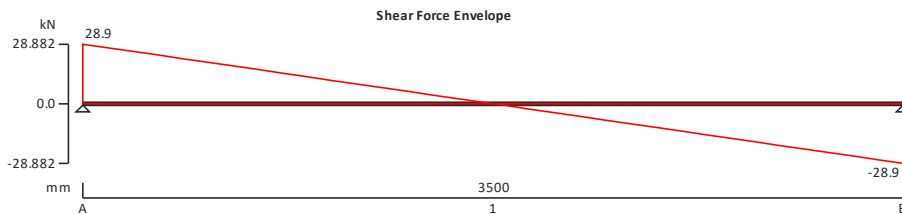
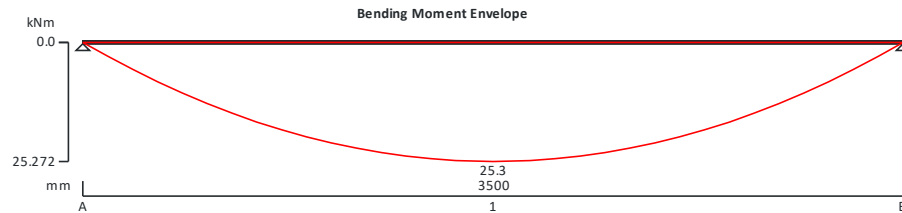
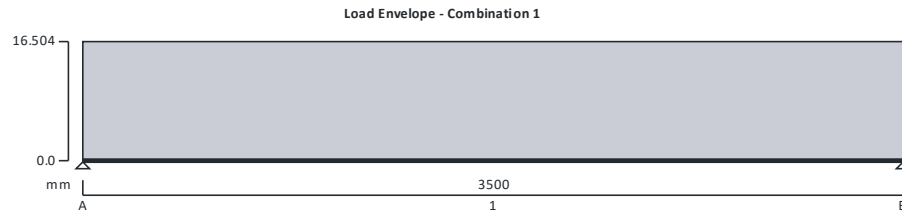


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Calcs for LEWIS WILLETTS				Start page no./Revision 1 A	
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**STEEL BEAM ANALYSIS & DESIGN (EN1993-1-1:2005)**

In accordance with EN1993-1-1:2005 incorporating Corrigenda February 2006 and April 2009 and the UK national annex

TEDDS calculation version 3.0.14



**Support conditions**

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

**Applied loading**

Beam loads	Permanent self weight of beam × 1 FLOOR - Permanent full UDL 7 kN/m WALL - Permanent full UDL 5 kN/m
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**Load combinations**

Load combination 1	Support A	Permanent × 1.35 Variable × 1.50 Permanent × 1.35 Variable × 1.50
	Support B	Permanent × 1.35 Variable × 1.50

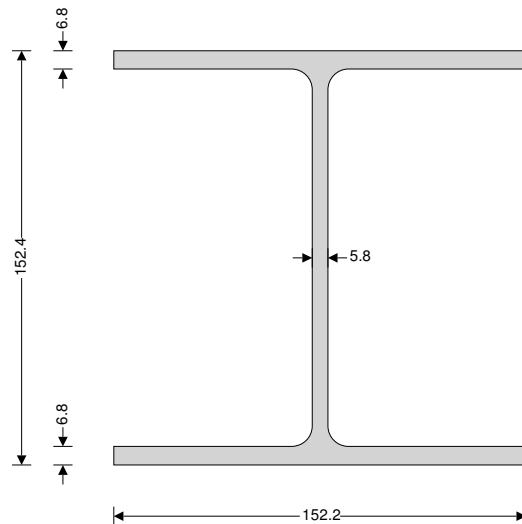
Project 47a NORTH ROAD - BEAM C				Job no. AB/10201	
Calcs for LEWIS WILLETTS				Start page no./Revision 2 A	
Calcs by AB	Calcs date 24/01/2024	Checked by DC	Checked date 24/01/2024	Approved by DC	Approved date 24/01/2024

**Analysis results**

Maximum moment	$M_{max} = 25.3 \text{ kNm}$	$M_{min} = 0 \text{ kNm}$
Maximum shear	$V_{max} = 28.9 \text{ kN}$	$V_{min} = -28.9 \text{ kN}$
Deflection	$\delta_{max} = 0 \text{ mm}$	$\delta_{min} = 0 \text{ mm}$
Maximum reaction at support A	$R_{A\_max} = 28.9 \text{ kN}$	$R_{A\_min} = 28.9 \text{ kN}$
Unfactored permanent load reaction at support A	$R_{A\_Permanent} = 21.4 \text{ kN}$	
Maximum reaction at support B	$R_{B\_max} = 28.9 \text{ kN}$	$R_{B\_min} = 28.9 \text{ kN}$
Unfactored permanent load reaction at support B	$R_{B\_Permanent} = 21.4 \text{ kN}$	

**Section details**

Section type	<b>UC 152x152x23 (BS4-1)</b>
Steel grade	<b>S275</b>
<b>EN 10025-2:2004 - Hot rolled products of structural steels</b>	
Nominal thickness of element	$t = \max(t_f, t_w) = 6.8 \text{ mm}$
Nominal yield strength	$f_y = 275 \text{ N/mm}^2$
Nominal ultimate tensile strength	$f_u = 410 \text{ N/mm}^2$
Modulus of elasticity	$E = 210000 \text{ N/mm}^2$



**Partial factors - Section 6.1**

Resistance of cross-sections	$\gamma_{M0} = 1.00$
Resistance of members to instability	$\gamma_{M1} = 1.00$
Resistance of tensile members to fracture	$\gamma_{M2} = 1.10$

**Lateral restraint**

Span 1 has full lateral restraint

**Effective length factors**

Effective length factor in major axis	$K_y = 1.000$
Effective length factor in minor axis	$K_z = 1.000$
Effective length factor for torsion	$K_{LT,A} = 1.000$
	$K_{LT,B} = 1.000$

**Classification of cross sections - Section 5.5**

$$\epsilon = \sqrt{[235 \text{ N/mm}^2 / f_y]} = 0.92$$

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**Internal compression parts subject to bending - Table 5.2 (sheet 1 of 3)**

Width of section  $c = d = 123.6$  mm  
 $c / t_w = 23.1 \times \epsilon \leq 72 \times \epsilon$  Class 1

**Outstand flanges - Table 5.2 (sheet 2 of 3)**

Width of section  $c = (b - t_w - 2 \times r) / 2 = 65.6$  mm  
 $c / t_f = 10.4 \times \epsilon \leq 14 \times \epsilon$  Class 3

**Section is class 3**

**Check shear - Section 6.2.6**

Height of web  $h_w = h - 2 \times t_f = 138.8$  mm

Shear area factor  $\eta = 1.000$   
 $h_w / t_w < 72 \times \epsilon / \eta$

**Shear buckling resistance can be ignored**

Design shear force  $V_{Ed} = \max(\text{abs}(V_{max}), \text{abs}(V_{min})) = 28.9$  kN

Shear area - cl 6.2.6(3)  $A_v = \max(A - 2 \times b \times t_f + (t_w + 2 \times r) \times t_f, \eta \times h_w \times t_w) = 997$  mm<sup>2</sup>

Design shear resistance - cl 6.2.6(2)  $V_{pl,Rd} = A_v \times (f_y / \sqrt{3}) / \gamma_{M0} = 158.4$  kN

**PASS - Design shear resistance exceeds design shear force**

**Check bending moment major (y-y) axis - Section 6.2.5**

Design bending moment  $M_{Ed} = \max(\text{abs}(M_{s1\_max}), \text{abs}(M_{s1\_min})) = 25.3$  kNm

Design bending resistance moment - eq 6.14  $M_{c,Rd} = M_{el,Rd} = W_{el,y} \times f_y / \gamma_{M0} = 45.1$  kNm

**PASS - Design bending resistance moment exceeds design bending moment**

**Check vertical deflection - Section 7.2.1**

Consider deflection due to variable loads

Limiting deflection  $\delta_{lim} = L_{s1} / 360 = 9.7$  mm

Maximum deflection span 1  $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 0$  mm

**PASS - Maximum deflection does not exceed deflection limit**