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Site: 105 Vernon Way

Job: Steel Beams

Job number:

SuperBeam 4.40h 440784

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beam Nr 1.SBW Printed 19 Dec 2019 16:07

Beam: Beam Nr 1

Span: 3.700 m.

	Load name	Loading w1	Start x1	Loading w2	End x2	R1comp	R2comp
U T	Beam	0.30 x 3.7	0		L	2.05	2.05
U T	Floor	2.0 x 2.8	0		L	10.36	10.36
					Total:	12.41	12.41

Load types: U:UDL (positions in m. from R1) T: Total

Maximum B.M. = 11.48 kNm at 1.85 m. from R1

Maximum S.F. = 12.41 kN at R1

Total deflection = $16.37 \times 10^8 / EI$ at 1.85 m. from R1 (E in N/mm², I in cm⁴)

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

SECTION SIZE : 178 x 102 x 19 UB Grade 43

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

$L_E/r_y = 3.70 \times 100 / 2.37 = 156$ D/T = 22.5

Permissible bending stress, $p_{bc} = 93.5 \text{ N/mm}^2$ (Table 3a)

Actual bending stress, $f_{bc} = 11.48 \times 1000 / 153.0 = 75.0 \text{ N/mm}^2$ OK

Maximum shear in web, $f_s = 12.41 \times 1000 / (4.8 \times 177.8) = 14.5 \text{ N/mm}^2$ OK

Check unstiffened web capacity with load of 12.41 kN

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

Buckling: $p_r = 141 \text{ N/mm}^2$ (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

Total deflection = $16.4 \times 10^8 / 205,000 \times 1,360 = 5.9 \text{ mm}$ (L/630) OK

Bearing details

Factor reactions by 1.55 (user selected value)

Masonry: 100mm 7N/mm² solid block (SF>2.0), class (iii) mortar, normal const/normal mfr

Local design strength (factored) = $6.4 / 3.5 = 1.83 \text{ N/mm}^2$ (BS5628-1 Table 2d)

R1 (12.41kN unfactored): 125 x 100mm padstone

Factored stress under padstone = $1.55 \times 12.41 \times 1000 / 125 \times 100 = 1.54 \text{ N/mm}^2$

R2 (12.41kN unfactored): 125 x 100mm padstone

Factored stress under padstone = $1.55 \times 12.41 \times 1000 / 125 \times 100 = 1.54 \text{ N/mm}^2$

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Site: 105 Vernon Way

Job: Steel Beams

Job number:

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SuperBeam 4.40h 440764

beam Nr 2.SBW Printed 19 Dec 2019 16:04

Beam: Beam Nr 2

Span: 3.700 m.

	Load name	Loading w1	Start x1	Loading w2	End x2	R1comp	R2comp
U T	0.3 x 3.7	0	0		L	0.00	0.00
P T	beam nr 1	12	2.9			2.59	9.41
Total:						2.59	9.41

Load types: U:UDL P:PL (positions in m. from R1) T: Total

Maximum B.M. = 7.52 kNm at 2.90 m. from R1

Maximum S.F. = -9.41 kN at R2

Total deflection = $7.846 \times 10^{-8} / EI$ at 2.10 m. from R1 (E in N/mm², I in cm⁴)

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

SECTION SIZE : 178 x 102 x 19 UB Grade 43

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

$L_E/r_y = 3.70 \times 100 / 2.37 = 156$ D/T = 22.5

Permissible bending stress, $p_{bc} = 93.5 \text{ N/mm}^2$ (Table 3a)

Actual bending stress, $f_{bc} = 7.524 \times 1000 / 153.0 = 49.2 \text{ N/mm}^2$ OK

Maximum shear in web, $f_s = 9.405 \times 1000 / (4.8 \times 177.8) = 11.0 \text{ N/mm}^2$ OK

Check unstiffened web capacities with loads of 2.595 kN and 9.405 kN

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

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

R1: Unstiffened web bearing capacity, $P_w = 27.1 \text{ kN}$: no minimum stiff bearing length required

R2: Unstiffened web bearing capacity, $P_w = 27.1 \text{ kN}$: no minimum stiff bearing length required

Total deflection = $7.85 \times 10^{-8} / 205,000 \times 1,360 = 2.8 \text{ mm}$ (L/1315) OK

Bearing details

Factor reactions by 1.55 (user selected value)

Masonry: 100mm 7N/mm² solid block (SF>2.0), class (iii) mortar, normal const/normal mfr

Local design strength (factored) = $6.4 / 3.5 = 1.83 \text{ N/mm}^2$ (BS5628-1 Table 2d)

R1 (2.59kN unfactored): 102 x 100mm padstone

Factored stress under padstone = $1.55 \times 2.59 \times 1000 / 102 \times 100 = 0.39 \text{ N/mm}^2$

R2 (9.41kN unfactored): 102 x 100mm padstone

Factored stress under padstone = $1.55 \times 9.41 \times 1000 / 102 \times 100 = 1.43 \text{ N/mm}^2$