



**BRIAN CLANCY HIGBY PARTNERSHIP**  
CHARTERED STRUCTURAL & CIVIL ENGINEERS

## **STRUCTURAL CALCULATIONS**

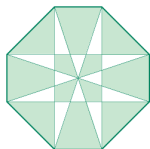
for

## **BASEMENT ALTERATIONS**

to

## **PARTNESHIP HOUSE**

## **ROCHDALE**



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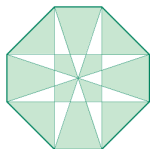


## **INTRODUCTION**

It is proposed to remove a number of the existing internal walls at basement level of the property to create a more useable space for offices.

We have visited the property to establish the structural arrangement to establish the load paths to basement level.

The attached calculations summarise the beam requirements (and bearings) for those walls supporting structure above ground floor level. A number of the walls proposed to be removed are non-loadbearing and these are annotated on the summary sketch SK01.



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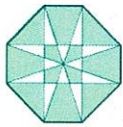
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BRIAN CLANCY HIGBY PARTNERSHIP

Project

PARTNERSHIP HOME

Job Ref.

0606.

Section

Sheet no./rev.

01

Calc. by

H. S. B.

Date

12/22

Chck'd by

Date

App'd by

Date

Ref.

Calculations

Output

PROPOSED OPENINGS IN BASEMENT(1) BEAM ① - SPAN 3.5m.GROUND AND 1<sup>st</sup> FLOORS SPAN PARALLEL  
MASONRY PIERCE ABOVE;ALLOW FOR FULL WEIGHT OF WALL FOR  $C_{10}$  - 1<sup>st</sup> (300 LOAD)

$$g_k = 7.7 \text{ kN/m}^2 \times 3$$

$$= 23.1 \text{ kN/m}$$

03-04 2N° 152 x 152 x 37 UC.(2) BEAM ② - HAULWAY WALL. SPAN 3.3m.ROOF AND FLOORS SPAN PARALLEL  
WALL THICKNESS 450mm.

$$g_k = 10.4 \times 6.0$$

$$= 62.4 \text{ kN/m}$$

05-06 2N° 203 x 203 x 46 UC.(3) BEAM ③ - HAULWAY WALL SPAN 3.1m

ROOF AND FLOORS SPAN PARALLEL

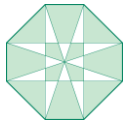
$$g_k = 10.4 \times 6.0$$

$$= 62.4 \text{ kN/m}$$

07-08 2N° 203 x 203 x 46 UC.

BEARING ;  $\text{MAX } C_{10} = 58.2 \times 2$   
 $= 104.4 \text{ kN}$

09-10 PROSTONE 440 x 440 x 215 N° OK  
MW. STEEL BEARING 800mm



BRIAN CLANCY HIGBY PARTNERSHIP

Project

Partnership House

Job Ref.

0606

Part of Structure

Loading

Sheet no./rev.

02

Calc. by

HIGBY

Date

12/22

Checked

Date

Approved

Date

Ref.

Calculations

Output

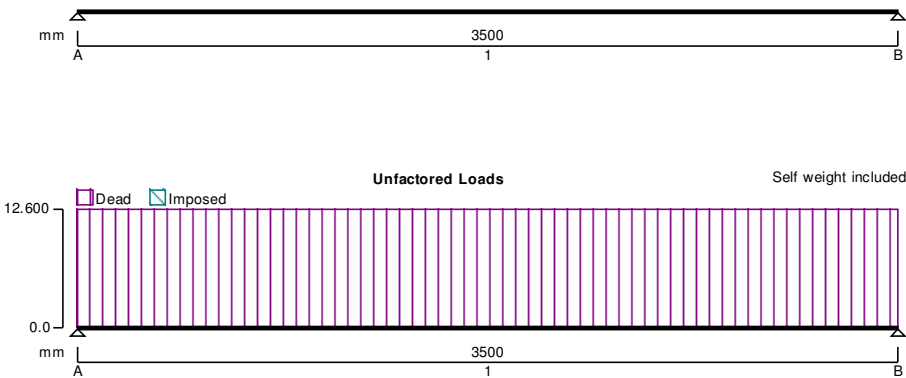
**LOADING****1. ROOF****Dead****Tiles****kN/m<sup>2</sup>****0.70****Felt/ battens****0.10****Insulation****0.05****Rafters****0.15****Ceiling Joists****0.10****Ceiling****0.25****TOTAL****1.35 kN/m<sup>2</sup>****Live****0.75 kN/m<sup>2</sup>****2. FLOORS****Dead****Boards****0.10****Joists****0.15****Ceiling****0.25****TOTAL****0.50 kN/m<sup>2</sup>****Live****1.50 kN/m<sup>2</sup>****3. WALLS****215 Brick****4.40****2 x Plaster****0.50****TOTAL****4.90 kN/m<sup>2</sup>****300 Brick****6.60****2 x Plaster****0.50****TOTAL****7.10 kN/m<sup>2</sup>****440 Brick****8.80****2 x Plaster****0.50****TOTAL****9.30 kN/m<sup>2</sup>**

|                                                                                                                                                                                                    |                              |                          |            |              |                                |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------|------------|--------------|--------------------------------|---------------|
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|                                                                                                                                                                                                    | Calcs for<br>Beam 1          |                          |            |              | Start page no./Revision<br>0 3 |               |
|                                                                                                                                                                                                    | Calcs by<br>HIGBY            | Calcs date<br>11/01/2023 | Checked by | Checked date | Approved by                    | Approved date |

**STEEL BEAM ANALYSIS & DESIGN (BS5950)**

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05



**Support conditions**

|           |                                            |
|-----------|--------------------------------------------|
| Support A | Vertically restrained<br>Rotationally free |
| Support B | Vertically restrained<br>Rotationally free |

**Applied loading**

|            |                                                         |
|------------|---------------------------------------------------------|
| Beam loads | Dead self weight of beam × 1<br>Dead full UDL 12.6 kN/m |
|------------|---------------------------------------------------------|

**Load combinations**

|                    |           |                               |
|--------------------|-----------|-------------------------------|
| Load combination 1 | Support A | Dead × 1.40<br>Imposed × 1.60 |
|                    | Span 1    | Dead × 1.40<br>Imposed × 1.60 |
|                    | Support B | Dead × 1.40<br>Imposed × 1.60 |
|                    |           |                               |
|                    |           |                               |
|                    |           |                               |

**Analysis results**

|                                            |                                 |                                |
|--------------------------------------------|---------------------------------|--------------------------------|
| Maximum moment                             | $M_{max} = 27.6 \text{ kNm}$    | $M_{min} = 0 \text{ kNm}$      |
| Maximum shear                              | $V_{max} = 31.6 \text{ kN}$     | $V_{min} = -31.6 \text{ kN}$   |
| Deflection                                 | $\delta_{max} = 7 \text{ mm}$   | $\delta_{min} = 0 \text{ mm}$  |
| Maximum reaction at support A              | $R_{A\_max} = 31.6 \text{ kN}$  | $R_{A\_min} = 31.6 \text{ kN}$ |
| Unfactored dead load reaction at support A | $R_{A\_Dead} = 22.6 \text{ kN}$ |                                |
| Maximum reaction at support B              | $R_{B\_max} = 31.6 \text{ kN}$  | $R_{B\_min} = 31.6 \text{ kN}$ |
| Unfactored dead load reaction at support B | $R_{B\_Dead} = 22.6 \text{ kN}$ |                                |

**Section details**

|              |                       |             |      |
|--------------|-----------------------|-------------|------|
| Section type | UC 152x152x30 (BS4-1) | Steel grade | S275 |
|--------------|-----------------------|-------------|------|

|                                                                                                                                                                                                    |                              |                          |            |              |                                |               |
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|                                                                                                                                                                                                    | Calcs for<br>Beam 1          |                          |            |              | Start page no./Revision<br>0 4 |               |
|                                                                                                                                                                                                    | Calcs by<br>HIGBY            | Calcs date<br>11/01/2023 | Checked by | Checked date | Approved by                    | Approved date |

#### Classification of cross sections - Section 3.5

Tensile strain coefficient  $\epsilon = 1.00$

Section classification **Plastic**

#### Shear capacity - Section 4.2.3

Design shear force  $F_v = 31.6$  kN

Design shear resistance  $P_v = 169$  kN

**PASS - Design shear resistance exceeds design shear force**

#### Moment capacity - Section 4.2.5

Design bending moment  $M = 27.6$  kNm

Moment capacity low shear  $M_c = 68.1$  kNm

#### Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment  $M_b = 44.3$  kNm

$M_b / m_{LT} = 44.3$  kNm

**PASS - Buckling resistance moment exceeds design bending moment**

#### Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection  $\delta_{lim} = 9.722$  mm

Maximum deflection  $\delta = 7.031$  mm

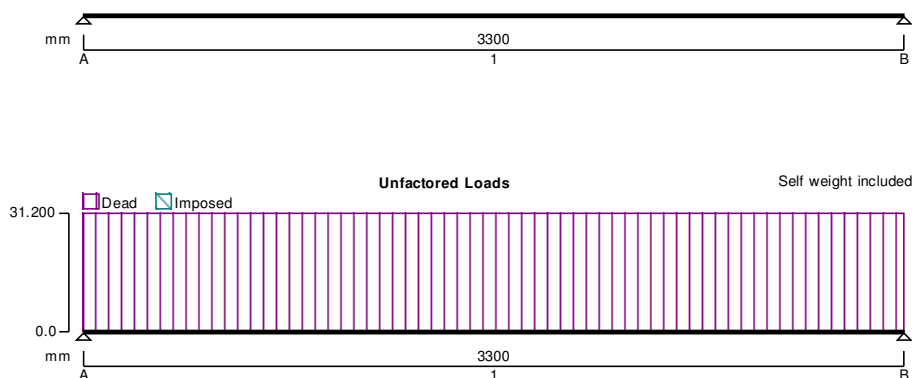
**PASS - Maximum deflection does not exceed deflection limit**

|                                                                                                                                                                                                    |                              |                          |            |              |                                |               |
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|                                                                                                                                                                                                    | Calcs for<br>Beam 2          |                          |            |              | Start page no./Revision<br>0 5 |               |
|                                                                                                                                                                                                    | Calcs by<br>HIGBY            | Calcs date<br>14/12/2022 | Checked by | Checked date | Approved by                    | Approved date |

## STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05



### Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

### Applied loading

Beam loads

Dead self weight of beam  $\times 1$

Dead full UDL 31.2 kN/m

### Load combinations

Load combination 1

Support A

Dead  $\times 1.40$

Imposed  $\times 1.60$

Span 1

Dead  $\times 1.40$

Imposed  $\times 1.60$

Support B

Dead  $\times 1.40$

Imposed  $\times 1.60$

### Analysis results

Maximum moment

$M_{max} = 60.3$  kNm

$M_{min} = 0$  kNm

Maximum shear

$V_{max} = 73.1$  kN

$V_{min} = -73.1$  kN

Deflection

$\delta_{max} = 5.2$  mm

$\delta_{min} = 0$  mm

Maximum reaction at support A

$R_{A_{max}} = 73.1$  kN

$R_{A_{min}} = 73.1$  kN

Unfactored dead load reaction at support A

$R_{A_{Dead}} = 52.2$  kN

Maximum reaction at support B

$R_{B_{max}} = 73.1$  kN

$R_{B_{min}} = 73.1$  kN

Unfactored dead load reaction at support B

$R_{B_{Dead}} = 52.2$  kN

### Section details

Section type

UC 203x203x46 (BS4-1)

Steel grade

S275

|                                                                                                                                                                                                    |                              |                          |            |              |                                |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------|------------|--------------|--------------------------------|---------------|
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|                                                                                                                                                                                                    | Calcs for<br>Beam 2          |                          |            |              | Start page no./Revision<br>0 6 |               |
|                                                                                                                                                                                                    | Calcs by<br>HIGBY            | Calcs date<br>14/12/2022 | Checked by | Checked date | Approved by                    | Approved date |

### Classification of cross sections - Section 3.5

Tensile strain coefficient  $\epsilon = 1.00$       Section classification      **Compact**

### Shear capacity - Section 4.2.3

Design shear force  $F_v = 73.1$  kN      Design shear resistance  $P_v = 241.4$  kN  
**PASS - Design shear resistance exceeds design shear force**

### Moment capacity - Section 4.2.5

Design bending moment  $M = 60.3$  kNm      Moment capacity low shear  $M_c = 136.8$  kNm

### Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment  $M_b = 105.2$  kNm       $M_b / m_{LT} = 105.2$  kNm  
**PASS - Buckling resistance moment exceeds design bending moment**

### Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

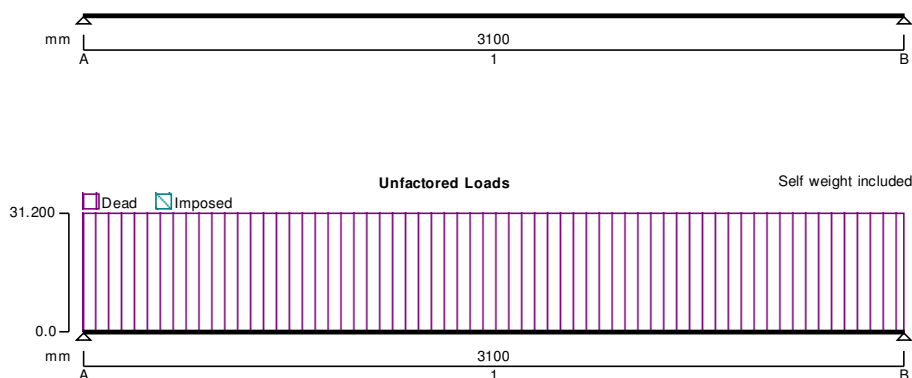
Limiting deflection  $\delta_{lim} = 9.167$  mm      Maximum deflection  $\delta = 5.22$  mm  
**PASS - Maximum deflection does not exceed deflection limit**

|                                                                                                                                                                                                    |                              |                          |            |              |                                |               |
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|                                                                                                                                                                                                    | Calcs for<br>Beam 3          |                          |            |              | Start page no./Revision<br>0 7 |               |
|                                                                                                                                                                                                    | Calcs by<br>HIGBY            | Calcs date<br>14/12/2022 | Checked by | Checked date | Approved by                    | Approved date |

## STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.05



### Support conditions

|           |                                            |
|-----------|--------------------------------------------|
| Support A | Vertically restrained<br>Rotationally free |
| Support B | Vertically restrained<br>Rotationally free |

### Applied loading

|            |                                                                |
|------------|----------------------------------------------------------------|
| Beam loads | Dead self weight of beam $\times 1$<br>Dead full UDL 31.2 kN/m |
|------------|----------------------------------------------------------------|

### Load combinations

|                    |           |                                             |
|--------------------|-----------|---------------------------------------------|
| Load combination 1 | Support A | Dead $\times 1.40$<br>Imposed $\times 1.60$ |
|                    | Span 1    | Dead $\times 1.40$<br>Imposed $\times 1.60$ |
|                    | Support B | Dead $\times 1.40$<br>Imposed $\times 1.60$ |

### Analysis results

|                                            |                                 |                          |
|--------------------------------------------|---------------------------------|--------------------------|
| Maximum moment                             | $M_{\max} = 53.2$ kNm           | $M_{\min} = 0$ kNm       |
| Maximum shear                              | $V_{\max} = 68.7$ kN            | $V_{\min} = -68.7$ kN    |
| Deflection                                 | $\delta_{\max} = 4.1$ mm        | $\delta_{\min} = 0$ mm   |
| Maximum reaction at support A              | $R_{A_{\max}} = 68.7$ kN        | $R_{A_{\min}} = 68.7$ kN |
| Unfactored dead load reaction at support A | $R_{A_{\text{Dead}}} = 49.1$ kN |                          |
| Maximum reaction at support B              | $R_{B_{\max}} = 68.7$ kN        | $R_{B_{\min}} = 68.7$ kN |
| Unfactored dead load reaction at support B | $R_{B_{\text{Dead}}} = 49.1$ kN |                          |

### Section details

|              |                       |             |      |
|--------------|-----------------------|-------------|------|
| Section type | UC 203x203x46 (BS4-1) | Steel grade | S275 |
|--------------|-----------------------|-------------|------|

|                                                                                                                                                                                                    |                              |                          |            |              |                                |               |
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|                                                                                                                                                                                                    | Calcs for<br>Beam 3          |                          |            |              | Start page no./Revision<br>0 8 |               |
|                                                                                                                                                                                                    | Calcs by<br>HIGBY            | Calcs date<br>14/12/2022 | Checked by | Checked date | Approved by                    | Approved date |

#### Classification of cross sections - Section 3.5

Tensile strain coefficient  $\epsilon = 1.00$       Section classification      **Compact**

#### Shear capacity - Section 4.2.3

Design shear force  $F_v = 68.7$  kN      Design shear resistance  $P_v = 241.4$  kN  
**PASS - Design shear resistance exceeds design shear force**

#### Moment capacity - Section 4.2.5

Design bending moment  $M = 53.2$  kNm      Moment capacity low shear  $M_c = 136.8$  kNm

#### Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment  $M_b = 108.4$  kNm       $M_b / m_{LT} = 108.4$  kNm  
**PASS - Buckling resistance moment exceeds design bending moment**

#### Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection  $\delta_{lim} = 8.611$  mm      Maximum deflection  $\delta = 4.065$  mm  
**PASS - Maximum deflection does not exceed deflection limit**

|                                                                                                                                                                                                           |                   |            |            |              |                         |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|------------|--------------|-------------------------|---------------|
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|                                                                                                                                                                                                           | Partnership House |            |            |              | 0606                    |               |
|                                                                                                                                                                                                           | Calcs for         |            |            |              | Start page no./Revision |               |
|                                                                                                                                                                                                           | bearing design    |            |            |              | 0 9                     |               |
|                                                                                                                                                                                                           | Calcs by          | Calcs date | Checked by | Checked date | Approved by             | Approved date |
|                                                                                                                                                                                                           | HIGBY             | 09/01/2023 |            |              |                         |               |

## MASONRY BEARING DESIGN TO BS5628-1:2005

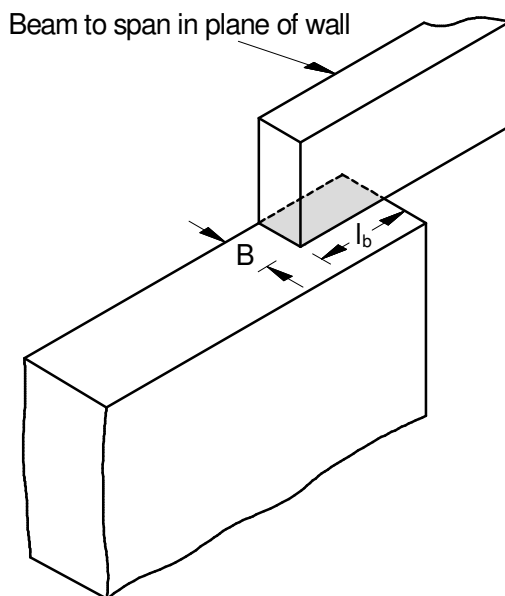
TEDDS calculation version 1.0.05

### Masonry details

Masonry type  
 Compressive strength of unit  
 Mortar designation  
 Category of masonry units  
 Category of construction control  
 Partial safety factor for material strength  
 Thickness of load bearing leaf  
 Effective thickness of masonry wall  
 Height of masonry wall  
 Effective height of masonry wall

### Clay or calcium silicate bricks

$p_{unit} = 20.0 \text{ N/mm}^2$   
**iii**  
**Category II**  
**Normal**  
 $\gamma_m = 3.5$   
 $t = 440 \text{ mm}$   
 $t_{ef} = 440 \text{ mm}$   
 $h = 3000 \text{ mm}$   
 $h_{ef} = 3000 \text{ mm}$



### Bearing details

Beam spanning in plane of wall  
 Width of bearing  
 Length of bearing

$B = 440 \text{ mm}$   
 $l_b = 200 \text{ mm}$

### Compressive strength from Table 2 BS5628:Part 1 - Clay or calcium silicate bricks

Mortar designation  
 Brick compressive strength  
 Characteristic compressive strength

Mortar = "iii"  
 $p_{unit} = 20.0 \text{ N/mm}^2$   
 $f_k = 5.00 \text{ N/mm}^2$

### Loading details

Characteristic concentrated dead load  
 Characteristic concentrated imposed load  
 Design concentrated load  
 Characteristic distributed dead load  
 Characteristic distributed imposed load

$G_k = 104 \text{ kN}$   
 $Q_k = 0 \text{ kN}$   
 $F = (G_k \times 1.4) + (Q_k \times 1.6) = 146.2 \text{ kN}$   
 $g_k = 0.0 \text{ kN/m}$   
 $q_k = 0.0 \text{ kN/m}$

|                                                                                                                                                                                                    |                   |            |            |              |                         |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|------------|--------------|-------------------------|---------------|
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|                                                                                                                                                                                                    | Partnership House |            |            |              | 0606                    |               |
|                                                                                                                                                                                                    | Calcs for         |            |            |              | Start page no./Revision |               |
|                                                                                                                                                                                                    | bearing design    |            |            |              | 0 10                    |               |
|                                                                                                                                                                                                    | Calcs by          | Calcs date | Checked by | Checked date | Approved by             | Approved date |
|                                                                                                                                                                                                    | HIGBY             | 09/01/2023 |            |              |                         |               |

Design distributed load

$$f = (g_k \times 1.4) + (q_k \times 1.6) = \mathbf{0.0 \text{ kN/m}}$$

### Masonry bearing type

Bearing type

**Type 2**

Bearing safety factor

$$\gamma_{\text{bear}} = \mathbf{1.50}$$

### Check design bearing without a spreader

Design bearing stress

$$f_{ca} = F / (B \times l_b) + f / t = \mathbf{1.661 \text{ N/mm}^2}$$

Allowable bearing stress

$$f_{cp} = \gamma_{\text{bear}} \times f_k / \gamma_m = \mathbf{2.143 \text{ N/mm}^2}$$

**PASS - Allowable bearing stress exceeds design bearing stress**

### Check design bearing at $0.4 \times h$ below the bearing level

Slenderness ratio

$$h_{\text{ef}} / t_{\text{ef}} = \mathbf{6.82}$$

Eccentricity at top of wall

$$e_x = \mathbf{0.0 \text{ mm}}$$

### From BS5628:1 Table 7

Capacity reduction factor

$$\beta = \mathbf{0.99}$$

Length of bearing distributed at  $0.4 \times h$

$$l_d = \mathbf{1400 \text{ mm}}$$

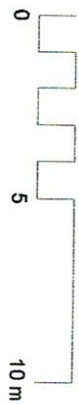
Maximum bearing stress

$$f_{ca} = F / (l_d \times t) + f / t = \mathbf{0.237 \text{ N/mm}^2}$$

Allowable bearing stress

$$f_{cp} = \beta \times f_k / \gamma_m = \mathbf{1.414 \text{ N/mm}^2}$$

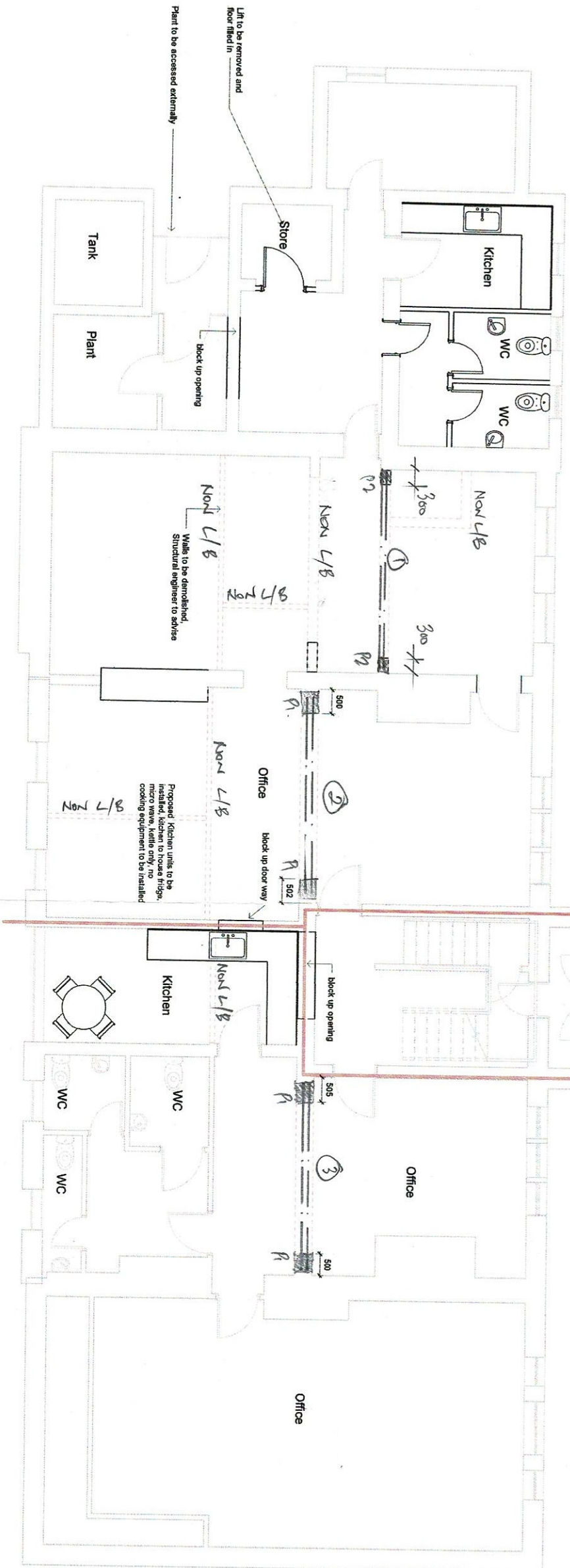
**PASS - Allowable bearing stress at  $0.4 \times h$  below bearing level exceeds design bearing stress**



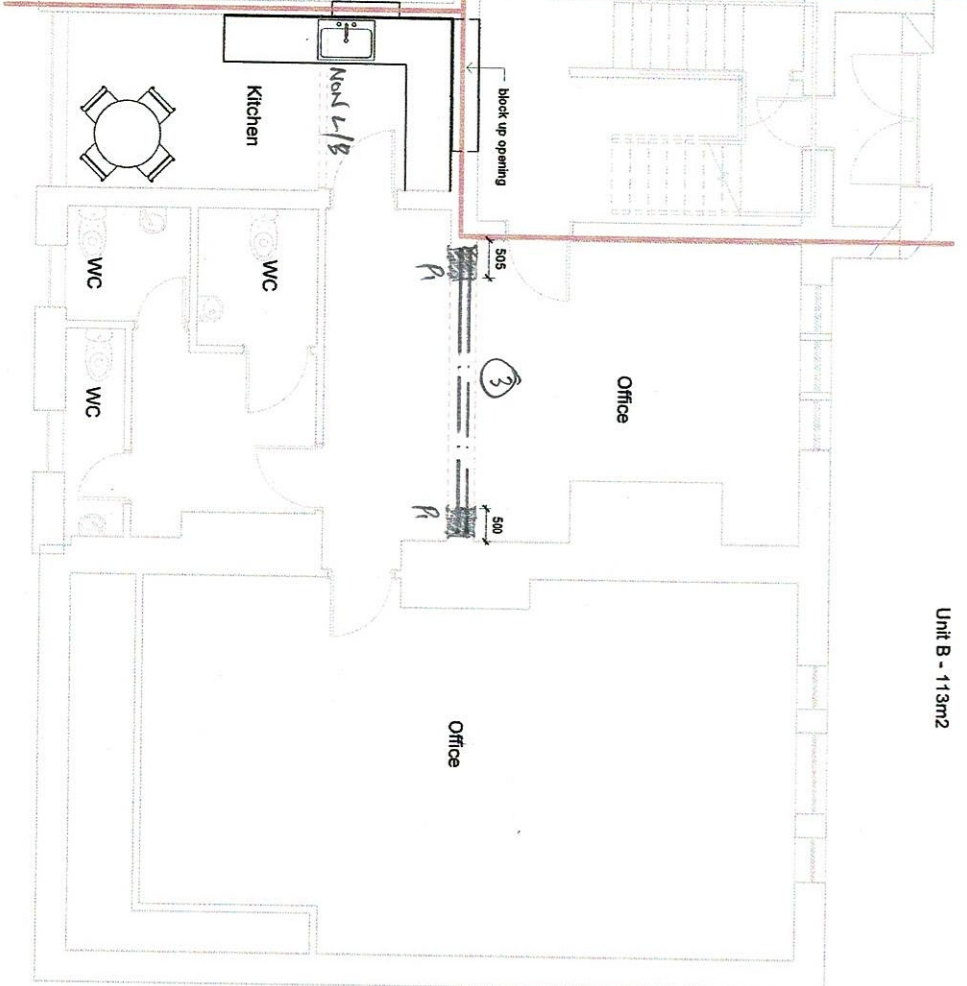
**NOTES**  
ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE  
ANY DISCREPANCIES ARE TO BE REPORTED TO THE PROJECT MANAGER BEFORE ANY WORK COMMENCES  
THIS DRAWING SHALL NOT BE SCALED TO ASCERTAIN ANY DIMENSIONS WORK TO REQUIRED DIMS ONLY  
THIS DRAWING SHALL NOT BE REPRODUCED WITHOUT EXPRESS WRITTEN PERMISSION FROM Clarke Bespoke Design LTD.

Unit A - 127m<sup>2</sup>

Proposed kitchen units to be installed kitchen to house fridge, micro wave, kettle only, no cooking equipment to be installed



Unit B - 113m<sup>2</sup>

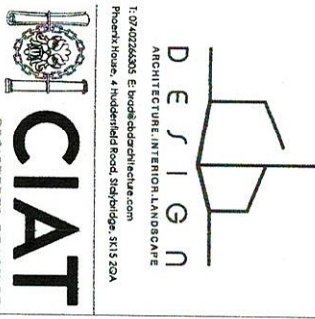


**1 Proposed Basement.**  
1 : 50

\* Non L/B = Non loadbearing wall  
ie No new support beam required  
old wall to be removed

|            |                                            |
|------------|--------------------------------------------|
| Beam ①     | 2 N° 152 x 152 x 37 UC                     |
| Beam ②     | 2 N° 203 x 203 x 46 UC                     |
| Beam ③     | 2 N° 203 x 203 x 46 UC                     |
| Propose R1 | 300 x 300 x 215 bf,<br>200mm steel bearing |
| Propose R2 | 440 x 440 x 215 bf<br>300mm steel bearing  |

Bath / 0606 / SK01  
STRUCTURAL REQUIREMENTS  
BASEMENT RELATIONS  
PRELIMINARY HOUSE



drawing title  
As Proposed Basement Plan

drawing title  
PRELIMINARY

|               |                 |            |
|---------------|-----------------|------------|
| scale 1 : 50  | drawn BC        | checked BC |
| sheet size A1 | rev code 210422 |            |
| 20            | PL-005          | PI         |
| job number    | drawing number  | revision   |