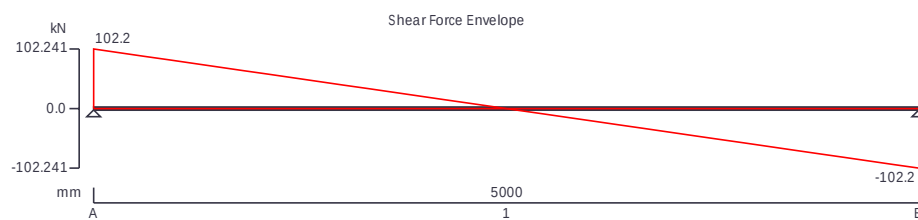
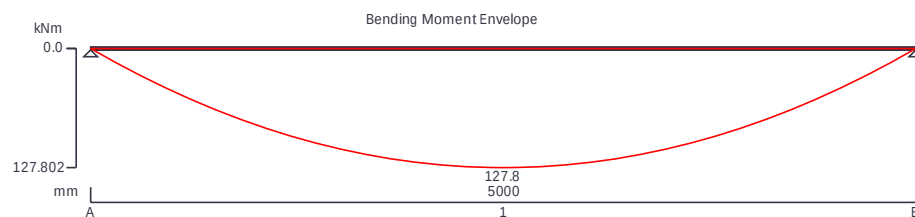
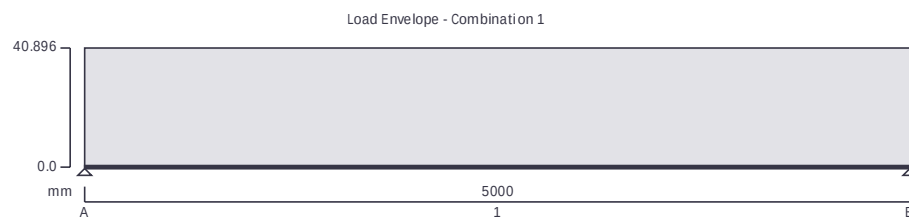
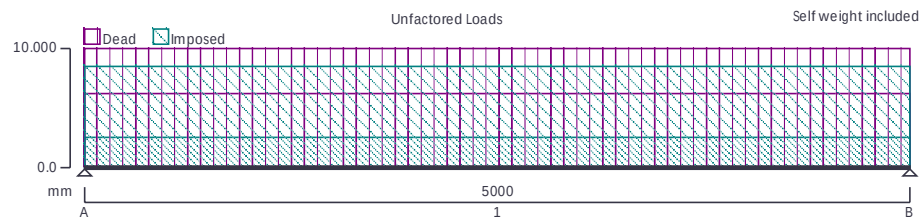


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STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.07



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Support conditions

Support A	Vertically restrained Rotationally free
Support B	Vertically restrained Rotationally free

Applied loading

Beam loads	Dead self weight of beam $\times 1$ Roof Load - Dead full UDL 6.22 kN/m Roof Imposed - Imposed full UDL 2.55 kN/m 1st Floor - Dead full UDL 10 kN/m 1st Floor Imposed - Imposed full UDL 8.5 kN/m
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Load combinations

Load combination 1	Support A	Dead $\times 1.40$
Imposed $\times 1.60$		
Dead $\times 1.40$		
Imposed $\times 1.60$		
Support B	Dead $\times 1.40$	
Imposed $\times 1.60$		

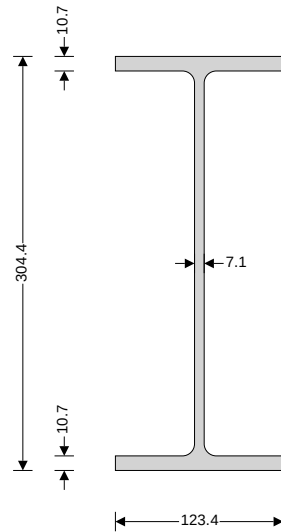
Analysis results

Maximum moment	$M_{\max} = 127.8$ kNm	$M_{\min} = 0$ kNm
Maximum shear	$V_{\max} = 102.2$ kN	$V_{\min} = -102.2$ kN
Deflection	$\delta_{\max} = 6.1$ mm	$\delta_{\min} = 0$ mm
Maximum reaction at support A	$R_{A_{\max}} = 102.2$ kN	$R_{A_{\min}} = 102.2$ kN
Unfactored dead load reaction at support A	$R_{A_{\text{Dead}}} = 41.5$ kN	
Unfactored imposed load reaction at support A	$R_{A_{\text{Imposed}}} = 27.6$ kN	
Maximum reaction at support B	$R_{B_{\max}} = 102.2$ kN	$R_{B_{\min}} = 102.2$ kN
Unfactored dead load reaction at support B	$R_{B_{\text{Dead}}} = 41.5$ kN	
Unfactored imposed load reaction at support B	$R_{B_{\text{Imposed}}} = 27.6$ kN	

Section details

Section type	UB 305x127x37 (BS4-1)
Steel grade	S275
From table 9: Design strength p_y	
Thickness of element	$\max(T, t) = 10.7$ mm
Design strength	$p_y = 275$ N/mm ²
Modulus of elasticity	$E = 205000$ N/mm ²

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Lateral restraint

Span 1 has full lateral restraint

Effective length factors

Effective length factor in major axis

$K_x = 1.00$

Effective length factor in minor axis

$K_y = 1.00$

Effective length factor for lateral-torsional buckling $K_{LT,A} = 1.00$

$K_{LT,B} = 1.00$

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]} = 1.00$

Internal compression parts - Table 11

Depth of section

$d = 265.2 \text{ mm}$

$d / t = 37.4 \times \varepsilon \leq 80 \times \varepsilon$

Class 1 plastic

Outstand flanges - Table 11

Width of section

$b = B / 2 = 61.7 \text{ mm}$

$b / T = 5.8 \times \varepsilon \leq 9 \times \varepsilon$

Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force

$F_v = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 102.2 \text{ kN}$

$d / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area

$A_v = t \times D = 2161 \text{ mm}^2$

Design shear resistance

$P_v = 0.6 \times p_y \times A_v = 356.6 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment

$M = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) = 127.8 \text{ kNm}$

Moment capacity low shear - cl.4.2.5.2

$M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) = 148.3 \text{ kNm}$

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

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Limiting deflection

$$\delta_{lim} = L_{s1} / 360 = \mathbf{13.889 \text{ mm}}$$

Maximum deflection span 1

$$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = \mathbf{6.117 \text{ mm}}$$

PASS - Maximum deflection does not exceed deflection limit