

Structural Design Services

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Design calculations

for

The Proposed Extension

at

***48 Wilton Road, Crumpsall,
Manchester, M8 4EL***

13.06.22

Note

The following calculations are based on the plan provided and the contractor is to verify all the dimensions on site.

The main purpose of these calcs is to check the actual loads on the piles & to design the ground beams spanning between the piles. No soil investigation or any other report is provided Location and the safety of the drains & other services is the responsibility of the main contractor and the client. No site visit is made

No work to commence on site before the prior approval of the Building Regulation

Designed By

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B Sc (Civil Eng.)
PE, MIE

Designed For

Kari Munawar

Brief History

The proposed works include the following

*It is proposed to provide pile foundation to the
proposed double storey extension only*

*The client advised to use steel cased cast in-situ concrete filled piles, this is to be checked
by Rogers Geotechnical Services Ltd who made the soil investigation report
As the safety of the embankment due to piling vibration is not guaranteed*

Loadings

	service kn/m ²	gema m	ultimate kn/m ²
<u>Roof</u>			
Dead load = tiles,battens,rafters etc.	1.00	1.4	1.4
Imposed load = roof + ceiling	0.75	1.6	1.20
<u>Total</u>	<u>1.75</u>		<u>2.6</u>
<u>First floor</u>			
Dead loads = boards,joists& ceilings	0.50	1.4	0.70
Imposed loads = single dwelling	1.50	1.6	2.40
<u>Total</u>	<u>2.00</u>		<u>3.10</u>
<u>Gr. floor</u>			
Dead load = 170mm conc. Slab	4.08	1.4	5.71
<u>Imposed load</u> =	1.50	1.6	2.40
<u>Total</u>	<u>5.58</u>		<u>8.11</u>
<u>Ext.walls</u>			
Dead load = 100mm solid block	2.10	1.4	2.94
= 100mm thermo light	1.00	1.4	1.40
<u>Total</u>	<u>3.00</u>		<u>4.34</u>
<u>Intr.walls</u>			
Dead load 100mm blockwall plastered	<u>2.10</u>	<u>1.4</u>	<u>2.94</u>
both sides			

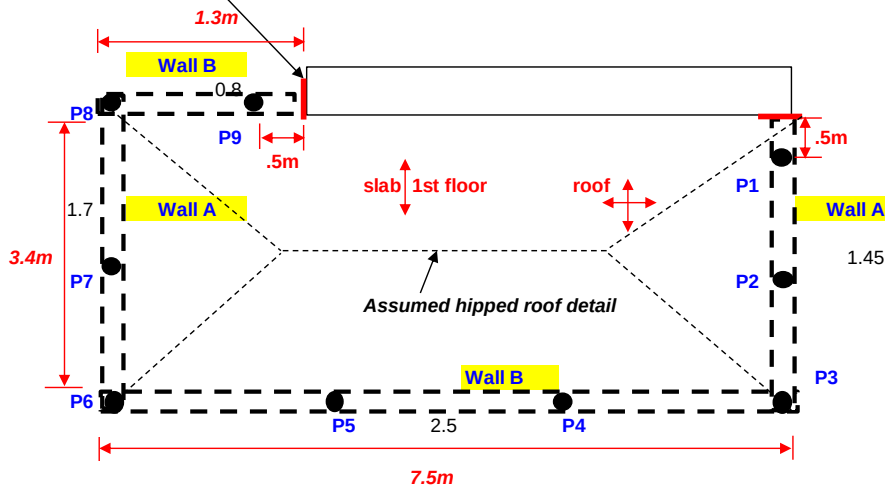
isolation joint

A12mm wide vertical separation joint is to be incorporated between the single & double storey walls

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Existing Drains / Services

The main contractor to expose the drains / services for the piling people for exact location & depth to avoid any damage to drains / services

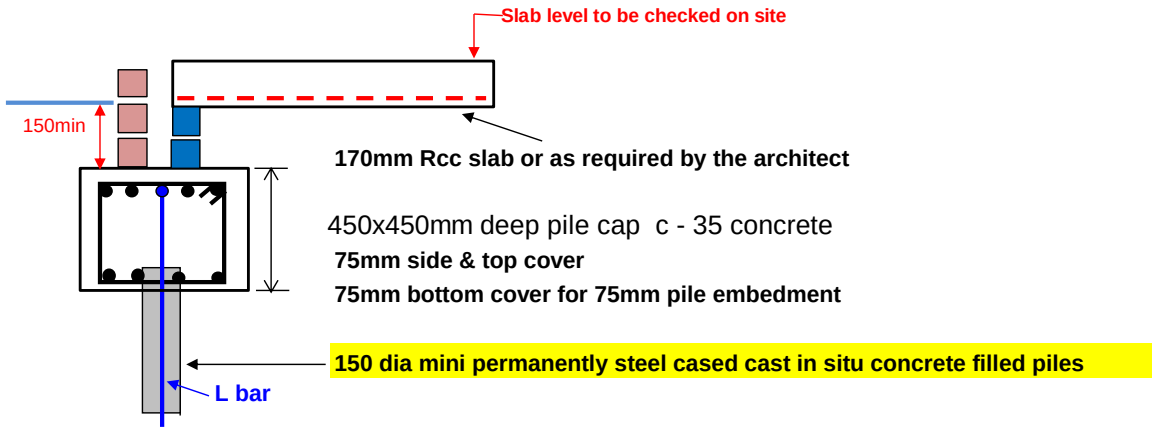


All piles are equally spaced UON

Piles and ground beams to be positioned centrally about the external walls

PROPOSED LAYOUT

ONLY FOR CALCS PURPOSES



Sectional Detail (typical)

Load Calculations

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Load on the pile

Wall A

Wall B

Roof= $2/2 \times 1.75 =$	1.8	1.8 Kn/m run	
wall = $3 \times 5 =$	15	15 Kn/m run	
1st floor load= $3.4/2 \times 2 =$	0	3.4 Kn/m run	
Pile cap = $0.45 \times 0.45 \times 24 =$	4.86	4.86 Kn/m run	
Slab = one way slab= $3.4/2 \times 5.58 =$	9.49	9.49 Kn/m run	to be on the safer side
	31.10	34.50 Kn/m run	

Max.Load on P1= Wall A*($0.5 + 1.45/2$)= 38 kn

Max.Load on P2= Wall A*1.45= 45 kn

Max.Load on P3= Wall A*($1.45/2$) + Wall B*($2.5/2$)= 66 kn

Max.Load on P4=P5= Wall B*2.5= 86 kn

Max.Load on P6= Wall A*($1.7/2$) + Wall B*($2.5/2$)= 70 kn

Max.Load on P7= Wall A*1.7= 53 kn

Max.Load on P8= Wall A*($1.7/2$) + Wall B*($0.8/2$)= 40 kn

Max.Load on P9= Wall B*($0.5 + 0.8/2$)= 31 kn

Total No of Piles = 9 150 mm dia piles

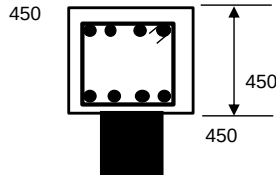
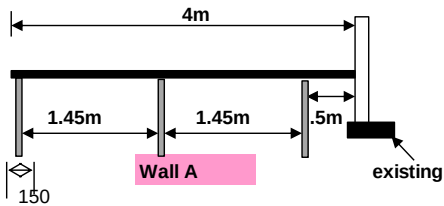
The safe working load of each pile to be = 100 kn

Factor of safety = 3

DESIGN OF GROUND BEAMS

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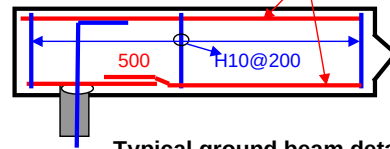
Size of beam = 450 x 450 deep
to cover pile construction tolerance



$$d \text{ effective} = 450 - 75 - 12/2 =$$

369 mm

4H12 top & bottom



Typical ground beam detail

	SERVICE LOAD kn/m	FACTOR LOAD	SPAN max. s	MOMENT KNm	d effec mm	k factor < .156	AS mm ²	$v = \frac{1000V}{bwd}$	vc	shear reforc.
WALL A	31.1	45.1	1.7	16.3	369	0.005	107	0.19	0.50	Provide at 200 c/c throughout
WALL B	34.5	50.0	2.5	39.1	369	0.012	256	0.31	0.50	

$$\text{MOMENT} = WL^2/8 \text{ KNm}$$

$$AS = \text{MOMENT} \times 10^6 / 0.87 \times f_y \times z$$

$$k = M / bd^2 f_{cu} \text{ if less than } 0.156 \text{ then } z = 0.95 \times d \text{ effec}$$

AS PROVIDED = 452mm² H grade steel $F_y = 500 \text{ N/mm}^2$

$$vc = 0.79(100As/bw \times d)^{1/3} \times (400/d)^{1/4} \times 1/\gamma_{\text{fema}} \text{ m}$$

$$\text{Minimum } A_s \text{ required} = .0013 \times b \times h$$

263 mm²

$$\text{Maximum } A_s \text{ required} = .004 \times b \times h$$

810 mm²

Provide 4Nos. T12 dia Bars Top & Bottom under the walls

Minimum lap length to be 500mm (deformed bar type 2 C35 concrete)

Ast provided = 452mm²

Asv provided = 157.1mm² 2 legs

Design of Ground floor slab

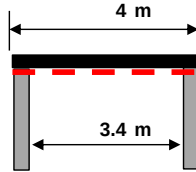
Loadings

Dead + Imposed = 8.11 kn / m²

Slab is designed as one way slab

Max.clear span = 3.4 m

Bending moment = $= 8.11 \times 3.4^2 / 8 =$
12 knm



Assuming thickness of slab = 170 mm

d effec = $170 - 20 - 10/2 =$
= 145mm

Area of steel required = $A_s = M / 0.87f_y \times 0.8d$

As positive. = 232 mm²

Provide 1 Layer of A393 mesh at bottom through out
slab thickness is 170mm

Use C35 grade concrete

Minimum lap length to be 400mm (deformed bar type 2 Fabric C35 concrete)

Make pockets in the existing wall 2 bricks miss & 3 bricks hit with 2 coarses deep
to support the slab along the existing wall

The mesh reinforcement to be taken into the pockets & over-lapped with the main mesh

The over-lap at these pockets location to be min. 1m