

STRUCTURAL CALCULATIONS

PROJECT NAME:	46 SERGEANTS LANE, MANCHESTER, M45
PROJECT NUMBER:	23148
DATE FIRST PRODUCED:	29/05/2023
CURRENT REVISION/ DATE:	P02



Quality management

Job No	23148
Client	N/A
Title	STRUCTURAL CALCULATIONS
Document Status	BUILDING CONTROL SUBMISSION
Date	29/05/2023
Prepared By	TK
Checked By	TK

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Revision Status/ History

Rev	Date	Issue/ Purpose/ Comment	Prepared	Checked	Authorised
P01	23/05/23	BC SUBMISSION	TK	TK	TK
P02	29/05/23	BC SUBMISSION	TK	TK	TK

General Loading

Typical Pitched Roof (Without Plasterboard Finish)	Imposed Load	0.60 kN/m ²
	Tiles	0.55 kN/m ²
	Battens and Felt	0.05 kN/m ²
	Rafters	0.15 kN/m ²
	Sum Dead Load	0.75 kN/m²

Typical Pitched Roof (With Plasterboard Finish)	Imposed Load	0.60 kN/m ²
	Tiles	0.55 kN/m ²
	Battens and Felt	0.05 kN/m ²
	Rafters	0.15 kN/m ²
	Insulation	0.02 kN/m ²
	Services	0.05 kN/m ²
	Plasterboard and Skim	0.15 kN/m ²
	Sum Dead Load	1.00 kN/m²

Typical Ceiling	Imposed Load	0.25 kN/m ²
	Deck and Insulation	0.05 kN/m ²
	Joist and Binders	0.10 kN/m ²
	Services	0.05 kN/m ²
	Plasterboard and Skim	0.15 kN/m ²
	Sum Dead Load	0.35 kN/m²

Typical Truss Roof	Use typical pitched roof (without plasterboard finish) and typical ceiling loads combined	
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Typical Flat Roof	Imposed Load	0.75 kN/m ²
	3 Layers Felt with Chippings (or Asphalt)	0.33 kN/m ²
	Boards	0.10 kN/m ²
	Rafters	0.15 kN/m ²
	Insulation	0.02 kN/m ²
	Services	0.05 kN/m ²
	Plasterboard and Skim	0.15 kN/m ²
	Sum Dead Load	0.80 kN/m²

Typical Timber Floor	Imposed Load	1.50 kN/m²
	Stud Partitions	0.50 kN/m²
	Lining / Carpet	0.05 kN/m ²
	Floor Board	0.10 kN/m ²
	Joists	0.20 kN/m ²
	Services	0.05 kN/m ²
	Plasterboard and Skim	0.15 kN/m ²
	Sum Dead Load	0.55 kN/m²

Typical Beam and Block Floor	Imposed Load	1.50 kN/m²
	Stud Partitions	0.50 kN/m²
	Lining / Carpet	0.05 kN/m ²
	65mm Screed	1.50 kN/m ²
	Beam and Block - Longley 392	1.95 kN/m ²
	Sum Dead Load	3.50 kN/m²

Typical 300w Cavity Wall	Plasterboard and Skim	0.15 kN/m ²
	100w Blockwork 15 kN/m ³	1.50 kN/m ²
	Insulation	0.02 kN/m ²
	100w Brickwork 21 kN/m ³	2.10 kN/m ²
	Sum Dead Load	3.80 kN/m²

Typical 300w Solid Wall	Plasterboard and Skim	0.15 kN/m ²
	300w Brickwork 21 kN/m ³	6.30 kN/m ²
	Sum Dead Load	6.45 kN/m²

Typical 215w Solid Wall	Plasterboard and Skim	0.15 kN/m ²
	215w Brickwork 21 kN/m ³	4.52 kN/m ²
	Sum Dead Load	4.70 kN/m²

Typical 100w Brick Wall Partition	Plasterboard and Skim Both Sides	0.30 kN/m ²
	100w Brickwork 21 kN/m ³	2.10 kN/m ²
	Sum Dead Load	2.40 kN/m²

Typical 100w Block Wall Partition	Plasterboard and Skim Both Sides	0.30 kN/m ²
	100w Blockwork 15 kN/m ³	1.50 kN/m ²
	Sum Dead Load	1.80 kN/m²

Typical Stud Wall Partition	Plasterboard and Skim Both Sides	0.30 kN/m ²
	Timber Studs	0.10 kN/m ²
	Sum Dead Load	0.40 kN/m²

Design Codes

BS648	SCHEDULING OF WEIGHTS OF MATERIALS
BS6399	LOADING FOR BUILDINGS
BS5268	STRUCTURAL USE OF TIMBER
BS5628	STRUCTURAL USE OF MASONRY
BS5950	STRUCTURAL USE OF STEELWORK
BS8110	STRUCTURAL USE OF CONCRETE
BS8004	CODE OF PRACTICE FOR FOUNDATIONS

Notes

- Calculations are to be read in conjunction with all other pertinent works documentation including all architectural drawings.
- Dimensions in these calculations are for structural purposes only. The building contractor is to obtain detailed dimensions from site measurements.
- These calculations only apply to the elements included in these documents. If any discrepancies are found on site, the engineer is to be informed.

PROJECT: 46 SERGRANTS LANE, M45		EVERSTRUCT CONSULTING ENGINEERS				
SHEET TITLE: DESIGN INFORMATION		PROJECT NO.: 23148	DATE: MAY 23	BY: TK	CHECKED: TK	SHEET/ REV: -

REFERENCE

CALCULATIONS

OUTPUT

DESIGN INFORMATION:

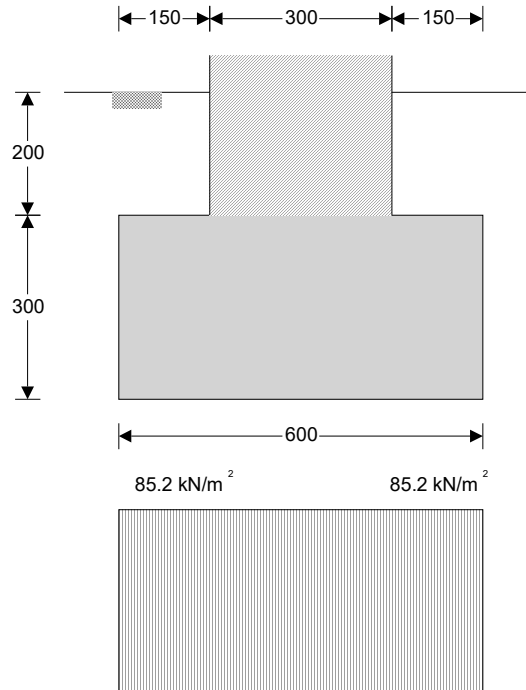
We have been instructed by the client of 46 Sergeants Lane, Manchester, M45 to check if the existing foundations are suitable for the proposed works. The proposed works includes to extend the single storey dwelling to a double storey dwelling so therefore the existing foundation will need to be suitable for the additional loading.

Load take down was calculated for the proposed works, and checked if the existing foundation was suitable. From the attached calculation we can confirm the existing foundation is satisfactory for the proposed works.

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	46 SERGEANTS LANE, M45				23148	
	Calcs for				Start page no./Revision	
	EXISTING EXTERNAL STRIP FOOTING				1	
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STRIP FOOTING ANALYSIS AND DESIGN (BS8110-1:1997)

Tedds calculation version 2.0.07



Strip footing details

Width of strip footing
Depth of strip footing
Depth of soil over strip footing
Density of concrete

$B = 600 \text{ mm}$
 $h = 300 \text{ mm}$
 $h_{\text{soil}} = 200 \text{ mm}$
 $\rho_{\text{conc}} = 23.6 \text{ kN/m}^3$

Load details

Load width
Load eccentricity

$b = 300 \text{ mm}$
 $e_P = 0 \text{ mm}$

Soil details

Density of soil
Design shear strength
Design base friction
Allowable bearing pressure

$\rho_{\text{soil}} = 20.0 \text{ kN/m}^3$
 $\phi' = 25.0 \text{ deg}$
 $\delta = 19.3 \text{ deg}$
 $P_{\text{bearing}} = 100 \text{ kN/m}^2$

Axial loading on strip footing

Dead axial load
Imposed axial load
Wind axial load
Total axial load

$P_G = 38.0 \text{ kN/m}$
 $P_Q = 6.5 \text{ kN/m}$
 $P_W = 0.0 \text{ kN/m}$
 $P = 44.5 \text{ kN/m}$

Foundation loads

Dead surcharge load
Imposed surcharge load
Strip footing self weight
Soil self weight

$F_{G_{\text{sur}}} = 0.000 \text{ kN/m}^2$
 $F_{Q_{\text{sur}}} = 0.000 \text{ kN/m}^2$
 $F_{\text{swt}} = h \times \rho_{\text{conc}} = 7.080 \text{ kN/m}^2$
 $F_{\text{soil}} = h_{\text{soil}} \times \rho_{\text{soil}} = 4.000 \text{ kN/m}^2$

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TK	23/05/2023	TK	23/05/2023	TK	23/05/2023	

Total foundation load

$$F = B \times (F_{Gsur} + F_{Qsur} + F_{swt} + F_{soil}) = \mathbf{6.6 \text{ kN/m}}$$

Calculate base reaction

Total base reaction

$$T = F + P = \mathbf{51.1 \text{ kN/m}}$$

Eccentricity of base reaction in x

$$e_T = (P \times e_P + M + H \times h) / T = \mathbf{0 \text{ mm}}$$

Base reaction acts within middle third of base

Calculate base pressures

$$q_1 = (T / B) \times (1 - 6 \times e_T / B) = \mathbf{85.247 \text{ kN/m}^2}$$

$$q_2 = (T / B) \times (1 + 6 \times e_T / B) = \mathbf{85.247 \text{ kN/m}^2}$$

Minimum base pressure

$$q_{min} = \min(q_1, q_2) = \mathbf{85.247 \text{ kN/m}^2}$$

Maximum base pressure

$$q_{max} = \max(q_1, q_2) = \mathbf{85.247 \text{ kN/m}^2}$$

PASS - Maximum base pressure is less than allowable bearing pressure

Material details

Characteristic strength of concrete

$$f_{cu} = \mathbf{30 \text{ N/mm}^2}$$

Calculate base lengths

Left hand length

$$B_L = B / 2 + e_P = \mathbf{300 \text{ mm}}$$

Right hand length

$$B_R = B / 2 - e_P = \mathbf{300 \text{ mm}}$$

Calculate rate of change of base pressure

Length of base reaction

$$B_x = B = \mathbf{600 \text{ mm}}$$

Rate of change of base pressure

$$C_x = (q_1 - q_2) / B_x = \mathbf{0.000 \text{ kN/m}^2/\text{m}}$$

Calculate minimum depth of unreinforced strip footing

Average pressure to left of strip footing

$$q_L = q_1 - C_x \times (B_L - b / 2) / 2 = \mathbf{85.247 \text{ kN/m}^2}$$

Minimum depth to left of strip footing

$$h_{Lmin} = (B_L - b / 2) \times \max(0.15 \times [(q_L / 1 \text{ kN/m}^2)^2 / (f_{cu} / 1 \text{ N/mm}^2)]^{1/4}, 1) = \mathbf{150 \text{ mm}}$$

Average pressure to right of strip footing

$$q_R = q_2 + C_x \times (B_R - b / 2) / 2 = \mathbf{85.247 \text{ kN/m}^2}$$

Minimum depth to right of strip footing

$$h_{Rmin} = (B_R - b / 2) \times \max(0.15 \times [(q_R / 1 \text{ kN/m}^2)^2 / (f_{cu} / 1 \text{ N/mm}^2)]^{1/4}, 1) = \mathbf{150 \text{ mm}}$$

Minimum depth of unreinforced strip footing

$$h_{min} = \max(h_{Lmin}, h_{Rmin}, 300 \text{ mm}) = \mathbf{300 \text{ mm}}$$

PASS - Unreinforced strip footing depth is greater than minimum