Project	Project number
High Gables, Straight Road, Boxted, Colchester, CO4 5QN	PA-2021-67
Calcs for	Date
Mr Ralph Keeble	29 Apr 2021

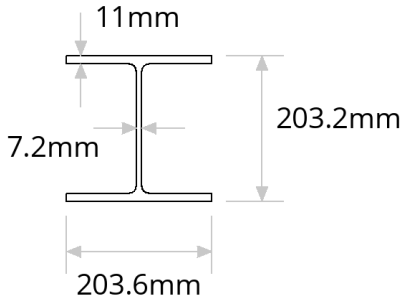
Steel Beam Calculation

Beam details

203 x 203 x 46 UC S275

Beam effective span length: **2.65 metres**

Width: **203.6 mm**
Depth: **203.2 mm**
Web: **7.2 mm**
Flange: **11 mm**
Radius: **10.2 mm**
Mass per metre: **46.1 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: **2.65 metres**

Variable load deflection limit: **Span/360 = 7.36 mm**
Total load deflection limit: **Span/200 = 13.25 mm**

Load details

UDL 1: Sloping roof, 0° to 30°

Permanent (dead) load per square metre: **1.15 kN/m^2**

Variable (live) load per square metre: **0.75 kN/m^2**

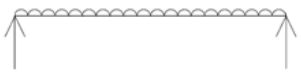
Width of load perpendicular to beam, or height of load supported by beam: **4.5 metres**

UDL 2: Ceiling beneath sloping roof

Permanent (dead) load per square metre: **0.3 kN/m^2**

Variable (live) load per square metre: **0.25 kN/m^2**

Width of load perpendicular to beam, or height of load supported by beam: **4.5 metres**



UDL 3: Timber floor (domestic dwelling)

Permanent (dead) load per square metre: **0.6 kN/m^2**

Variable (live) load per square metre: **1.5 kN/m^2**

Width of load perpendicular to beam, or height of load supported by beam: **4.5 metres**

Project	Project number
High Gables, Straight Road, Boxted, Colchester, CO4 5QN	PA-2021-67
Calcs for	Date
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UDL 4: 102.5mm Brickwork + Plaster or render on ONE side

Permanent (dead) load per square metre: **2.25 kN/m²**

Variable (live) load per square metre: **0 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **3 metres**

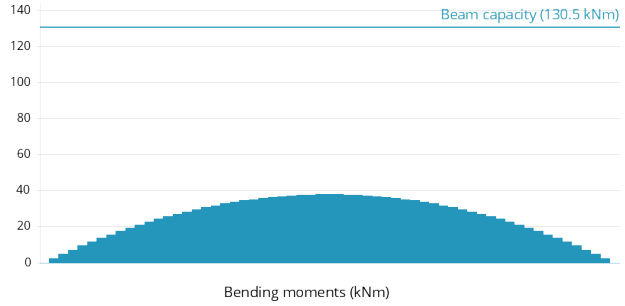
UDL 5: 100mm Lightweight blockwork + Plaster or render on ONE side

Permanent (dead) load per square metre: **1 kN/m²**

Variable (live) load per square metre: **0 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **3 metres**

Calculations



Bending moments (kNm)

Bending moments

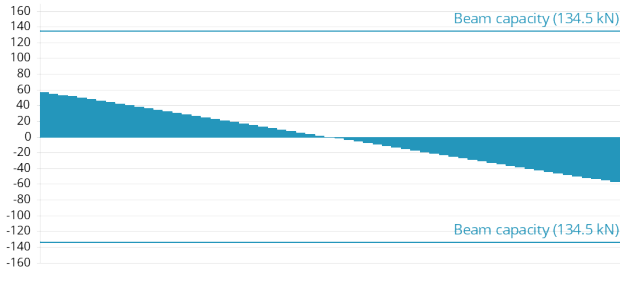
Mc,y = 137kNm > 37.84kNm, Therefore OK

Mc,y value from Tata Steel 'blue book' to BS EN 1993-1-1

Mb = 130.5kNm > 37.84kNm, Therefore OK

Mb value INTERPOLATED from Tata Steel 'Blue Book' to BS EN 1993-1-1

C1 value conservatively taken as 1.0



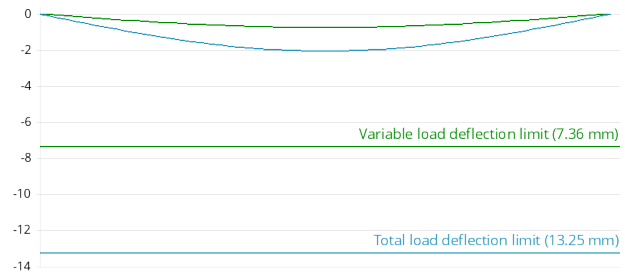
Shear forces (kN)

Shear forces

Shear capacity Vc = 269kN x 0.5 = 134.5kN > 57.11kN, Therefore OK

Shear Capacity, Vc 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 = 0.75mm < 7.36mm, Therefore OK

Total load deflection = 2.05mm < 13.25mm, Therefore OK

Notes

Mc,y value from Tata Steel 'Blue Book' to BS EN 1993-1-1

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

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C1 value conservatively taken as 1.0

Shear Capacity, Vc 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)