

EuroBeam from Greentram Software

Typical calculations produced by the pre-release version

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EuroBeam 1.00x0

Draycott.eub

Beam: Draycott example 2.2/2.7: Timber beam

Span: 4.25 m.

	Load name	Loading w1	Start x1	Loading w2	End x2	R1comp	R2comp
U G	Dead load	2.0/L	0		L	1.00	1.00
U QB	Imposed load	3.5/L	0		L	1.75	1.75
Total load (unfactored): 5.500 kN						2.75	2.75
(6.10): 7.950 kN						3.97	3.97

*Load types: U:UDL; Load positions are measured in m. from R1
Load durations: G:Dead; Qx: Imposed; QB: Office*

Maximum B.M. = 4.22 kNm (6.10) at 2.13 m. from R1

Maximum S.F. = 3.97 kN (6.10) at R1

Mid-span deflections: Dead: $2.00 \times 10^8/EI$ (E in N/mm^2 , I in cm^4)

Live: $3.50 \times 10^8/EI$

Total: $5.50 \times 10^8/EI$

Timber beam calculation to BS EN1995-1-1 using C16 timber

Use 72 x 220 C16 5.9 kg/m approx

$W_{el,v} = 580.8 \text{ cm}^3$ $I_v = 6,389 \text{ cm}^4$

Depth factor, $k_h = 1.00$ [EC5 3.2]

Timber grade: C16

Grade bending stress, $f_{m,k} = 16.0 \text{ N/mm}^2$

Grade shear stress, $f_{v,k} = 1.8 \text{ N/mm}^2$

Material partial factor, $\gamma_M = 1.3$ [EC5 UK Table NA.3]

$E_{0,mean} = 8,000 \text{ N/mm}^2$

Loading modification factor, $k_{mod} = 0.8$ (Service class 2; Live load duration: Medium term) [EC5 Table 3.1]

Load sharing factor, $k_{sys} = 1.0$

Deflection modification factor, $k_{def} = 0.800$ [EC5 Table 3.2]

Bending

Design bending stress, $f_{m,d} = f_{m,k} \cdot k_{mod} \cdot k_h \cdot k_{sys} / \gamma_M = 16.0 \times 0.80 \times 1.00 \times 1.0 / 1.30 = 9.85 \text{ N/mm}^2$

Applied bending stress, $\sigma_{m,y,d} = 4.22 \times 1000 / 580.8 = 7.27 \text{ N/mm}^2$ OK

Shear

Design shear stress, $f_{v,d} = f_{v,k} \cdot k_{mod} \cdot k_{sys} / \gamma_M = 1.80 \times 0.80 \times 1.0 / 1.30 = 1.11 \text{ N/mm}^2$

Applied shear stress, $\sigma_{v,y,d} = 3.97 \times 1000 \times 3/2 \times 72 \times 220 = 0.38 \text{ N/mm}^2$ OK

Deflection

Final deflection limit = $L/150 = 28.33 \text{ mm}$

Instantaneous mid-span shear deflection = $1.2 \times 2.92 \times 10^6 / ((E/16) \times 72 \times 220) = 0.44 \text{ mm}$

Final shear deflection is assumed to increase in proportion to total bending deflection

Mid-span deflections:	$\times 1e8/EI$	Inst. mm	ψ_2	kdef	Fin. mm
Dead:	2.00	3.91		0.80	7.04
Live QB:	3.50	6.84	0.30	0.80	8.49
Shear deflection:		0.44			0.64
Total		11.20			16.17 OK

Check: Final deflection should be 16.2mm