

 ROGER BULLIVANT Roger Bullivant Ltd Cleadon Lane, East Boldon Tyne & Wear, NE36 0AJ Tel: 0191 537 2542 Fax: 0191 519 3097	Project				Job Ref.	
	Bank View, Birkenshaw				EM.17.5253	
	Section				Sheet no./rev.	
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KB	13.12.17					

Wall Loads					
Wall A					
Foundation	0.50	0.40	24.00 kN/m ³		4.80 kN/m
G Floor (precast)	4.00	0.50	5.10 kN/m ²		10.20 kN/m
1st Floor (timber)	0.00	0.50	2.50 kN/m ²		0.00 kN/m
2nd Floor (timber)	0.00	0.50	2.50 kN/m ²		0.00 kN/m
Wall	2.80		4.00 kN/m ²		11.20 kN/m
Wall (gable)	0.00	0.50	4.00 kN/m ²		0.00 kN/m
Roof	1.00	0.50	2.00 kN/m ²		1.00 kN/m
					<u>27.20 kN/m</u>
Wall B					
Foundation	0.50	0.40	24.00 kN/m ³		4.80 kN/m
G Floor (precast)	4.00	0.50	5.10 kN/m ²		10.20 kN/m
1st Floor (timber)	4.00	0.50	2.50 kN/m ²		5.00 kN/m
2nd Floor (timber)	4.00	0.50	2.50 kN/m ²		5.00 kN/m
Wall (internal)	8.50		2.50 kN/m ²		21.25 kN/m
Wall (gable)	0.00	0.50	4.00 kN/m ²		0.00 kN/m
Roof	0.00	0.50	2.00 kN/m ²		0.00 kN/m
					<u>46.25 kN/m</u>
Wall C					
Foundation	0.50	0.40	24.00 kN/m ³		4.80 kN/m
G Floor (precast)	0.00	0.50	5.10 kN/m ²		0.00 kN/m
1st Floor (timber)	0.00	0.50	2.50 kN/m ²		0.00 kN/m
2nd Floor (timber)	0.00	0.50	2.50 kN/m ²		0.00 kN/m
Wall	7.00		4.00 kN/m ²		28.00 kN/m
Wall (gable)	0.00	0.50	4.00 kN/m ²		0.00 kN/m
Roof	8.50	0.50	2.00 kN/m ²		8.50 kN/m
					<u>41.30 kN/m</u>
Wall D					
Foundation	0.50	0.40	24.00 kN/m ³		4.80 kN/m
G Floor (precast)	8.30	0.50	5.10 kN/m ²		21.17 kN/m
1st Floor (timber)	8.30	0.50	2.50 kN/m ²		10.38 kN/m
2nd Floor (timber)	8.30	0.50	2.50 kN/m ²		10.38 kN/m
Wall (internal)	6.00		2.50 kN/m ²		15.00 kN/m
Wall (gable)	0.00	0.50	4.00 kN/m ²		0.00 kN/m
Roof	0.00	0.50	2.00 kN/m ²		0.00 kN/m
					<u>61.72 kN/m</u>
Wall E					
Foundation	0.50	0.40	24.00 kN/m ³		4.80 kN/m
G Floor (precast)	4.00	0.50	5.10 kN/m ²		10.20 kN/m
1st Floor (timber)	4.00	0.50	2.50 kN/m ²		5.00 kN/m
2nd Floor (timber)	4.00	0.50	2.50 kN/m ²		5.00 kN/m
Wall	7.00		4.00 kN/m ²		28.00 kN/m
Wall (gable)	2.50	0.50	4.00 kN/m ²		5.00 kN/m
Roof	0.00	0.50	2.00 kN/m ²		0.00 kN/m
					<u>58.00 kN/m</u>

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Wall F

Foundation	0.50	0.40	24.00 kN/m ³	4.80 kN/m
G Floor (precast)	4.20	0.50	5.10 kN/m ²	10.71 kN/m
1st Floor (timber)	4.20	0.50	2.50 kN/m ²	5.25 kN/m
2nd Floor (timber)	4.20	0.50	2.50 kN/m ²	5.25 kN/m
Wall	7.00		4.00 kN/m ²	28.00 kN/m
Wall (gable)	2.50	0.50	4.00 kN/m ²	5.00 kN/m
Roof	0.00	0.50	2.00 kN/m ²	0.00 kN/m
				<u>59.01 kN/m</u>

Wall G

Foundation	0.50	0.40	24.00 kN/m ³	4.80 kN/m
G Floor (precast)	0.00	0.50	5.10 kN/m ²	0.00 kN/m
1st Floor (timber)	0.00	0.50	2.50 kN/m ²	0.00 kN/m
2nd Floor (timber)	0.00	0.50	2.50 kN/m ²	0.00 kN/m
Wall	7.50		4.00 kN/m ²	30.00 kN/m
Wall (gable)	2.50	0.50	4.00 kN/m ²	5.00 kN/m
Roof	0.00	0.50	2.00 kN/m ²	0.00 kN/m
				<u>39.80 kN/m</u>

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Design of mini piles and RC ground beams for the above site

1 Design Parameters

Wall Loads (see drawing)	62 kN/m (max)
Pile Spacings max	4.1 m c/c
Width of ground beam	500 mm
Depth of ground beam	400 mm
Concrete Grade	35 N/mm ²
Cover to Reinforcement	50 mm

2 Pile Loads

Pile No.	span (m)	wall (kN/m)	p. load kN	pile load
1	3.80	0.50	28.00	83.2 kN
	1.50	0.50	40.00	
2	3.80	0.50	28.00	106.4 kN
	3.80	0.50	28.00	
3	3.80	0.50	28.00	69.2 kN
	0.80	0.50	40.00	
4	4.50	0.50	40.00	75.00
5	4.50	0.50	40.00	75.00
6	2.20	0.50	47.00	220.7 kN
	3.20	0.50	40.00	
	3.50	0.50	60.00	
7	4.30	0.50	47.00	101.05 kN
8	6.20	0.50	47.00	207.7 kN
	2.00	0.50	62.00	
9	3.30	0.50	40.00	211.1 kN
	1.60	0.50	58.00	
	4.20	0.50	47.00	
10	4.20	0.50	65.00	136.5 kN
11	4.20	0.50	58.00	121.8 kN
12	3.20	0.50	42.00	178.2 kN
	3.70	0.50	60.00	
13	4.40	0.50	42.00	92.4 kN

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Pile Loads cont.

Pile No.	span (m)	wall (kN/m)	p. load kN	pile load
14	0.70	0.50	42.00	37.8 kN
	1.10	0.50	42.00	
15	5.20	0.50	42.00	174.3 kN
	2.10	0.50	62.00	
16	4.00	0.50	42.00	159.4 kN
	2.60	0.50	58.00	

worst case 221 kN

Therefore use 220mm dia drill and case mini piles
with 190mm diameter rock socket 3m deep (SWL = 233kN)

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3 Design RC Ground Beam

i) Main reinforcement

$$\text{Max Bm} = wl^2/8 \quad \frac{47 \times 4.1^2}{8.00} \quad 98.8 \text{ kNm}$$

$$A_s = M/0.95 \cdot F_{yz} \quad \text{where } d = 400 - 50 - 10 - 20/2 \quad 330 \text{ mm}$$

$$z = 0.95d \quad 313.5 \text{ mm}$$

$$A_s = 98.8 \times 10^6 \times 1.5 \text{ fos} / 0.95 \times 460 \times 313.5 \quad 1081.756 \text{ mm}^2$$

Use 4 No. H20's top and bottom A_s provided = $1256 \text{ mm}^2 > 1082 \text{ mm}^2$ therefore
OK

ii) Shear Reinforcement

$$\text{max shear} = wl/2 \quad 96.4$$

$$v = v/bvd \quad 96.4 \times 10^3 \times 1.5 \text{ fos} / 500 \times 330 \quad 0.88 \text{ N/mm}^2 < 0.8 \sqrt{f_{cu}} < 5 \text{ N/mm}^2$$

OK

$$100A_s/bd \quad 100 \times 1256 / 500 \times 330 \quad 0.76$$

from table 3.9 BS8110

$$v_c \quad 0.61$$

from table 3.8 BS8110

$$0.5v_c < v < (v_c + 0.4)$$

$$A_s = 0.4bvsv/0.95f_{yv}$$

$$A_s = 0.4 \times 500 \times 200 / 0.95 \times 460 \quad 91.5 \text{ mm}^2$$

Use 2 No H10 links in pairs at 200mm c/c i.e. a_{sv} at N.A. = $314 \text{ mm}^2 > 91.5 \text{ mm}^2$
therefore OK

4 Typical Section Through RC Ground Beam

