

# Mitchell-Horton

Consulting Structural Engineers

8 OAK TREE CLOSE BURPHAM GUILDFORD SURREY GU4 7JQ  
Tel : 01483 562018

## STRUCTURAL CALCULATIONS

Job No. **23756** Page **1**  
Project **Pavilion Extension at Arborfield Park, Swallowfield Road, Arborfield, Berks**  
Client **Arborfield & Newlands Parish Council**

### PROJECT DESCRIPTION

Proposed Alterations & Extension

PAGE	CONTENTS
2	LOADING
3-4	LAYOUTS
5-6	STEELS
7	MASONRY
8	FOUNDATION
LI	LINTELS

Dimensions in calculations not to be used for construction. All dimensions to be checked on site before ordering materials.

## LOADING.

### Roof

Tiles =  $0.75 \text{ kN/m}^2$

Felt + Bat =  $0.05$

$0.80 \text{ kN/m}^2 \times \frac{1}{\cos 21} = 0.80 \text{ kN/m}^2$

Truss =  $0.30$

Ceiling =  $0.20$

$1.30 \text{ kN/m}^2$

Imposed Roof =  $0.75 \text{ kN/m}^2$

Left =  $0.25$

$1.00 \text{ kN/m}^2$

### GROUND FLOOR

Screed =  $1.80 \text{ kN/m}^2$

Beam + Blk =  $2.20$

$4.00 \text{ kN/m}^2$

Imposed =  $2.5 \text{ kN/m}^2$

### EXTERNAL WALL

Block x 2 =  $3.4 \text{ kN/m}^2$

Plaster =  $0.2$

Battens =  $0.05$

Boarding =  $0.20$

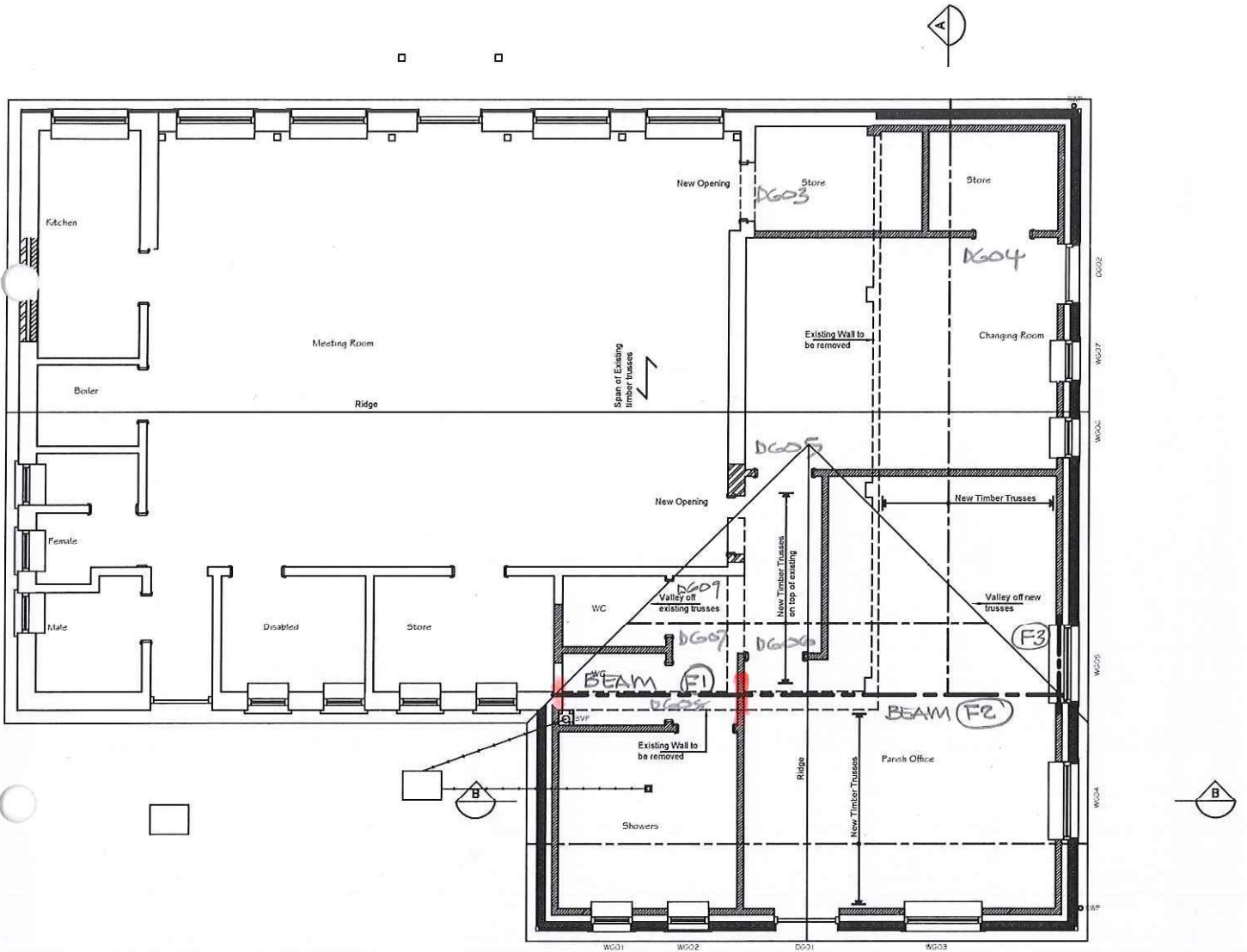
$3.85 \text{ kN/m}^2$

### INTERNAL WALL

100 Block =  $1.5 \text{ kN/m}^2$

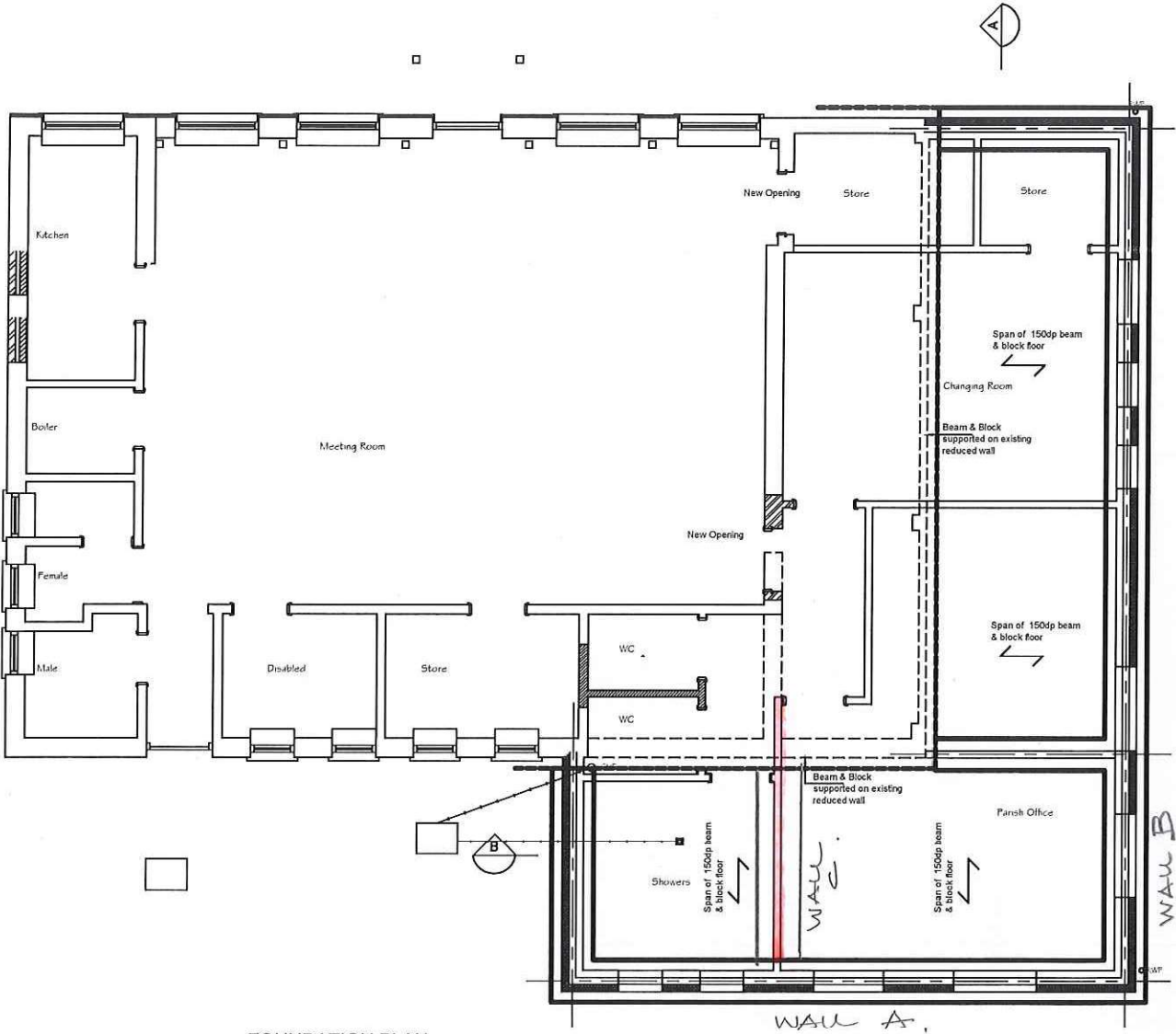
2x plaster =  $0.4$

$1.9 \text{ kN/m}^2$



GROUND FLOOR PLAN  
Showing CONSTRUCTION OVER





FOUNDATION PLAN

BEAM F1

Span = 2900

LOAD

$$\begin{aligned} \text{Roof DL} &= 1.36 \times 8.8/2 = 5.98 \text{ KN/m} \times 1.4 = 8.38 \text{ KN/m} \\ \text{LL} &= 1.0 \times 4.4 = 4.40 \times 1.0 = 4.40 \\ &= 10.38 \text{ KN/m} \\ &\times 2.9 \\ &= 30.10 \text{ KN} \end{aligned} \quad \begin{aligned} &= 8.38 \text{ KN/m} \\ &= 7.04 \\ &= 15.42 \text{ KN/m} \\ &\times 2.9 \\ &= 44.72 \text{ KN} \end{aligned}$$

$$M = 44.72 \times 2.9 / 2 = 16.21 \text{ KNm}$$

Allow defl =  $2900 / 360 = 8 \text{ mm}$

$$I_{\text{reqd}} = \frac{5 \times 30.10 \times 10^3 \times 2.9 \times 10^9}{384 \times 205 \times 10^3 \times 8.0} = 582 \times 10^4 \text{ mm}^4$$

203 x 102 x 23 UB

$$\begin{aligned} M_D &= 26 \text{ KNm} \\ I &= 2090 \end{aligned}$$

BEAM F2

Span = 4900

LOAD

$$\begin{aligned} 10.38 \text{ KN/m} &\times 4.9 = 50.86 \text{ KN} \\ 15.42 \text{ KN/m} &\times 4.9 = 75.56 \text{ KN} \end{aligned}$$

$$M = 75.56 \times 4.9 / 2 = 46.3 \text{ KNm}$$

Allow defl =  $4900 / 360 = 13.6 \text{ mm}$

$$I_{\text{reqd}} = \frac{5 \times 75.56 \times 10^3 \times 4.9 \times 10^9}{384 \times 205 \times 10^3 \times 13.6} = 2795 \times 10^4 \text{ mm}^4$$

203 x 203 x 46 UC

$$\begin{aligned} M_D &= 89 \text{ KNm} \\ I &= 4560 \end{aligned}$$

PADSTONE

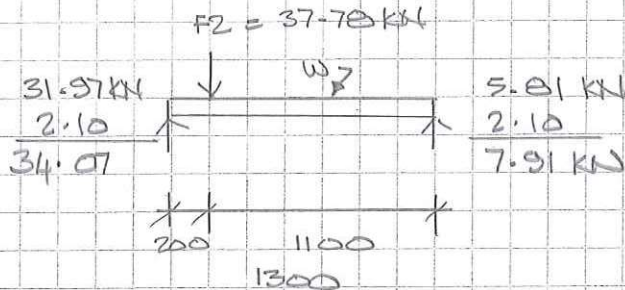
7.3N block  $f_k = 6.4 \text{ N/mm}^2$   $\gamma_m = 3.5$

$$\text{LOAD} = \frac{75.56 + 44.72}{2} = 60.14 \text{ KN}$$

$$\text{Area reqd} = \frac{60.14 \times 10^3 \times 3.5}{1.5 \times 6.4} = 21926 \text{ mm}^2$$

440 x 100 x 215dp.

## BEAM F3



load  $w$

$$w_{wall} = 3.25 \times 0.6 = 2.3 \text{ kN/m} \times 1.4 = 3.23 \text{ kN/m}$$

$$\times \frac{1.3}{4.20} = 4.20 \text{ kN}$$

$$M = (34.07 \times 0.2) - (3.23 \times 0.2^2 / 2)$$

$$= 6.81 - 0.06$$

$$= 6.75 \text{ kNm}$$

$$\text{Allow } d \propto L = 1300 / 360 = 3.6 \text{ min}$$

$$\text{Equiv. UDL} = \frac{6.75 \times 8}{1.5 \times 1.3} = 27.7 \text{ kN}$$

$$I_{reqd} = \frac{5 \times 27.7 \times 10^3 \times 1.3^3 \times 10^9}{384 \times 205 \times 10^3 \times 3.6} = 107 \times 10^4 \text{ mm}^4$$

152 x 89 x 16 UB.

$$\frac{M_b}{I} = 23 \text{ kNm}$$

$$I = 838$$

$$\text{Shear cap} = 0.6 \times 275 \times \frac{152 \times 4 \times 4.5}{10^3} = 113 \text{ kN} > 34.07 \text{ kN OK}$$

## PIER SUPPORTING F3.

$$103 + 100 \text{ CAU} + 100$$

$$\text{eff thck} = \frac{2}{3}(103+100) = 133 \text{ mm}$$

$$\text{Pier } 300 \times 100 \quad \text{Area} = 0.09 \text{ m}^2$$

$$\text{Area RF} = 0.7 + (1.5 \times 0.09) = 0.835.$$

$$\text{SR} = \frac{0.75 \times 2400}{133} = 14.7$$

LOAD

$$\text{F3} = 34.07 \text{ KN}$$

$$\text{Roof DL} = 1.36 \times 8.4/2 \times 1.5 \times 1.4 = 11.99$$

$$\text{W} = 1.0 \times 4.2 \times 1.5 \times 1.6 = 10.08$$

$$\text{Wall} = 1.7 \times 0.9 \times 1.5 \times 1.4 = 3.21$$

$$\underline{59.35 \text{ KN}}$$

$$e_x = t/6 \quad \beta = 0.72.$$

$$f_k = \frac{59.35 \times 10^3 \times 3.5}{900 \times 100 \times 0.835 \times 0.72} = 3.84 \text{ N/mm}^2 < 6.4 \text{ N/mm}^2$$

Use 7.3 N Block.

## FOUNDATIONS

### Wall A

$$\text{Wall} = 3.85 \times 4.5 = 17.33 \text{ KN/m}$$

$$\text{GF DL} = 4.0 \times 3.1/2 = 6.20$$

$$U = 2.5 \times 1.55 = 3.87$$

$$\text{Found} = (24 - 18) \times 0.6 = 3.60$$

$$\frac{31.00 \text{ KN/m}}{0.6} = 51.6 \text{ KN/m}^2 \text{ OK.}$$

6000 W

### Wall B

$$\text{Wall} = 3.85 \times 3.3 = 12.70 \text{ KN/m}$$

$$\text{Roof DL} = 1.36 \times 8.4/2 = 5.71$$

$$U = 1.0 \times 4.2 = 4.20$$

$$\text{Found} = 3.6$$

$$\text{Beam F2} = 25.43 \times 1/3.0 = 8.47$$

$$\frac{34.68 \text{ KN/m}}{0.6} = 57.8 \text{ KN/m}^2 \text{ OK.}$$

6000 W

### Wall C

$$\text{Beam F1} = 15.05 \times 1/3.5 = 4.30 \text{ KN/m}$$

$$\text{F2} = 25.43 \times 1/3.5 = 7.26$$

$$\text{Wall} = 1.9 \times 3.0 = 5.70$$

$$\text{Found} = 3.60$$

$$\frac{20.86 \text{ KN/m}}{0.45} = 46.35 \text{ KN/m}^2$$

450 W



Ref	Wall thick	Clear Span	Loading	Keystone Lintel Reference
WG01	103+100 FAV+100	630	Wall = $3.25 \times 0.6 \times 0.63 = 1.45 \text{KN}$	HT/S-100 1050
WG02	DITTO	630	Wall = $3.25 \times 0.63^2 / 4 = 0.38 \text{KN}$	HT/S-100 1050
DG01	DITTO	1010	Wall = $3.25 \times 1.01^2 / 4 = 0.98 \text{KN}$	HT/S-100 1350
WG03	DITTO	1200	Wall = $3.25 \times 1.0 \times 1.2 = 4.62$	HT/S-100 1500
WG04	DITTO	1200	Roof = $2.36 \times 2.3 / 2 \times 1.2 = 11.75 \text{KN}$ Wall = $3.25 \times 0.4 \times 1.2 = 1.95$ 13.60	HT/S-100 1500
WG05	DITTO	1200		STEEL FS + HT/S-100 -1500
WG06	DITTO	630	AS WG02	HT/S-100 1050
WG07	DITTO	630	AS WG02	HT/S-100 1050
DG02	DITTO	932	Wall = $3.25 \times 1.2 \times 0.93 = 4.3 \text{KN}$	HT/S-100 1350
NG03	100 + 100	896	Wall = $1.9 \times 0.6 \times 0.9 = 1.03 \text{KN}$	2 N° Box/K-100 -1200
DG04	100	896	Wall = $1.9 \times 0.6 \times 0.9 = 1.03 \text{KN}$	Box/K-75 1200
DG05	100	896	AS DG04	Box/K-75 1200
DG06	100	896	AS DG04	Box/K-75-1200
DG07	100	896	AS DG04	Box/K-75-1200
DG08	100	896	AS DG04	Box/K-75-1200
DG09	100	896	AS DG04	Box/K-75-1200
DG10	100+100	896	AS DG03	2 N° Box/K-100 -1200