Jrbdesigns Ltd.
1 Saville Street Cudworth

Site: 19 Cropton Road	**Made by JRB**
Job: Extension	**Page 1**
job number MCP002	**File copy**

Beam: **Side wall support steels first floor** **Span: 3.1 m.**

		Load name	*Loading w1*	*Start x1*	*Loading w2*	*End x2*	*R1comp*	*R2comp*
U	L	floor	1.8	0		L	2.79	2.79
U	D	floor	.9	0		L	1.39	1.39
R	D	wall inner	5	2.6		3.1	0.20	2.30
R	D	wall outer	7	2.6		3.1	0.28	3.22
					Total load: 14.37 kN		**4.67**	**9.70**
						Dead:	*1.88*	*6.91*
						Live:	*2.79*	*2.79*

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

Maximum B.M. = 4.04 kNm at 1.73 m. from R1

Maximum S.F. = -9.70 kN at R2

Live load deflection = 2.16 x 1e8/EI at 1.55 m. from R1 (E in N/mm^2, I in cm^4)

Total deflection = 4.14 x 1e8/EI at 1.60 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 cm^4 r_y=2.37 cm Z_x=153 cm^3

L_e = 1.2L = 3.72m. L_E/r_y = 3.72x100/2.37 = 157 D/T = 22.5

Permissible bending stress, p_{bc} = 93.2 N/mm^2 (Table 3a)

Actual bending stress, f_{bc} = 4.037 x 1000/2 x 153.0 = 13.2 N/mm^2 OK

Maximum shear in web, f_s = 9.701 x 1000/(2 x 4.8 x 177.8) = 5.7 N/mm^2 OK

Check unstiffened web capacities with loads of 4.669/2 = 2.334 kN and 9.701/2 = 4.851 kN

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

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

R1: Unstiffened web bearing capacity, P_w = 27.1kN: no minimum stiff bearing length required

R2: Unstiffened web bearing capacity, P_w = 27.1kN: no minimum stiff bearing length required

Live load deflection = 2.16 x 1e8/(2 x 205,000 x 1,360) = 0.4 mm (L/7987) OK

Total deflection = 4.14 x 1e8/(2 x 205,000 x 1,360) = 0.7 mm (L/4180)

Combined bending and shear check (14.c): $(f_{bc}/p_{bc})^2 + (f_s/p_s)^2$ = 0.020 at 1.74 m. (<=1.25 OK)

Bearing details

R2 (14.14kN factored): 300 x 100mm padstone

Local design strength of masonry (factored) = 0.700 N/mm^2 (User-ented value)

Factored stress under padstone = 14.14 x 1000/300 x 100 = 0.47 N/mm^2

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