

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Steel Beam Calculation

Calculation was made by steelbeamcalculator.co.uk

This calculation for beam I 11

Beam details

203 x 102 x 23 UB S275

Beam effective span length: **3.41 metres**

Width: **101.8 mm**

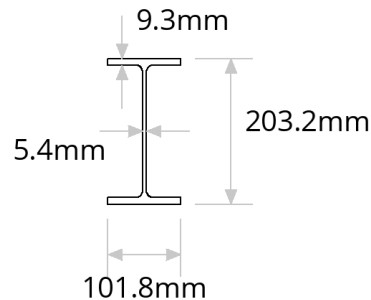
Depth: **203.2 mm**

Web: **5.4 mm**

Flange: **9.3 mm**

Radius: **7.6 mm**

Mass per metre: **23.1 kg/m**



Safety factors, restraints & deflection limits

Permanent load safety factor: **1.35**

Variable load safety factor: **1.5**

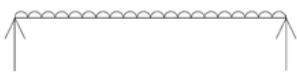
Beam is fully restrained along its length: **No**

Length between lateral restraints: **3.41 metres**

Variable load deflection limit: **Span/360 = 9.47 mm**

Total load deflection limit: **Span/200 = 17.05 mm**

Load details



UDL 1: Sloping roof, 30° to 45°

Permanent (dead) load per square metre: **1.41 kN/m²**

Variable (live) load per square metre: **0.75 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.925 metres**



UDL 2: Ceiling beneath sloping roof

Permanent (dead) load per square metre: **0.3 kN/m²**

Variable (live) load per square metre: **0.25 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.35 metres**

Project 11 Walerley Drive, Prescott L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021



UDL 3: 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: **2.88 metres**

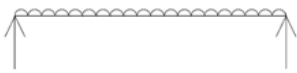


UDL 4: Lightweight timber stud partitions, on floor plan

Permanent (dead) load per square metre: **0 kN/m²**

Variable (live) load per square metre: **0.25 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.35 metres**



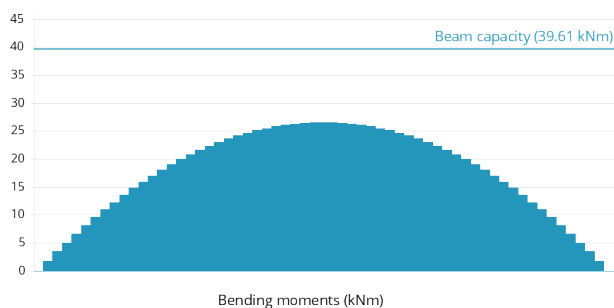
UDL 5: 100mm Lightweight blockwork + Plaster or render on ONE side

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: **1.35 metres**

Calculations



Bending moments

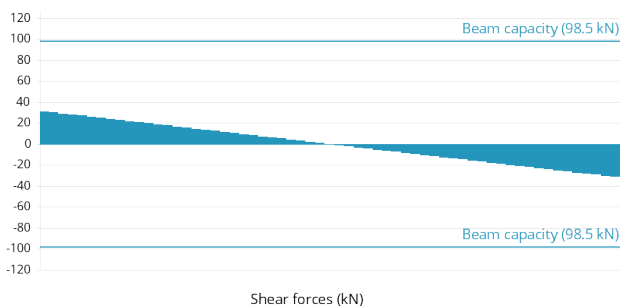
Mc,y = 64.4kNm > 26.55kNm, Therefore OK

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

Mb = 39.61kNm > 26.55kNm, Therefore OK

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

C1 value conservatively taken as 1.0



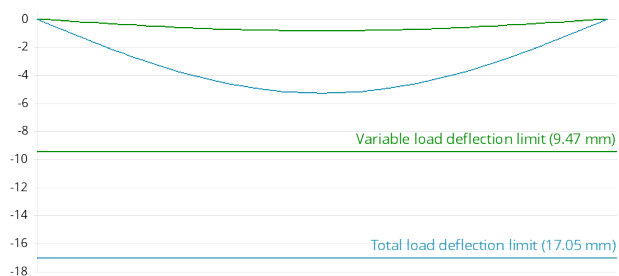
Shear forces

Shear capacity Vc = 197kN x 0.5 = 98.5kN > 31.14kN, 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

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021



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

Deflection

Variable load deflection = 0.84mm < 9.47mm,

Therefore OK

Total load deflection = 5.29mm < 17.05mm,

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

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)

Project 11 Walerley Drive, Prescott L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Steel Beam Calculation

Calculation was made by steelbeamcalculator.co.uk

This calculation is for beam I 21

Beam details

203 x 133 x 25 UB S275

Beam effective span length: **4 metres**

Width: **133.2 mm**

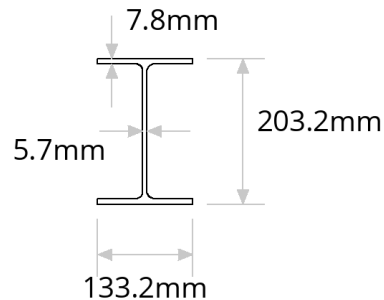
Depth: **203.2 mm**

Web: **5.7 mm**

Flange: **7.8 mm**

Radius: **7.6 mm**

Mass per metre: **25.1 kg/m**



Safety factors, restraints & deflection limits

Permanent load safety factor: **1.35**

Variable load safety factor: **1.5**

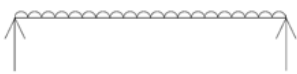
Beam is fully restrained along its length: **No**

Length between lateral restraints: **4 metres**

Variable load deflection limit: **Span/360 = 11.11 mm**

Total load deflection limit: **Span/200 = 20 mm**

Load details



UDL 1: Sloping roof, 30° to 45°

Permanent (dead) load per square metre: **1.41 kN/m²**

Variable (live) load per square metre: **0.75 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.925 metres**



UDL 2: Ceiling beneath sloping roof

Permanent (dead) load per square metre: **0.3 kN/m²**

Variable (live) load per square metre: **0.25 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.35 metres**

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021



UDL 3: 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: **2.88 metres**



UDL 4: Lightweight timber stud partitions, on floor plan

Permanent (dead) load per square metre: **0 kN/m²**

Variable (live) load per square metre: **0.25 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.35 metres**



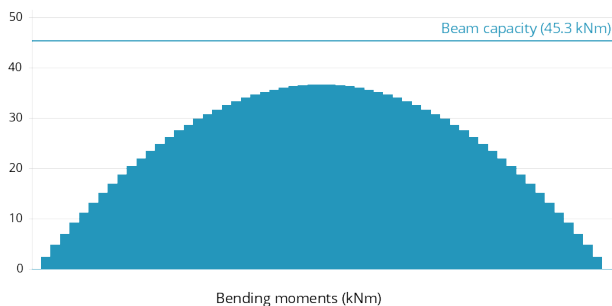
UDL 5: 100mm Lightweight blockwork + Plaster or render on ONE side

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: **1.35 metres**

Calculations



Bending moments

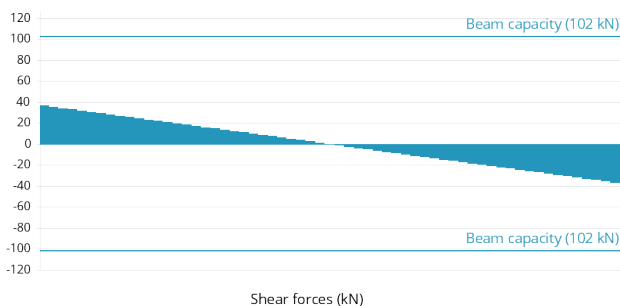
Mc,y = 71kNm > 36.58kNm, Therefore OK

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

Mb = 45.3kNm > 36.58kNm, Therefore OK

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

C1 value conservatively taken as 1.0



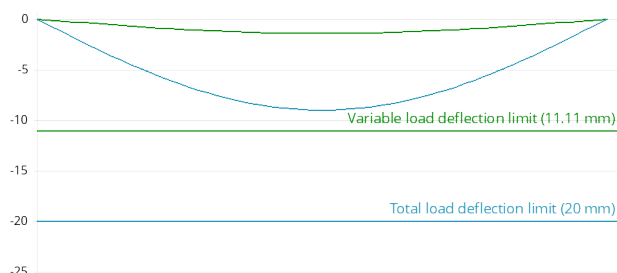
Shear forces

Shear capacity Vc = 204kN x 0.5 = 102kN > 36.58kN, 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

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021



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

Deflection

Variable load deflection = 1.44mm < 11.11mm,

Therefore OK

Total load deflection = 9.03mm < 20mm, **Therefore**

OK

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)

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Steel Beam Calculation

Calculation was made by steelbeamcalculator.co.uk

This calculation is for beam I3

Beam details

254 x 146 x 37 UB S275

Beam effective span length: **6.8 metres**

Width: **146.4 mm**

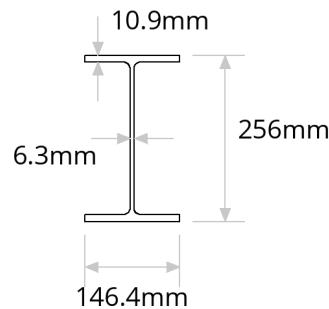
Depth: **256 mm**

Web: **6.3 mm**

Flange: **10.9 mm**

Radius: **7.6 mm**

Mass per metre: **37 kg/m**



Safety factors, restraints & deflection limits

Permanent load safety factor: **1.35**

Variable load safety factor: **1.5**

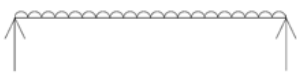
Beam is fully restrained along its length: **No**

Length between lateral restraints: **6.8 metres**

Variable load deflection limit: **Span/360 = 18.89 mm**

Total load deflection limit: **Span/200 = 34 mm**

Load details



UDL 1: Sloping roof, 0° to 30°

Permanent (dead) load per square metre: **1.15 kN/m²**

Variable (live) load per square metre: **0.75 kN/m²**

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



UDL 2: Ceiling beneath sloping roof

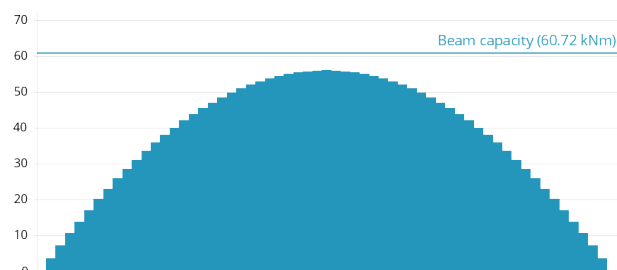
Permanent (dead) load per square metre: **0.3 kN/m²**

Variable (live) load per square metre: **0.25 kN/m²**

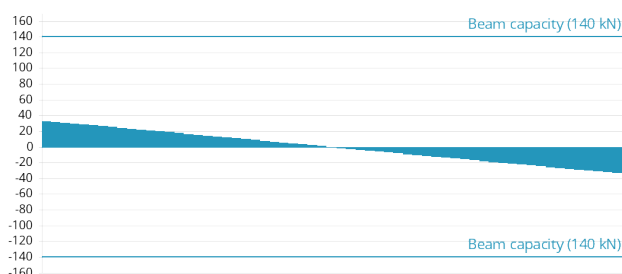
Width of load perpendicular to beam, or height of load supported by beam: **1.5 metres**

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

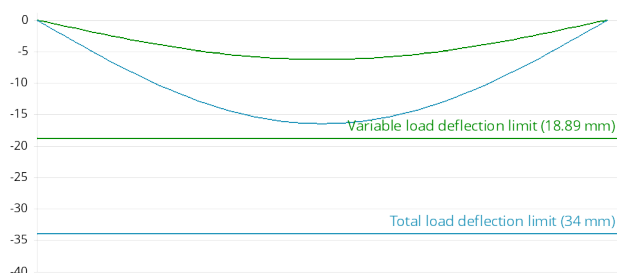
Calculations



Bending moments (kNm)



Shear forces (kN)



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

Bending moments

$M_{c,y} = 133\text{kNm} > 56.02\text{kNm}$, Therefore OK

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

$M_b = 60.72\text{kNm} > 56.02\text{kNm}$, Therefore OK

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

C1 value conservatively taken as 1.0

Shear forces

Shear capacity $V_c = 280\text{kN} \times 0.5 = 140\text{kN} > 32.95\text{kN}$, Therefore OK

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

Deflection

Variable load deflection = $6.29\text{mm} < 18.89\text{mm}$, Therefore OK

Total load deflection = $16.49\text{mm} < 34\text{mm}$, Therefore OK

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

C1 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)

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Steel Beam Calculation

Calculation is made by steelbeamcalculator.co.uk

This calculation is for beam I12

Beam details

203 x 102 x 23 UB S275

Beam effective span length: **3.41 metres**

Width: **101.8 mm**

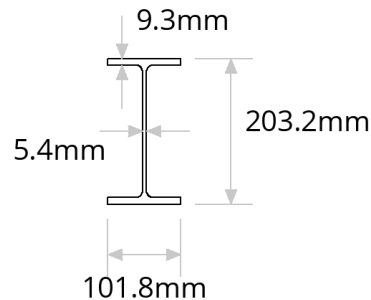
Depth: **203.2 mm**

Web: **5.4 mm**

Flange: **9.3 mm**

Radius: **7.6 mm**

Mass per metre: **23.1 kg/m**



Safety factors, restraints & deflection limits

Permanent load safety factor: **1.35**

Variable load safety factor: **1.5**

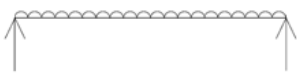
Beam is fully restrained along its length: **No**

Length between lateral restraints: **3.41 metres**

Variable load deflection limit: **Span/360 = 9.47 mm**

Total load deflection limit: **Span/200 = 17.05 mm**

Load details



UDL 1: Sloping roof, 0° to 30°

Permanent (dead) load per square metre: **1.15 kN/m²**

Variable (live) load per square metre: **0.75 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.5 metres**



UDL 2: 102.5mm Brickwork + Plaster or render on ONE side

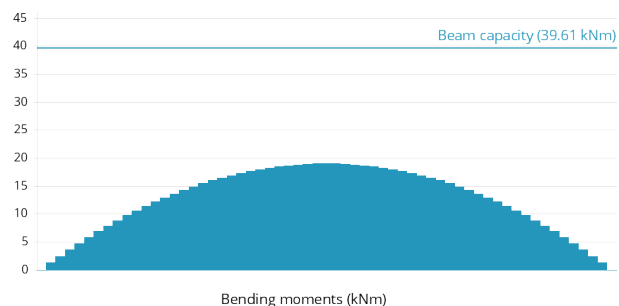
Permanent (dead) load per square metre: **2.25 kN/m²**

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

Width of load perpendicular to beam, or height of load supported by beam: **2.88 metres**

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Calculations



Bending moments

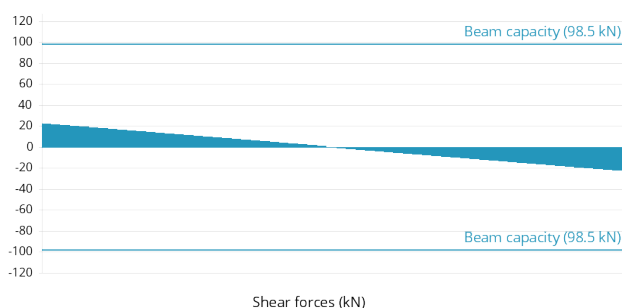
$M_{c,y} = 64.4\text{kNm} > 19\text{kNm}$, Therefore OK

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

$M_b = 39.61\text{kNm} > 19\text{kNm}$, Therefore OK

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

C_1 value conservatively taken as 1.0

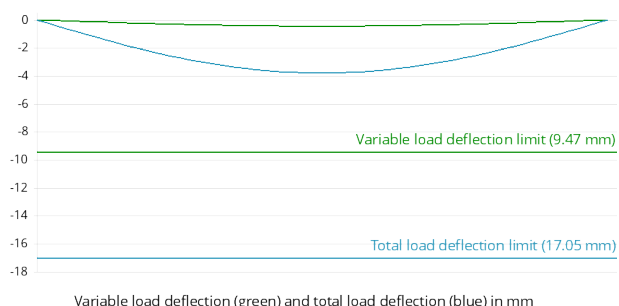


Shear forces

Shear capacity $V_c = 197\text{kN} \times 0.5 = 98.5\text{kN} > 22.28\text{kN}$, Therefore OK

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



Deflection

Variable load deflection = $0.45\text{mm} < 9.47\text{mm}$, Therefore OK

Total load deflection = $3.81\text{mm} < 17.05\text{mm}$, Therefore OK

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)

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Steel Beam Calculation

Calculation was made by steelbeamcalculator.co.uk

This calculation is for beam I22

Beam details

203 x 102 x 23 UB S275

Beam effective span length: **4 metres**

Width: **101.8 mm**

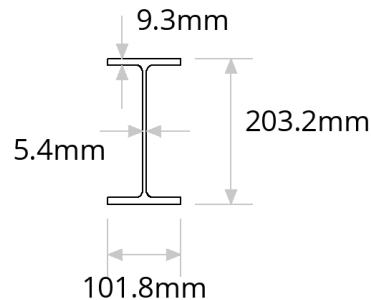
Depth: **203.2 mm**

Web: **5.4 mm**

Flange: **9.3 mm**

Radius: **7.6 mm**

Mass per metre: **23.1 kg/m**



Safety factors, restraints & deflection limits

Permanent load safety factor: **1.35**

Variable load safety factor: **1.5**

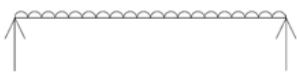
Beam is fully restrained along its length: **No**

Length between lateral restraints: **4 metres**

Variable load deflection limit: **Span/360 = 11.11 mm**

Total load deflection limit: **Span/200 = 20 mm**

Load details



UDL 1: Sloping roof, 0° to 30°

Permanent (dead) load per square metre: **1.15 kN/m²**

Variable (live) load per square metre: **0.75 kN/m²**

Width of load perpendicular to beam, or height of load supported by beam: **1.5 metres**



UDL 2: 102.5mm Brickwork + Plaster or render on ONE side

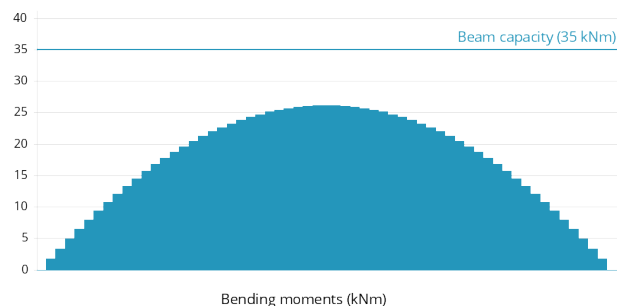
Permanent (dead) load per square metre: **2.25 kN/m²**

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

Width of load perpendicular to beam, or height of load supported by beam: **2.88 metres**

Project 11 Walerley Drive, Prescot L341PU	Project number
Calcs for Chase Construction NW Ltd	Date 23 Feb 2021

Calculations



Bending moments

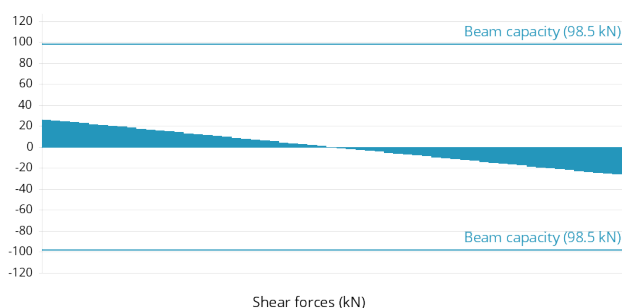
$M_{c,y} = 64.4\text{kNm} > 26.14\text{kNm}$, Therefore OK

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

$M_b = 35\text{kNm} > 26.14\text{kNm}$, Therefore OK

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

C_1 value conservatively taken as 1.0

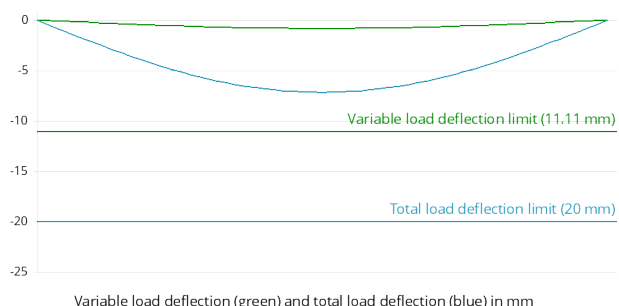


Shear forces

Shear capacity $V_c = 197\text{kN} \times 0.5 = 98.5\text{kN} > 26.14\text{kN}$, Therefore OK

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



Deflection

Variable load deflection = $0.85\text{mm} < 11.11\text{mm}$, Therefore OK

Total load deflection = $7.21\text{mm} < 20\text{mm}$, Therefore OK

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)