

Jrbdesigns Ltd.
1 Saville Street Cudworth

Site: 19 Cropton Road
Job: Extension
job number MCP002

Made by JRB
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SuperBeam 4.50g 441893

19 Cropton Road.SBW

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Beam: Front wall support steels

Span: 2.288 m.

	Load name	Loading w1	Start x1	Loading w2	End x2	R1comp	R2comp
U	L roof	4	0		L	4.58	4.58
U	D roof	3	0		L	3.43	3.43
U	D wall inner	5	0		L	5.72	5.72
U	D wall outer	7	0		L	8.01	8.01
Total load: 43.47 kN						21.74	21.74
Dead:						17.16	17.16
Live:						4.58	4.58

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

Maximum B.M. = 12.4 kNm at 1.14 m. from R1

Maximum S.F. = 21.7 kN at R1

Live load deflection = $1.43 \times 1e8/EI$ at 1.14 m. from R1 (E in N/mm², I in cm⁴)

Total deflection = $6.78 \times 1e8/EI$ at 1.14 m. from R1

Steel calculation to BS449 Part 2 using S275 (Grade 43) steel

SECTION SIZE : 2No 178 x 102 x 19 UB Grade 43

D=177.8 mm B=101.2 mm t=4.8 mm T=7.9 mm $I_x=1,360 \text{ cm}^4$ $r_y=2.37 \text{ cm}$ $Z_x=153 \text{ cm}^3$

$L_e = 1.2L = 2.75\text{m}$. $L_e/r_y = 2.75 \times 100 / 2.37 = 116$ D/T = 22.5

Permissible bending stress, $p_{bc} = 119.3 \text{ N/mm}^2$ (Table 3a)

Actual bending stress, $f_{bc} = 12.43 \times 1000 / 2 \times 153.0 = 40.6 \text{ N/mm}^2$ OK

Maximum shear in web, $f_s = 21.74 \times 1000 / (2 \times 4.8 \times 177.8) = 12.7 \text{ N/mm}^2$ OK

Check unstiffened web capacity with load of $21.74/2 = 10.87 \text{ kN}$

Bearing: $p_b = 210 \text{ N/mm}^2$ (Table 9); C1 = 27.1 kN; C2 = 1.01 kN/mm

Buckling: $p_c = 141 \text{ N/mm}^2$ (Table 17a); C1 = 60.2 kN; C2 = 0.677 kN/mm

Unstiffened web bearing capacity, $P_w = 27.1 \text{ kN}$: no minimum stiff bearing length required

Live load deflection = $1.43 \times 1e8 / (2 \times 205,000 \times 1,360) = 0.3 \text{ mm}$ (L/8939) OK

Total deflection = $6.78 \times 1e8 / (2 \times 205,000 \times 1,360) = 1.2 \text{ mm}$ (L/1882)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2 = 0.116$ at 1.14 m. (≤ 1.25 OK)

Bearing details

Masonry: 7 N/mm^2 brick, class (iii) mortar, normal const/normal mfr

Local design strength (factored) = $3.14/3.5 = 0.90 \text{ N/mm}^2$ (BS5628-1 Table 2a)

R1 (31.35kN factored): 350 x 100mm padstone

Factored stress under padstone = $31.35 \times 1000 / 350 \times 100 = 0.90 \text{ N/mm}^2$

R2 (31.35kN factored): 350 x 100mm padstone

Factored stress under padstone = $31.35 \times 1000 / 350 \times 100 = 0.90 \text{ N/mm}^2$

Beams to be bolted together with M16 bolts at 600 c/crs.