL = 0.6 LW - 10  WILL DL = 0.25 x 2.8 x 0.8 x 20=11.5  DL = 26.0 LW - 10						
POOF DL = 1:0x 1:05 = 10564   name 12 = 1000   10 = 1000   10 = 1000   10 = 1000   10 = 1000   10 = 1000   10 = 1000   10 = 1000   10000   10000   10000   10000   10000   10000   10000   10000   10000   10000   10000   10000   10000   10000   10000   100000   100000   100000   100000   100000   100000   100000   1000000   1000000   1000000   1000000   1000000   1000000   100000000	COADING D	U EXTERI	uak wac	LTOLEAR	ADDUTON-	
POOF DL = 1.0 x 1.05 = 105 (L) - 200 FLOOR  (C = 1.0 x 0.6 = 0.6 LV) - 200 FLOOR  (C = 1.0 x 0.6 = 0.6 LV) - 11 4.  WILL DL = 0.25 x 2.6 x 2.0  (L. 64)  FLOOR DL = 0.6 x 7.0 = 0.6 LV) - 1  (L. 64)	1 st Floor					
U = 1.0x06 = 0.660/- 6.25. FLOOR UC NULL AND THOOR DU = 0.6x20 = 0.660/- 4 11.6000 CL. 6000 C		10 4 1.AC	= 10/1			187FLOOR
Well DC = 0.25 x 2.8 x 20  FLOOR DC = 0.6 x 20 = 0.6 LOD - 1.  CL = 2.0 x 1.5 = 1.5 GOD - 1.  GRD FLOOR  FLOOR DC = 0.6 LOD - 1.  Well DC = 0.25 x 2.8 x 0.8 x 20=11.5  DC = 28.0 LOD - 1.				VI T	CD. FLOOR	16
= 14.0 W/-  FLOOR DL = 0.6x 2.0 = 0.0 W/-  CL = 2.0x1.5 = 1.56 W/-  GAD FLOOR  L= 1.56 W/-  Wall DL = 0.25 x 2.8 NO.8 \$20=11.5  DL = 28.0 W/-		1			116-4	<del></del> _
FLOOR DC = 0.6x 20 = 0.640/  GRDFCOOR  FLOOK DC + 0.664/  U = 1.560/0  Wall DC = 0.23 x 2.8 x 0.8 \$ 20=11.5	well be = 0.2		= 14.06N	/_ 7		10:46KL
61 = 1.0x1.5 = 1.560/  GRD FLOOR  FLOOR 96 = 0.664/  U = 1.560/  Nell DC = 0.25 x 2.8 x 0.8 x 20=11.5  DC = 28.060/	FLOOR DL = O.	6x70=	0.640)	\-\-\-\-\-\-\-\-\-\-\-\-\-\-\-\-\-\-\-		
ELOOK 96 = 0.664-  Well DC = 0.23 x 2.8 x 0.8 \$ 20=11.5  DC = 28.062/-			n i i n			
Vall DC = 0.23 x 2.2 x 0.8 x 20=11.5					+	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Well BC = 0.25 x 2.8 x 0.8 x 20=11.5	GNDFLOOR		4			
nall BC = 0.25 x 2.8 x 0.8 x 20=11.5	FLOOK 96 =	0.664				
06=28.06A	U >	1-56 W/4				
06=28.06N	wall be-o	,25 x 2.8 1	10,8 ×20>	11.5		
			Λ.			
			7			
		1 - 9.00				

ENTUITIVE	Project	124 Saint Par	ncras Way, NW:		Page Avo4
CIVIOTIVE	Project No. 4369	Made by	Checked	Date Mar '17	Revision
LOADINGS O	v waces t	OR BIA			- + 1 :
Rear wall	of hous	e:			
Root					
U=1.05		0.6	364-20		
2 0 190 FLOOR	7				
DC = 0.6x		246	6.6		
well = 0:3		5.9x0.8			
Well@rest-10:39					+ + + +
DL = 1.2 4/1.6	0x 2.4)	3661			
U= 3.0+ 6	.6x2.4)			1460/-	
wall tard to 14 -0.39			<b>f</b>		
Basement - 0.	4x 20x0:6	25×2.5 = 17.55	40		
anderfinn of					
= hox	24x0.55	= B.24 98.7	<del>//_</del>	1.04N_	

		Project	124 Saint Pancras Way, NW1			Page A 05
	ENTUITIVE	Project No.	Made by	Checked	Date Mar '17	Revision
	LOADING			NE:		
	6 jan = 5.0	<b>4</b> .			=19.06N -	51 W 35 W
	Assuare la	e loud		DU 60 5 LN	<b>V</b>	POL=48LW
	a basemen			U=4.04N		U-606W
e <sup>g</sup>	$DL = \begin{pmatrix} 3/4.0 \\ 32.5 \end{pmatrix}$		6x2.5)	42XO.42	x 24) 4(14:0	(25)
**. Z	U= a.4/4 -		<b>-</b>			
	LOYDING ON		4(/ 1)0 //	77 < 12 +		
	LEWISIUG DIO	SIVE WO	\(\tau_0\). 12		DC = 11.361	1-
		7	*	· @ Grd v	(L = 12.55)	W-+1.75
	u/p/ng = 16	560/-			C = 1.0+1.	<b>S</b> *
			1.75 t 16.5	= 42.660	M_+16.8	= 58.96W.
	Un = 1.0t	15 - 215	; GN			
	LOADING Tiles + bed	a ON SLA	B:			
	ingulation		0.1			
	ureed to p		0.075224			
	5/ab 3/60.	elg = C	)3 x 24	10.54		

	Project	124 Saint P	ancras Way, N	N1	Page
ENTUITIVE	Project No.	<del></del>			106
	4369	Made by	Checked	Date Mar '17	Revision
FLOATION	ChlEck:				
- read load	d on ba	sement s	lab = 9	000	
-Pead load -Read load	Parone	low to	-16	olules	
	O ora	Van gra	me -	74.8x2	0 = 10.41
wead road	Grow 14	retainin	gwall =	0.3x24x2	5-2=90
	the state of the s				
		otal de	ed load	acting	
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the cass	uned u	rlifting	water p.	ressive	
1					
	+ + + + +		1		

	Project	124 Saint Pan	cras Way, NW1	1	Page 4
ENTUITIVE	Project No.	Made by	Checked		407
	4369	JM)	Спескед	Date Mar '17	Revision
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untu	right -				
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Ka nase grd		+ 0.32	6		
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19, = 0320	18 x 10	2 = 2.93	tled/a	Pigat.	
P= = 0.326	* 18x 10)	2+18 =	1.63 WM-	131	<b>\$</b>
	20× 1.8/2		9.4 Lest		
	1		17		
Paux = 032	5 x 2.5	= 6.8	14 KM ~	Sector R	
Pares - 029	x 2.5	= 6.47	Llead	PEZ	
	x 2-12/2		·63(4)_		7
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	www.				
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ENTUITIVE	Project	124 Saint Pand	ras Way, NW1		Page AOS
ENTOTIVE	Project No. 4369	Made by	Checked	Date Mar '17	Revision
LOADINGS	ON RC U	WAERPIN	waus:		
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Par - 0.326	0x 18, x 1.0	h = 1:92 = 1:	PTUNIS		
Pay = 0.29			2560/-		2.
Paux. = 0.33				uoz kie	F-2
12002 : 0.29	1 x 2.5	= 0.72	le de la		
					-+
		1 1 1			
		+			

EMTUITIVE 143 Cownstone Road London SW2 1NB

Project 124 St. PANKKAS WAY NW ( Section

Retaining wall underpin temporary condition

Date

4369 Sheet no./rev.

A09

Calc. by Date JM 25/04/2017

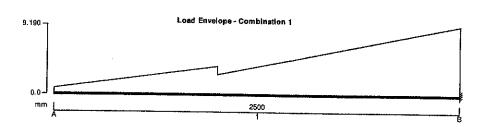
Chk'd by

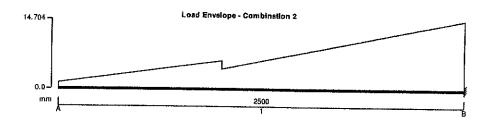
App'd by

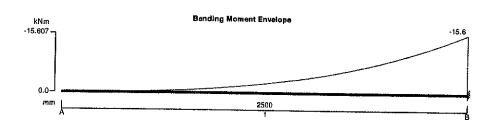
Job Ref.

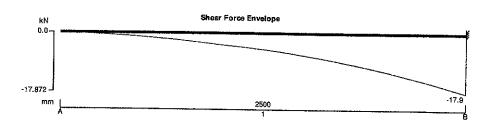
## RC BEAM ANALYSIS & DESIGN BS8110

TEDDS calculation version 2.0.01









## **Support conditions**

Support A

Support B

**Applied loading** 

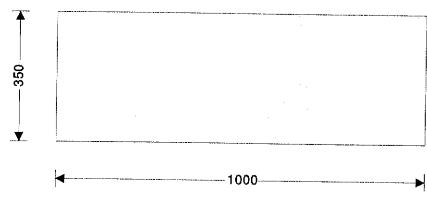
Vertically free Rotationally free Vertically restrained

Rotationally restrained

Imposed partial VDL 0 kN/m at 0 mm to 2.93 kN/m at 1000 mm Imposed partial UDL 1.95 kN/m from 1000 mm to 2500 mm

### 

	Imposed partial VDL 0 kN/m at 1000 mm to 6.52 kN/m at 2500 mm Imposed partial UDL 0.81 kN/m from 0 mm to 1000 mm Imposed partial UDL 0.72 kN/m from 1000 mm to 2500 mm			
Load combinations	, ,	1000 11111		
Load combination 1	Support A	Dead × 1.00		
		Imposed × 1.00		
	Span 1	•		
	Opan 1	Dead × 1.00		
	Support D	Imposed × 1.00		
	Support B	Dead × 1.00		
Load combination 2		Imposed × 1.00		
Load Combination 2	Support A	Dead × 1.40		
		Imposed × 1.60		
	Span 1	Dead × 1.40		
		Imposed × 1.60		
	Support B	Dead × 1.40		
		Imposed × 1.60		
Analysis results				
Maximum moment support A	MA_max = 0 kNm	$M_{A\_red} = 0 \text{ kNm}$		
Maximum moment span 1 at 0 mm	$M_{s1\_max} = 0 \text{ kNm}$	M <sub>s1_red</sub> = <b>0</b> kNm		
Maximum moment support B	M <sub>B_max</sub> = -16 kNm	M <sub>B_red</sub> = -16 kNm		
Maximum shear support A	$V_{A_{max}} = 0 \text{ kN}$	Va_red = -6 kN		
Maximum shear support A span 1 at 300 mm	$V_{A_s1_max} = 0 \text{ kN}$	V <sub>A_s1_red</sub> = <b>-4</b> kN		
Maximum shear support B	$V_{B_max} = -18 \text{ kN}$	V <sub>B_red</sub> = -6 kN		
Maximum shear support B span 1 at 2200 mm	$V_{B_s1_{max}} = -14 \text{ kN}$	V <sub>B_s1_red</sub> = <b>-2</b> kN		
Maximum reaction at support A	$R_A = 0 \text{ kN}$	<del></del>		
Unfactored imposed load reaction at support A	$R_{A\_imposed} = 0 \text{ kN}$			
Maximum reaction at support B	R <sub>B</sub> = 18 kN			
Unfactored imposed load reaction at support B	$R_{B\_Imposed} = 11 \text{ kN}$			
Rectangular section details				
Section width	b = 1000 mm			
Section depth	h = <b>350</b> mm			



### Concrete details

Concrete strength class
Characteristic compressive cube strength

C40/50

 $f_{\text{cu}} = 50 \text{ N/mm}^2$ 

CSC > TEDDS\*

ENTUTIVE

143 Cownstone Road
London SW2 1NB

Project

124 SC. PANCRAS, NW1

Section

Retaining wall underpin temporary condition

Job Ref.

4369

Sheet no./rev.

Retaining wall underpin temporary condition

Calc. by Date Chk'd by Date App'd by Date

JM 25/04/2017

Modulus of elasticity of concrete

 $E_c = 20kN/mm^2 + 200 \times f_{cu} = 30000 N/mm^2$ 

Maximum aggregate size

 $h_{\text{agg}} = 20 \ \text{mm}$ 

Reinforcement details

Characteristic yield strength of reinforcement

 $f_y = 500 \text{ N/mm}^2$ 

Characteristic yield strength of shear reinforcement

 $f_{yv} = 500 \text{ N/mm}^2$ 

Nominal cover to reinforcement

Nominal cover to top reinforcement

 $C_{nom\_t} = 35 \text{ mm}$ 

Nominal cover to bottom reinforcement

Cnom\_b = **50** mm

Nominal cover to side reinforcement

 $c_{nom\_s} = 35 \text{ mm}$ 

# **ENTUITIVE**

Project: 124 Saint Pancras Way NW1
Project No.: 4369 Made by: JM Rev:

e = M/w

CASE 1

CASE 2

w1

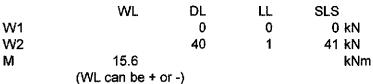
w2 = (D-L)/D w1

W2

CL

Project No.: 4369 Made by: JM Rev: Date: Apr 17 Chkd:

## FOUNDATION FOR RETAINING WALL IN TEMPORARY CONDITION



combination 1.0 1.0 1.0

foundation size, L = 1.5 m foundation size, B = 1 m foundation depth = 0.4 m x1 = 0 m x2 = 0.325 m

Base moment = 28.925 kNm (SLS) Weight = 41 kN (SLS)

foundation weight = 14.4 kN total load = 55.4 kN

Z of foundation = 0.375 m3

Load factor on overturning moment = 1 Load factor on restoring forces = 1

> M = 28.925 kNm W = 55.4 kN

eccentricty of axial load, e = 0.522112 m width of triangular stress block, D = 0.683664 m

CASE 1 reaction checks

maximum stress under base, w1 =  $162.0679 \text{ kN/m}^2$  moment reaction = 28.925 kNm minimum stress under base, w2 =  $0 \text{ kN/m}^2$  upwards reaction = 55.4 kN

the above ignores pressure on side of foundation - conservative