

1401449 FUL

DESIGN OF STEEL BEAMS AT STONELEIGH HOUSE, LANCADLE, VALE OF GLAM.

Design to BS 5950 ; Loading Criteria to BS 6399

Nov. 11/14.

2nd Beams required to support cavity wall over new opening.

Worst Case Scenario is inner beam which takes :- Span = 3.3m.

- | | | |
|----------------|----------------------------|----------------------------|
| (1) Wall Load | $DL = 2.2 \text{ kN/m}^2$ | |
| (2) Floor Load | $DL = 0.5 \text{ kN/m}^2$ | $IL = 1.5 \text{ kN/m}^2$ |
| (3) Roof Load | $DL = 0.75 \text{ kN/m}^2$ | $IL = 0.75 \text{ kN/m}^2$ |

Loads: $\delta_f = 1.4 \text{ GC and } 1.6 \text{ OC.}$

Roof	DL	=	$0.75 \times 5.8 \times 3.3 = 14.36$	x	1.4 =	20.10
	IL	=	$0.75 \times 5.8 \times 3.3 = 14.36$	x	1.6 =	22.98
1 st Fl ^r	DL	=	$0.50 \times 0.9 \times 3.3 = 1.49$	x	1.4 =	2.09
	IL	=	$1.50 \times 0.9 \times 3.3 = 4.46$	x	1.6 =	7.14
Wall	DL	=	$2.2 \times 2.5 \times 3.3 = 18.15$	x	1.4 =	25.41
						77.72 kN

$$M_x = \frac{W_L}{8} = \frac{77.72 \times 3.3}{8} = 32.05 \text{ kN.m}$$

Try BEAM SIZE 203 x 133 x 30 kg/m U.B.



• Check Bending

$$M_x < M_b \text{ where } M_b = P_b \cdot S_x$$

$$\text{Find } P_b. \quad \lambda = \frac{L_e}{r_{yy}} = \frac{3300}{3.17 \times 10} = 104.$$

From steel tables $P_y = 275 \text{ N/mm}^2$; $S_x = 314 \text{ cm}^3$; $\lambda = 21.5$.

From table 19(b) $P_b = 172 \text{ N/mm}^2$

$$\therefore M_b = \frac{172 \times 314 \times 10^3}{10^6} = 54.0 \text{ kN.m.}$$

$\therefore M_b > M_x \checkmark$ OK in Bending.

• Check Shear

$$\text{Max}^m \text{ SF} = \frac{7772}{2} = 38.86 \text{ kN}$$

Shear Cap. of Section $P_v = 0.6 \cdot P_y \cdot A_v$ where $A_v = t \cdot D$

From steel tables $t = 6.4 \text{ mm}$; $D = 206.8 \text{ mm}$

$$\therefore P_v = \frac{0.6 \times 275 \times 6.4 \times 206.8}{10^3} = 214.8 \text{ kN.}$$

$\therefore P_v > \text{Max}^m \text{ S.F.} \checkmark$ OK in Shear

• Check Deflection

$$\delta_{\text{allow}} = \frac{L}{360} = \frac{3300}{360} = 9.16 \text{ mm}$$

$$\delta_{\text{act.}} = \frac{5}{384} \cdot \frac{W L^3}{E I} \quad \text{where } W = u/F \cdot IL = 18.82 \text{ kN}$$

$$\delta_{\text{act}} = \frac{5}{384} \times \frac{18.82 \times 3.3^3 \times 10^{12}}{205 \times 2896 \times 10^7} = 1.48 \text{ mm.}$$

$\therefore \delta_{\text{act}} < \delta_{\text{allow}} \checkmark$ OK in Deflection

• Check Bearing at Supports (allow min 175mm bearing)

$$\sigma = \frac{L}{A} = \frac{18.82 \times 10^3}{175 \times 133} = 0.81 \text{ N/mm}^2 \checkmark \text{ OK.}$$

Support beams on p.c. concrete padstones

\therefore use 2^{N^R} 203 x 133 x 30 kg/m UB's

End

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