Tekla Tedds	Project	97 Longmeadows Harwich		Job no. 17_861
CPS Architecture + Design Limited 7 Middleborough Colchester Essex	Calcs for	Beam B		Start page no./Revision 1
	Calcs by AF	Calcs date 25/03/2020	Checked by AF	Checked date	Approved by AF	Approved date

STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.05

Load Envelope - Combination 1

Bending Moment Envelope

Shear Force Envelope
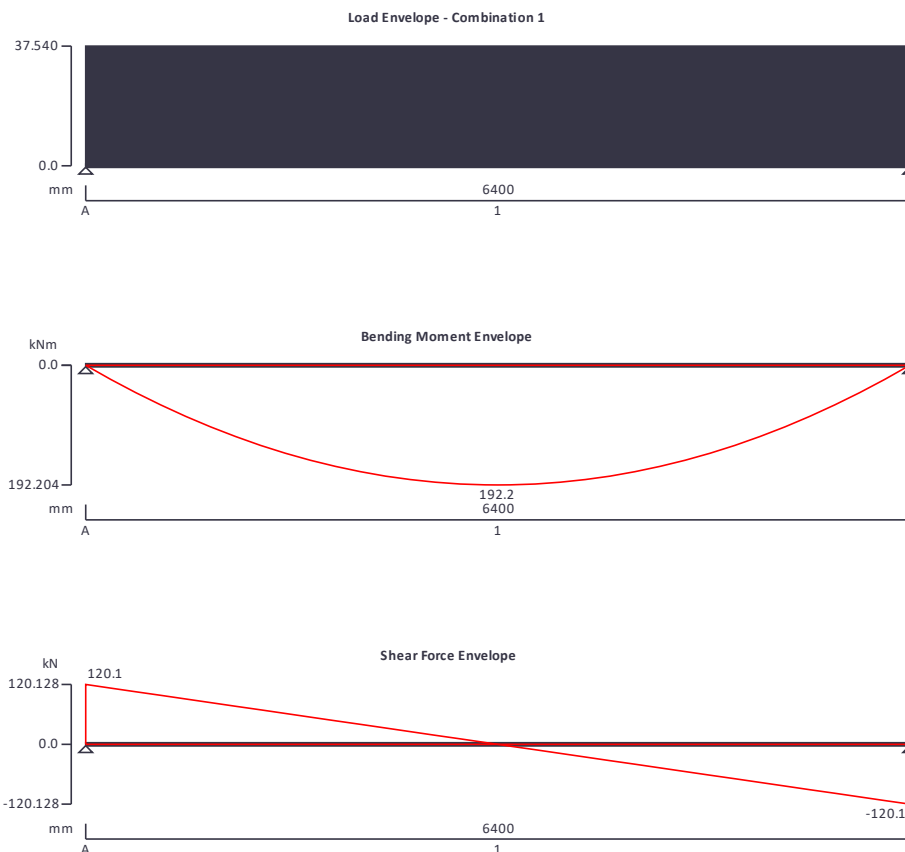
Support conditions

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

Applied loading

Beam loads
floor - Dead full UDL 0.8 kN/m
floor - Imposed full UDL 2.4 kN/m
roof - Dead full UDL 3.6 kN/m
roof - Imposed full UDL 2.6 kN/m
roof - Dead full UDL 1.5 kN/m
roof - Imposed full UDL 1.1 kN/m
wall - Dead full UDL 13 kN/m
Dead self weight of beam $\times$ 1

Load combinations

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

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Dead × 1.40

Imposed × 1.60

Support B

Dead × 1.40

Imposed × 1.60

Analysis results

Maximum moment M_{max} = **192.2 kNm** M_{min} = **0 kNm**

Maximum shear V_{max} = **120.1 kN** V_{min} = **-120.1 kN**

Deflection δ_{max} = **14.4 mm** δ_{min} = **0 mm**

Maximum reaction at support A R_{A_max} = **120.1 kN** R_{A_min} = **120.1 kN**

Unfactored dead load reaction at support A R_{A_Dead} = **63.5 kN**

Unfactored imposed load reaction at support A $R_{A\_Imposed}$ = **19.5 kN**

Maximum reaction at support B R_{B_max} = **120.1 kN** R_{B_min} = **120.1 kN**

Unfactored dead load reaction at support B R_{B_Dead} = **63.5 kN**

Unfactored imposed load reaction at support B $R_{B\_Imposed}$ = **19.5 kN**

Section details

Section type   **2 x UKB 305x127x48 (Tata Steel Advance)**

Steel grade   **S275**

From table 9: Design strength p_y

Thickness of element   max(T, t) = **14.0 mm**

Design strength p_y = **275 N/mm^2**

Modulus of elasticity   E = **205000 N/mm^2**
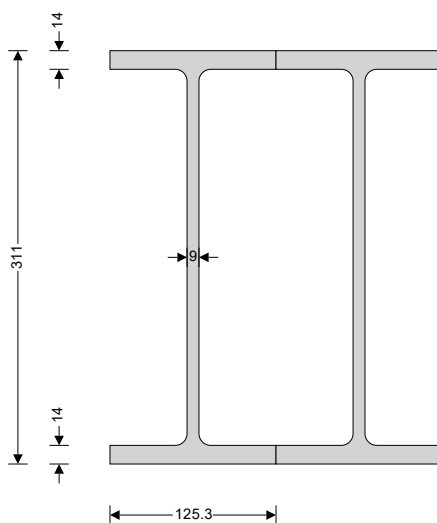
Lateral restraint

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**

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Internal compression parts - Table 11

Depth of section d = **265.2** mm

$d / t = 29.5 \times \varepsilon \leq 80 \times \varepsilon$ Class 1 plastic

Outstand flanges - Table 11

Width of section $b = B / 2 =$ **62.7** mm

$b / T = 4.5 \times \varepsilon \leq 9 \times \varepsilon$ Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force $F_v = max(abs(V_{max}), abs(V_{min})) =$ **120.1** kN

$d / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area $A_v = t \times D =$ **2799** mm^2

Design shear resistance $P_v = 0.6 \times N \times p_y \times A_v =$ **923.7** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment $M = max(abs(M_{s1\_max}), abs(M_{s1\_min})) =$ **192.2** kNm

Moment capacity low shear - cl.4.2.5.2 $M_c = N \times min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) =$ **390.9** kNm

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection $\delta_{lim} = L_{s1} / 360 =$ **17.778** mm

Maximum deflection span 1 $\delta = max(abs(\delta_{max}), abs(\delta_{min})) =$ **14.437** mm

PASS - Maximum deflection does not exceed deflection limit