

N° 55 LOWER PASTURES, CT OAKLEY.

Beam loading: -

Beam 'B' span 2.3m (allow for build in at both ends).

Carrying: -

$$\text{Floor. } \frac{6.3}{2} \times 2.3 = 7.3 \text{ m}^2 \times 200 \text{ kg/m}^2 = 1460 \text{ kg.}$$

$$\text{Stud wall. } 2.4 \times 2.3 = 5.52 \text{ m}^2 \times 70 \text{ kg/m}^2 = 387$$

$$\underline{1847 \text{ kg}}$$

$$= 18.5 \text{ kN total}$$

$$= 8.05 \text{ kN/m UDL.}$$

Use 152x89 Universal beams. - connect into web of beam 'A'.

Beams 'A'. Point load at 2.15m of $8.05 \div 2 = 4.025 \text{ kN}$.
Span 5.03m

UDL load: -

$$\text{cavity wall } 5.03 \times 2.55 = 12.83 \text{ m}^2 \times 360 \text{ kg/m}^2 = 4618$$

$$\text{Ceiling } 5.03 \times \frac{7.1}{2} = 17.86 \text{ m}^2 \times 100 \text{ kg/m}^2 = 1786$$

$$\text{house roof. } 5.03 \times 5.3 = 26.66 \text{ m}^2 \times 140 \text{ kg/m}^2 = 3733$$

$$\text{extrn roof. } 5.03 \times \frac{3.8}{2} = 9.56 \text{ m}^2 \times 150 \text{ kg/m}^2 = 1434$$

$$\underline{11571 \text{ kg}}$$

$$= 115.71 \text{ kN}$$

$$= 23.0 \text{ kN/m UDL.}$$

Using 2 N° steel beams bolted together

2 N° 254x146x37 UB's

build solid brick piers in cavity wall at both ends and sit steels on concrete padstones or 4 course eng brick.
* allow 200mm bearing at both ends for steel lengths.

T R Sandy MRICS MCABE
80 High Street, Gretton, Northants, NN17 3DF
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Site: 55 Lower Pastures, Gt Oakley
Job: Rear GF cavity wall removal, Int wall removal
Job number:

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SuperBeam 7.05b 441305

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SuperBeam Project Summary

Project started 21 Aug 2018 TS
Site address: 55 Lower Pastures, Gt Oakley
Job: Rear GF cavity wall removal, Int wall removal
Client: Mr S Ratcliffe

ITEMS:

1: Beam: Beam B - internal wall removal
Span: 2.3 m. Reactions: R1: 9.60 kN R2: 9.60 kN
Use 127 x 76 x 13 UB S355 — USE 152x89 UB.

2: Beam: Beam A - GF rear cavity wall removal
Span: 5.03 m. Reactions: R1: 62.04 kN R2: 61.45 kN
Use 2No 254 x 146 x 37 UB S355

Sections to be bolted together with tube spacers or suitable alternative connection at max 1.5m c/s

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Beam: Beam B - internal wall removal

Span: 2.3 m.

Load name	Loading w1	Start x1	Loading w2	End x2	R1comp	R2comp
U D o.w.	0.3	0		L	0.34	0.34
U L	8.05	0		L	9.26	9.26
Total load: 19.20 kN					9.60	9.60
					Dead:	0.34
					Live:	9.26

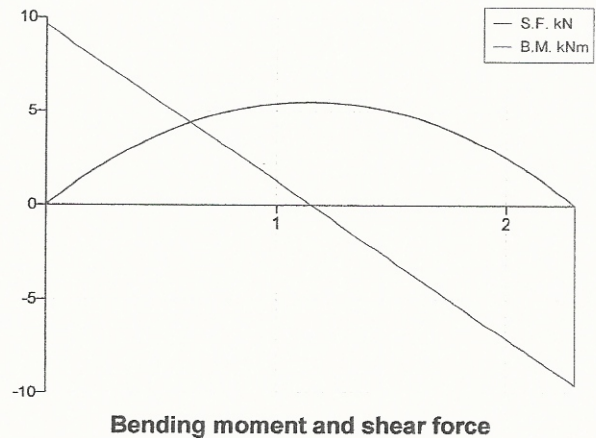
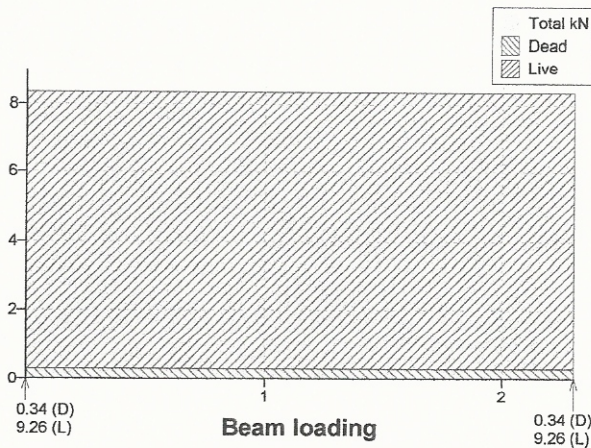
Load types: U: UDL D: Dead; L: Live (positions in m. from R1)

Maximum B.M. = 5.52 kNm at 1.15 m. from R1

Maximum S.F. = 9.60 kN at 0.00 m. from R1

Live load deflection = $2.93 \times 10^8/EI$ at 1.15 m. from R1 (E in N/mm^2 , I in cm^4)

Total deflection = $3.04 \times 10^8/EI$ at 1.15 m. from R1



Steel beam calculation to BS449 Part 2 using S355 steel

SECTION SIZE : 127 x 76 x 13 UB S355

$D=127.0$ mm $B=76.0$ mm $t=4.0$ mm $T=7.6$ mm $I_x=473$ cm⁴ $r_y=1.84$ cm $Z_x=75.0$ cm³

Bending: $L_E/r_y = 2.30 \times 100/1.84 = 125$ $D/T = 16.7$

Permissible bending stress, $p_{bc} = 151.8$ N/mm² (Table 3b)

Actual bending stress, $f_{bc} = 5.52 \times 1000/75.0 = 73.6$ N/mm² OK

Shear: Maximum shear in web, $f_s = 9.60 \times 1000/(4.0 \times 127.0) = 18.9$ N/mm² OK

Beam web: Check unstiffened web capacity with load of 9.602 kN

Bearing: $p_b = 260$ N/mm² (Table 9); $C1 = 27.4$ kN; $C2 = 1.04$ kN/mm

Buckling: $p_c = 192$ N/mm² (Table 17b); $C1 = 48.8$ kN; $C2 = 0.769$ kN/mm

Minimum required stiff bearing length, $L_b = 0$ mm

Bearing capacity, $P_w = C1 + L_b.C2 = 27.4$ kN <<<

Buckling capacity, $P_x = C1 + L_b.C2 = 48.8$ kN

Deflection: Live load deflection = $2.93 \times 1e8/(205,000 \times 473) = 3.0$ mm (L/760) OK

Total deflection = $3.04 \times 1e8/(205,000 \times 473) = 3.1$ mm (L/733)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2 = 0.235$ at 1.15 m. (≤ 1.25 OK)

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Beam: Beam A - GF rear cavity wall removal

Span: 5.03 m.

Load name	Loading w1	Start x1	Loading w2	End x2	R1comp	R2comp
U D o.w.	0.75	0		L	1.89	1.89
U L	23	0		L	57.85	57.85
P L	4.025	2.15			2.30	1.72
Total load: 123.49 kN					62.04	61.45
					Dead:	1.89
					Live:	60.15
						59.57

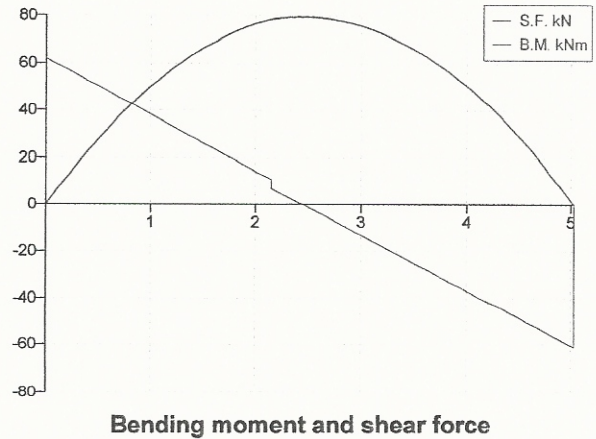
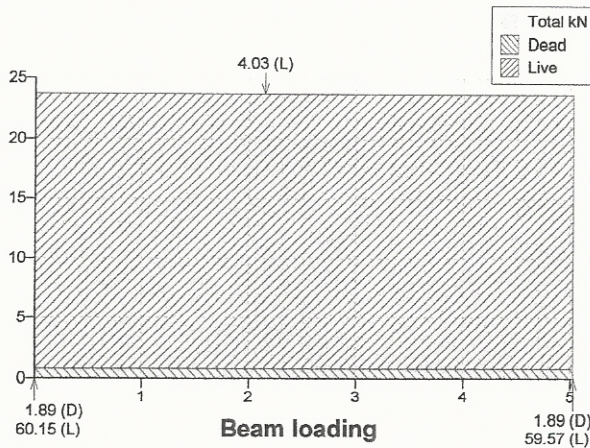
Load types: U: UDL P: PL D: Dead; L: Live (positions in m. from R1)

Maximum B.M. = 79.5 kNm at 2.44 m. from R1

Maximum S.F. = 62.0 kN at 0.00 m. from R1

Live load deflection = $202 \times 10^8/EI$ at 2.52 m. from R1 (E in N/mm^2 , I in cm^4)

Total deflection = $208 \times 10^8/EI$ at 2.52 m. from R1



Steel beam calculation to BS449 Part 2 using S355 steel

SECTION SIZE : 2No 254 x 146 x 37 UB S355

D=256.0 mm B=146.4 mm t=6.3 mm T=10.9 mm $I_x=5,540 \text{ cm}^4$ $r_y=3.48 \text{ cm}$ $Z_x=433 \text{ cm}^3$ (per section)

Bending: $L_E/r_y = 5.03 \times 100/3.48 = 145$ $D/T = 23.5$

Permissible bending stress, $p_{bc} = 112.8 \text{ N/mm}^2$ (Table 3b)

Actual bending stress, $f_{bc} = 79.5 \times 1000/(2 \times 433.0) = 91.8 \text{ N/mm}^2$ OK

Shear: Maximum shear in web, $f_s = 62.0 \times 1000/(2 \times 6.3 \times 256.0) = 19.2 \text{ N/mm}^2$ OK

Beam web: Check unstiffened web capacities with loads of $62.04/2 = 31.02 \text{ kN}$ and $61.45/2 = 30.73 \text{ kN}$

Bearing: $p_b = 260 \text{ N/mm}^2$ (Table 9); $C1 = 52.5 \text{ kN}$; $C2 = 1.64 \text{ kN/mm}$

Buckling: $p_c = 169 \text{ N/mm}^2$ (Table 17b); $C1 = 136 \text{ kN}$; $C2 = 1.06 \text{ kN/mm}$

R1: Minimum required stiff bearing length, $L_b = 0 \text{ mm}$

Bearing capacity, $P_w = C1 + L_b.C2 = 52.5 \text{ kN} \lll$

Buckling capacity, $P_x = C1 + L_b.C2 = 136 \text{ kN}$

R2: Minimum required stiff bearing length, $L_b = 0 \text{ mm}$

Bearing capacity, $P_w = C1 + L_b.C2 = 52.5 \text{ kN} \lll$

Buckling capacity, $P_x = C1 + L_b.C2 = 136 \text{ kN}$

Deflection: Live load deflection = $202 \times 1e8/(2 \times 205,000 \times 5,540) = 8.9 \text{ mm}$ (L/566) OK

Total deflection = $208 \times 1e8/(2 \times 205,000 \times 5,540) = 9.2 \text{ mm}$ (L/549)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2 = 0.662$ at 2.41 m. (≤ 1.25 OK)

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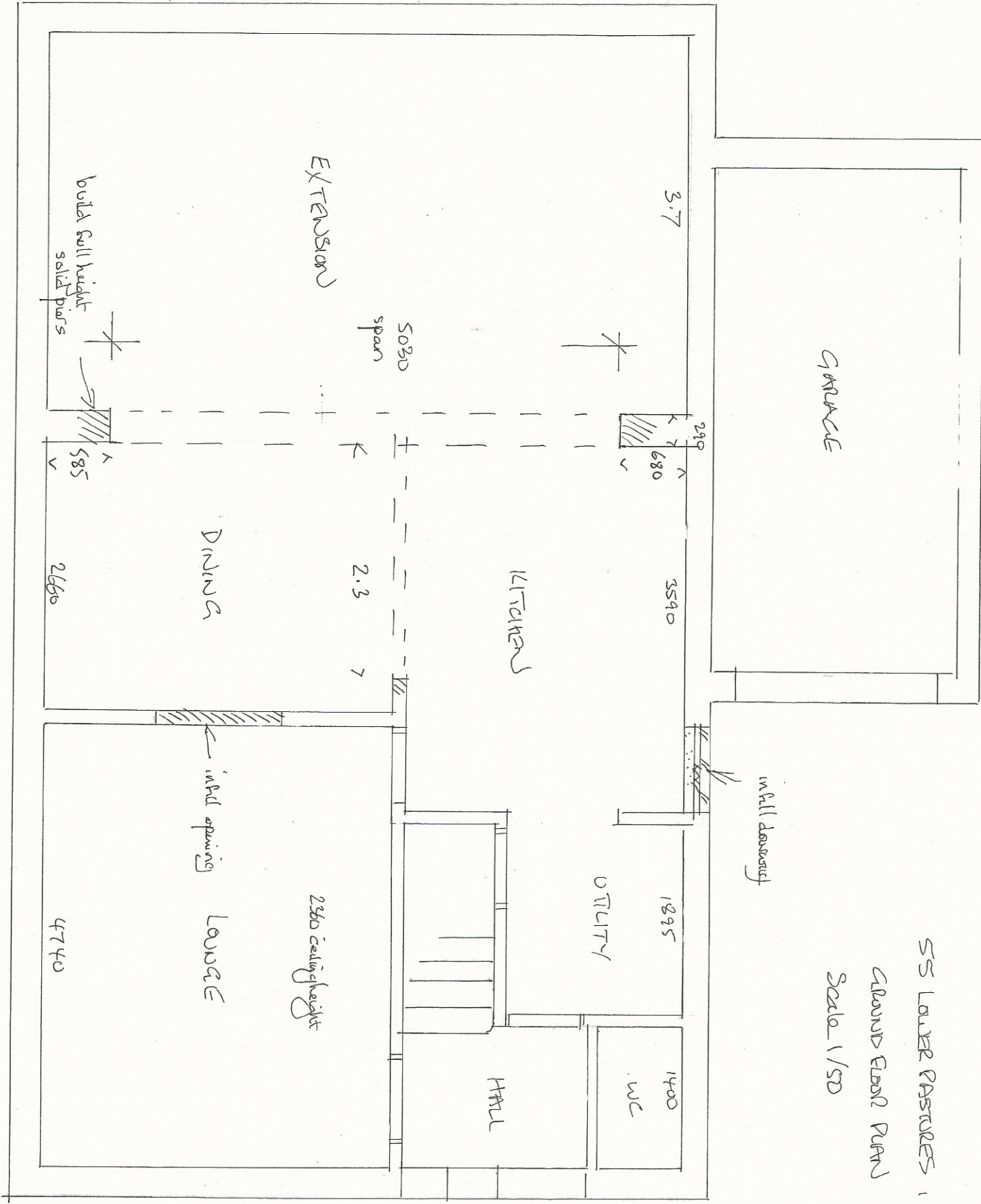
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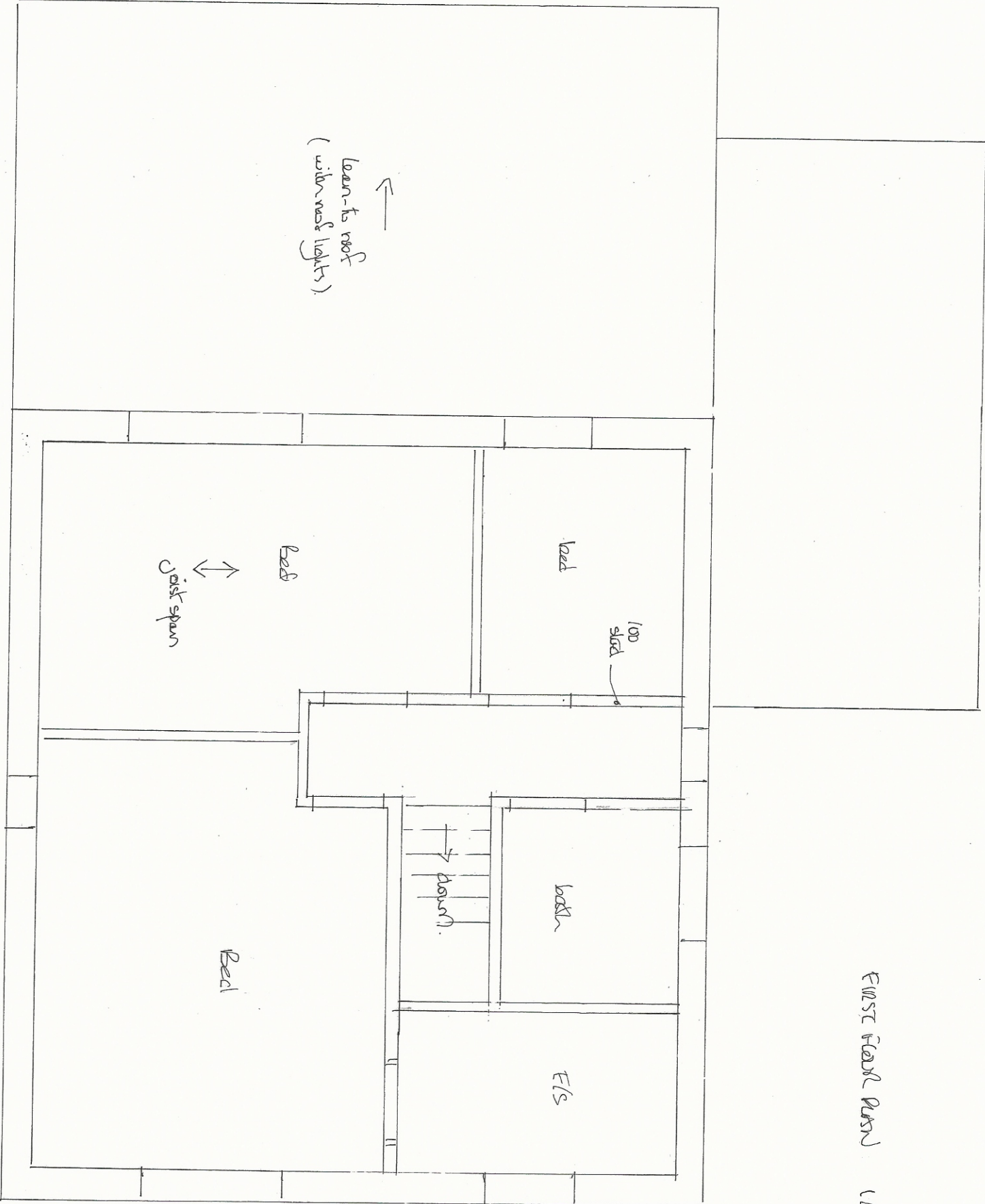
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SS Lower Pastures 1 - GET OFFICEY
 Ground Floor Plan (for beam loadings only)
 Scale 1/50



EAST FLOOR PLAN 1/50



SECTION.