

**Structural Calculations
For
Alterations at
196 King Street
Whakatane**

210008
12/02/2021

39 EAST TAMAKI ROAD,
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AUCKLAND,

NEW ZEALAND

CLIENT: Adrian Hart / Generators By Design

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ADDRESS: 196 King Street, Waiakarana

JOB NO: 2/0008

PROJECT: Alterations

DATE: 27/1/21

BY: KR

Internal alterations involve removing walls and replacing with beams

1. Loads

	G	Q (kPa)
Roof	0.80	0.25
Walls	0.40	—
Floor	0.40	1.50

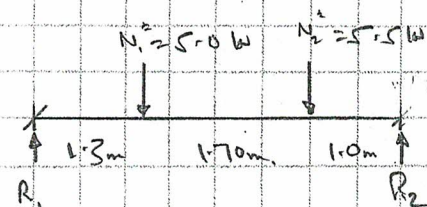
2 Beam 1 over Kitchen

Span = 4.0m

$$w = 1.2G + 1.5Q$$

$$= (1.2 \times 0.80 + 1.5 \times 0.25) / 0.30$$

$$= 1.54 \text{ kPa}$$



$$N_1 \sim 1.54 \times 4.0 + 2.8 / 4$$

$$= 5.0 \text{ kN}$$

$$N_2 \sim 1.54 \times 4.0 + 3.1 / 4$$

$$= 5.5 \text{ kN}$$

$$M^* \leq N^2 ab / l$$

$$= 5.0 \times 1.3 + 2.7 / 4.0 + 5.5 \times 1.0 + 3.0 / 4.0$$

$$= 8.51 \text{ kNm}$$

$$\phi M = \phi k k_r b z$$

$$= 0.8 + 0.8 \times 14.0 \times 1.262 \text{ kPa}$$

$$= 11.31 \text{ kPa}$$

$$2/290 \times 15$$

$$k_r = 1/b = 4000/90 = 44.4 \quad k_r = 0.86$$

$$d/b = 290/90 = 3.2$$

$$\phi M = 0.86 \times 11.31$$

$$= 9.73 \text{ kNm}$$

$$> M^* = 8.51 \text{ kNm}$$

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2nd flr
 $\Delta_y \sim 12.7$ (maximum)
 $\Delta_{all} = 11300 = 12.7$

Recommend $2 \times 290 \times 45$ as Beam ①

Supports:

$$R_1 = 4.75 \text{ kN}$$

$$R_2 = 5.75 \text{ kN}$$

3 Beam 2 over Dining Room.
span = 3.0m

$$N^* = 5.75 \text{ kN}$$

$$W \sim 1.54 \times 3.0 / 2$$

$$= 2.31 \text{ kN}$$

$$M^* = W L^2 / 8 + N^* a b / L$$

$$= 6.22 \text{ kNm}$$

$$\phi M = \phi k_1 k_2$$

$$= 0.9 \times 0.8 \times 19.0 \times 0.864 \text{ kN}$$

$$= 7.74 \text{ kN}$$

$$k_1, \frac{I_b}{d_b} = 3000 / 90 = 33.3 \quad k_2 = 0.91$$

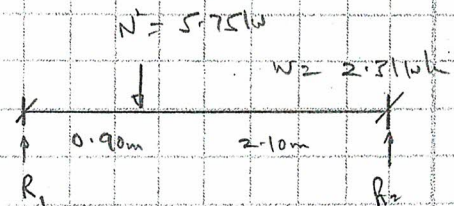
$$d_b = 290 / 90 = 3.2$$

$$\phi M = 0.91 \times 7.74$$

$$= 7.0 \text{ kNm}$$

$$> M^* = 6.22 \text{ kNm}$$

2nd flr
 $\Delta_y \sim 9.1$ (maximum) - (high)
 $\Delta_{all} = 11300 = 10.0$



$2 \times 290 \times 45$

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Revised 2/290+45 as Beam 2 to reduce deflection

• supports: $R_1 = 7.5 \text{ kN}$
 $R_2 = 5.2 \text{ kN}$

4 Support Posts

$$N_{\text{max}}^* = 7.5 \text{ kN}$$

→ 2/290+45, double steel / all posts.

• Foundation post (125+125)
height ~ 0.70m

$$N^* = 7.5 \text{ kN} \quad \text{max min}$$

$$\begin{aligned} \phi N &= \phi k k_{\phi} f_c A \\ &= 0.8 + 0.8 + 1.0 + 120.0 \times 10^{-3} \text{ kN} \quad \text{125 post} \\ &= 165.9 \text{ kN} \end{aligned}$$

$$\begin{aligned} k_{\phi} \lambda b &= 700/120 \\ &= 5.83 \end{aligned}$$

$$\rightarrow k_{\phi} = 1.0$$

$$\begin{aligned} \phi N &= 165.9 \text{ kN} \\ &> N^* = 7.5 \text{ kN} \end{aligned}$$

125 square support post adequate for beam support

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* Foundation Pool. (600 x 600 + 300)

$$N^* = 7.5 \text{ kN}$$

$$\begin{aligned} q^* &= N^* / A_c \\ &= 7.5 / 0.60^2 \\ &= 20.8 \text{ kPa} \\ &< q_{all} \sim 120 \text{ kPa} \end{aligned}$$

* 600 x 600 + 300 pool / D12 @ 300 c/c each way 5 base

5 Connection Details

* Beam ① - ② connection: 2 Bowmac B177 brackets, 1 each side / M12 bolts

$$N^* = 4.75 \text{ kN}$$

$$\begin{aligned} \phi Q &= \phi n k_1 k_2 k_3 \phi_1 \\ &= 0.7 \times 4 \times 0.8 \times 1.0 \times 1.0 \times 6.97 \\ &= 15.61 \text{ kN} \\ \therefore N^* &= 4.75 \text{ kN} \end{aligned} \quad \text{M12 bolts}$$

* B177 Bowmac brackets adequate for beam connection