Steel Beam Calculation

Beam design for new opening to be created over existing door to lounge in order to create open plan area. Point load assumed as factored beam end reaction of 30.85kN when taking account of the permanent safety factor.

Beam details

152 x 89 x 16 UB S275

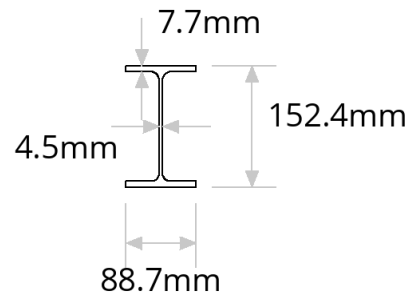Beam effective span length: **2.15 metres**

Width: **88.7 mm**
Depth: **152.4 mm**
Web: **4.5 mm**
Flange: **7.7 mm**
Radius: **7.6 mm**
Mass per metre: **16 kg/m**

Safety factors, restraints & deflection limits

Permanent load safety factor: **1.35**
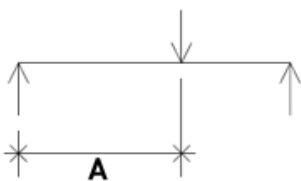Variable load safety factor: **1.5**

Beam is fully restrained along its length: **No**
Length between lateral restraints: **2.15 metres**

Variable load deflection limit: **Span/360 = 5.97 mm**
Total load deflection limit: **Span/300 = 7.17 mm**

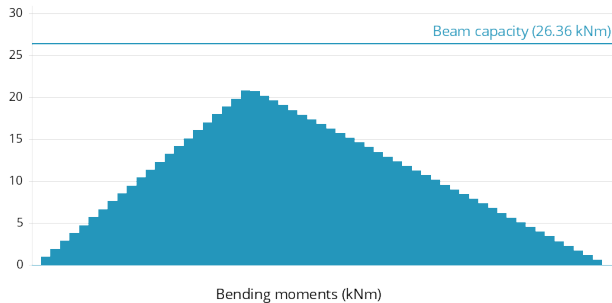## Load details

Point load 1: Point load of lounge beam
Distance to point load (**A** in diagram): **0.8 metres**
Permanent (dead) load: **30.85 kN**
Variable (live) load: **0 kN**

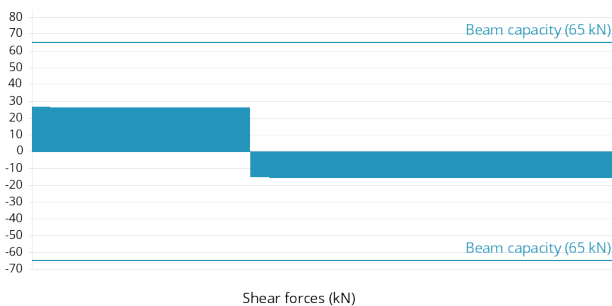# Calculations

Bending moments (kNm)

Bending moments
$M_{c,y}$ = 33.8kNm > 20.73kNm, <mark>Therefore OK</mark>
$M_{c,y}$ value from Tata Steel 'blue book' to BS EN 1993-1-1
M_b = 26.36kNm > 20.73kNm, <mark>Therefore OK</mark>
M_b value INTERPOLATED from Tata Steel 'Blue Book' to BS EN 1993-1-1
C_1 value conservatively taken as 1.0
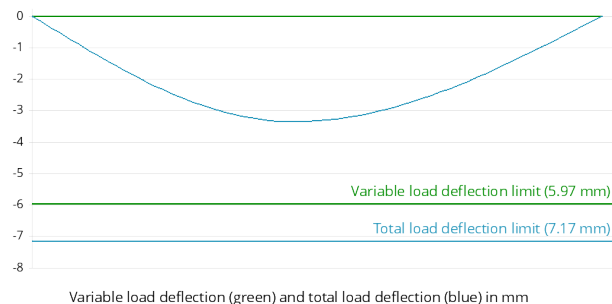

Shear forces (kN)

Shear forces
Shear capacity V_c = 130kN x 0.5 = 65kN > 26.38kN, <mark>Therefore OK</mark>
Shear Capacity, V_c from Tata Steel 'Blue Book' to BS EN 1993 -1-1
Reduction of moment resistance by high coincident shear force has been avoided by checking that the shear force is no more than 50% of the shear resistance

Variable load deflection (green) and total load deflection (blue) in mm

Deflection
Variable load deflection = 0mm < 5.97mm, <mark>Therefore OK</mark>
Total load deflection = 3.37mm < 7.17mm, <mark>Therefore OK</mark>

Notes

$M_{c,y}$ value from Tata Steel 'Blue Book' to BS EN 1993-1-1

M_b value interpolated from Tata Steel 'Blue Book' to BS EN 1993-1-1

C_1 value conservatively taken as 1.0

Shear Capacity, V_c from Tata Steel 'Blue Book' to BS EN 1993-1-1

Reduction of moment resistance by high coincident shear force has been avoided by checking that the shear force is not more than 50% of the shear resistance

Ends of beam are to be laterally restrained. Ends of beams can be laterally restrained using one of the following methods;

1) End of beam built into masonry wall.
2) End of beam fixed to a masonry wall.
3) End of beam fixed to a column or a beam.

The designer is to ensure that the proposed detail adequately ensures that the end of the beam is laterally restrained.

No allowance has been made for destabilising loads which are outside the scope of these calculations (Destabilising loads would not normally occur in a traditional masonry structure)