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CSS Ref:	P00607
Document:	Structural Calculation Package
Project Address:	64 Muswell Hill-N10 3JR
Date:	April 2025
Engineer:	Daniel Kamalach

Table Of Contents

1.0 Design Philosophy

The design of the structural elements will be carried out in such a way to limit the impact of the structural works on the existing building construction and that of the neighbouring properties.

This structural design package is carried out in accordance with the relevant British Standards.

This is solely a Permanent Works Structural Design package and does not include any Temporary Works documentation. Temporary works remains the Contractor's responsibility unless a Temporary Works Co-ordinator is appointed.

Note: Calculations are subject to building control approval. Any works carried out prior to approval of calculations by building control are at own risk.

Deflection Limits:

Beams supporting existing masonry	= span/500 Total Load
Beams supporting new structure	= span/360 Live Load
Beams supporting new structure	= span/200 Total Load

Bearing Pressures:

A site specific geotechnical investigation has not been carried out however BGS website has indicated clay soil. Foundation depths for new trench footings have been determined considering NHBC CH4.2. An allowable bearing pressure of 100 kPa will be used in the design of foundations. Local building inspector required to confirm bearing conditions on site prior to pouring new concrete foundations.

Existing Masonry

Existing masonry is to be assessed in accordance with guidance given in CIRIA Report 111 ie, for UNFACTORED LOADS

i) Basic brick compressive strength = 0.42 N/mm2

ii) Enhancement under bearings = 1.5

iii) Therefore padstones to be sized on the basis of a bearing stress of

(0.42 x 1.5 =) 0.63 N/mm2

2.0. Loadings (Service Loads SL)

Pitched Roof

Dead Loads	
Slate and felt	0.30 kN/m^2
Boards and joists	0.25 kN/m^2
Ceiling	0.25 kN/m^2
Services	0.15 kN/m^2
Total Dead Load	**1.00 kN/m^2**
Imposed Load Roof (maintenance)	0.75 kN/m^2
Total Imposed Loading	**0.75 kN/m^2**

Timber Floors

Dead Loads	
Boards and joists	0.30 kN/m^2
Ceiling	0.15 kN/m^2
Services	0.15 kN/m^2
Total Dead Load	**0.50 kN/m^2**
Imposed Load	**1.50 kN/m^2**
Partitions (on plan)	**0.60 kN/m^2**

Walls Loads (on elevation)

Stud Partitions	0.50 kN/m^2
225 Brickwork + Plaster	5.30 kN/m^2

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3.0 STRUCTURAL DESIGN CALCULATIONS

ROOF

TJ1

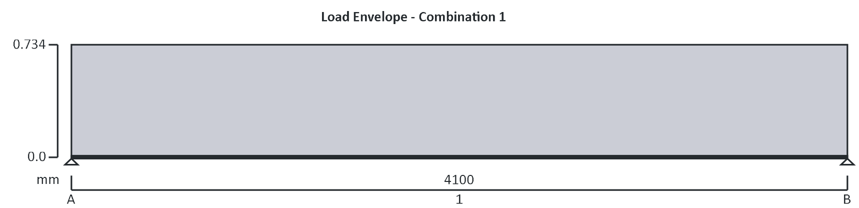
Joist length = 4.1m

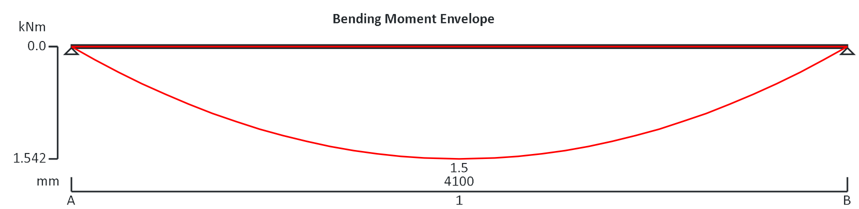
DL= 1 x 0.4= 0.4kN/m , IL= 0.75 x 0.4= 0.3kN/m

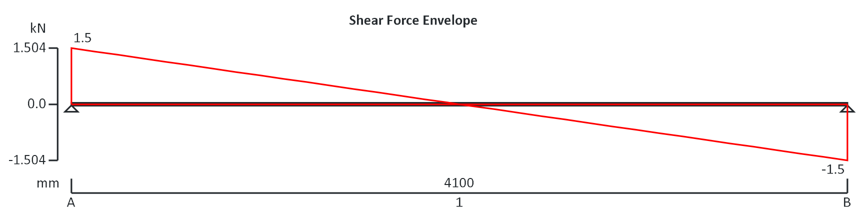
TIMBER BEAM ANALYSIS & DESIGN (BS5268)

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.03







Applied loading

Beam loads

Dead self weight of beam × 1

Dead full UDL 0.400 kN/m

Imposed full UDL 0.300 kN/m

Load combinations

Load combination 1	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00

Support B — Dead × 1.00

Imposed × 1.00

Analysis results

Design moment M = **1.542** kNm — Design shear F = **1.504** kN

Total load on beam W_{tot} = **3.009** kN

Reactions at support A R_{A_max} = **1.504** kN — R_{A_min} = **1.504** kN

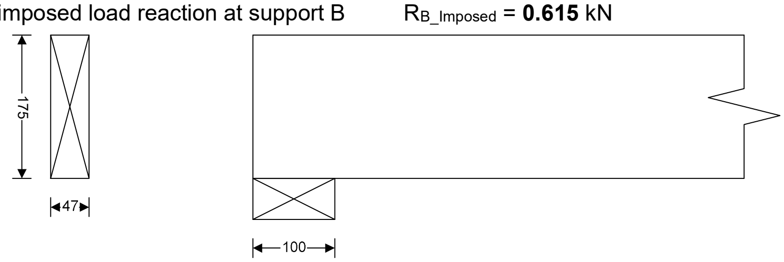
Unfactored dead load reaction at support A R_{A_Dead} = **0.889** kN

Unfactored imposed load reaction at support A $R_{A\_Imposed}$ = **0.615** kN

Reactions at support B R_{B_max} = **1.504** kN — R_{B_min} = **1.504** kN

Unfactored dead load reaction at support B R_{B_Dead} = **0.889** kN

Unfactored imposed load reaction at support B $R_{B\_Imposed}$ = **0.615** kN



Timber section details

Breadth of section b = **47** mm — Depth of section h = **175** mm

Number of sections N = **1** — Breadth of beam b_b = **47** mm

Timber strength class **C24**

Member details

Service class of timber **1** — Load duration **Long term**

Length of span L_{s1} = **4100** mm

Length of bearing L_b = **100** mm

The beam is part of a load-sharing system consisting of four or more members

Lateral support - cl.2.10.8

Permiss.depth-to-breadth ratio **5.00** — Actual depth-to-breadth ratio **3.72**

PASS - Lateral support is adequate

Check bearing stress

Permissible bearing stress σ_{c_adm} = **2.640** N/mm^2 — Applied bearing stress σ_{c_a} = **0.320** N/mm^2

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permissible bending stress σ_{m_adm} = **8.754** N/mm^2 — Applied bending stress σ_{m_a} = **6.428** N/mm^2

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress τ_{adm} = **0.781** N/mm^2 — Applied shear stress τ_a = **0.274** N/mm^2

PASS - Applied shear stress is less than permissible shear stress

Deflection

Permissible deflection δ_{adm} = **12.300** mm — Total deflection δ_a = **12.244** mm

PASS - Total deflection is less than permissible deflection

FLITCH BEAM

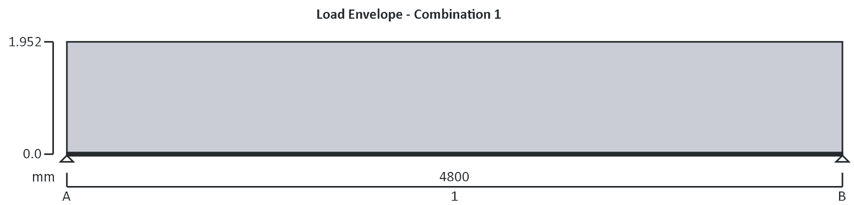
Beam length = 4.2m

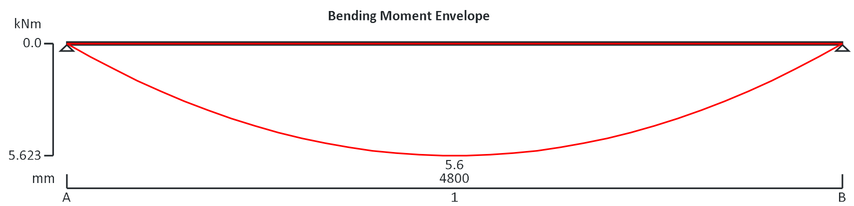
DL= 1 x 2/2= 1kN/m , IL= 0.75 x 2/2= 0.75kN/m

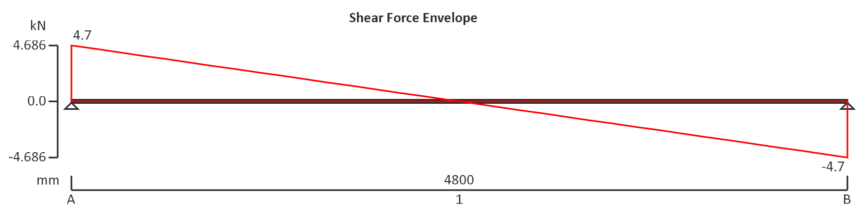
TIMBER BEAM ANALYSIS & DESIGN (BS5268)

FLITCH BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.03







Applied loading

Beam loads

Dead self weight of beam × 1

Dead full UDL 1.000 kN/m

Imposed full UDL 0.750 kN/m

Load combinations

Load combination 1	Support A	Dead × 1.00
		Imposed × 1.00
	Span 1	Dead × 1.00
		Imposed × 1.00
	Support B	Dead × 1.00
		Imposed × 1.00

Analysis results

Design moment $M = \mathbf{5.623}$ kNm Design shear $F = \mathbf{4.686}$ kN

Total load on beam $W_{tot} = \mathbf{9.372}$ kN

Reactions at support A $R_{A\_max} = \mathbf{4.686}$ kN $R_{A\_min} = \mathbf{4.686}$ kN

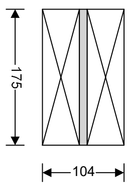
Unfactored dead load reaction at support A $R_{A\_Dead} = \mathbf{2.886}$ kN

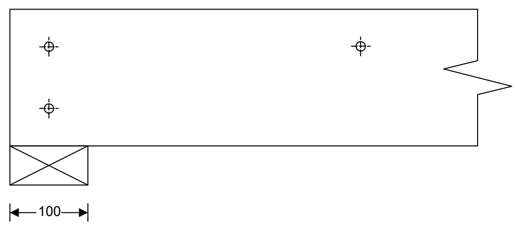
Unfactored imposed load reaction at support A $R_{A\_Imposed} = \mathbf{1.800}$ kN

Reactions at support B $R_{B\_max} = \mathbf{4.686}$ kN $R_{B\_min} = \mathbf{4.686}$ kN

Unfactored dead load reaction at support B $R_{B\_Dead} = \mathbf{2.886}$ kN

Unfactored imposed load reaction at support B $R_{B\_Imposed} = \mathbf{1.800}$ kN





Timber section details

Breadth of section $b = \mathbf{47}$ mm Depth of section $h = \mathbf{175}$ mm

Number of sections $N = \mathbf{2}$

Timber strength class **C24**

Steel section details

Breadth of steel plate $b_s = \mathbf{10}$ mm Depth of steel plate $h_s = \mathbf{175}$ mm

Number of steel plates in beam $N_s = \mathbf{1}$ Steel stress $p_y = \mathbf{165}$ N/mm^2

Bolt diameter $\phi_b = \mathbf{12}$ mm Maximum bolt spacing $S_{max} = \mathbf{400}$ mm

Member details

Service class of timber **2** Load duration **Long term**

Length of span $L_{s1} = \mathbf{4800}$ mm

Length of bearing $L_b = \mathbf{100}$ mm

Lateral support - cl.2.10.8

Permiss.depth-to-breadth ratio **5.00** Actual depth-to-breadth ratio **1.68**

PASS - Lateral support is adequate

Check bearing stress

Permissible bearing stress $\sigma_{c\_adm} = \mathbf{2.400}$ N/mm^2 Applied bearing stress $\sigma_{c\_a} = \mathbf{0.499}$ N/mm^2

PASS - Applied compressive stress is less than permissible compressive stress at bearing

Bending parallel to grain

Permiss. timber bending stress $\sigma_{m\_adm} = \mathbf{7.958}$ N/mm^2 Applied timber bending stress $\sigma_{m\_a} = \mathbf{3.882}$ N/mm^2

PASS - Timber bending stress is less than permissible timber bending stress

Permiss. steel bending stress $p_y = \mathbf{165.000}$ N/mm^2 Applied steel bending stress $\sigma_{m\_a\_s} = \mathbf{100.292}$ N/mm^2

PASS - Steel bending stress is less than permissible steel bending stress

Shear parallel to grain

Permissible shear stress $\tau_{adm} = \mathbf{0.710}$ N/mm^2 Applied shear stress $\tau_a = \mathbf{0.142}$ N/mm^2

PASS - Applied shear stress is less than permissible shear stress

Deflection

Permissible deflection $\delta_{adm} = \mathbf{13.995}$ mm Total deflection $\delta_a = \mathbf{10.466}$ mm

PASS - Total deflection is less than permissible deflection

Flitch plate bolting requirements

Bolts required at beam end N_{be} = **2.000** Bolts required to beam length N_{bl} = **2.424**

- Provide a minimum of 2 No.12 mm diameter bolts at each support
- Provide 12 mm diameter bolts at a maximum of 400 mm centres along the length of the beam

Minimum bolt spacings

Minimum end spacing S_{end} = **48** mm Minimum edge spacing S_{edge} = **48** mm

Minimum bolt spacing S_{bolt} = **48** mm

Minimum washer diameter ϕ_w = **36** mm Minimum washer thickness t_w = **3.0** mm

B1-1/2/3

Load will be the same however, beam length varies

B1-1= 2.9m

B1-2= 1.4m

B1-3= 2.6m

UDL=

Roof

DL= 1 x 5/2= 2.5kN/m , IL= 0.6x 5/2= 1.5kN/m

2nd Floor + 1st floor

DL= 0.8 x 5/2 x2= 4kN/m , IL= 1.5x 5/2x2=7.5kN/m

Wall selfweight

DL= 5.3x 6.5= 34.5kN/m

Total

DL= 2.5+4+34.5=41kN/m , IL= 1.5+7.5=9kN/m

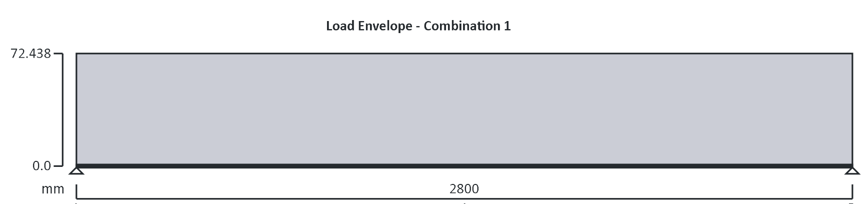
B1-1

STEEL BEAM ANALYSIS & DESIGN (BS5950)

STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.08



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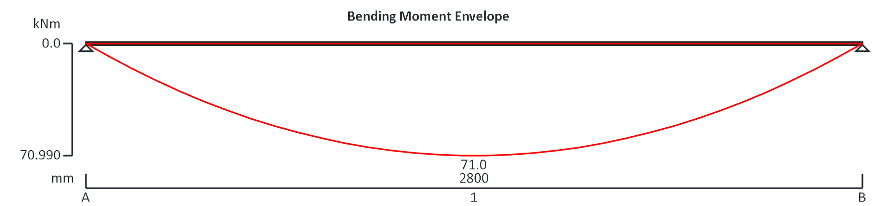
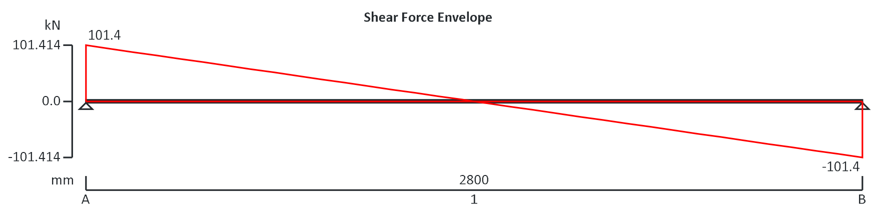




Support conditions

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

Applied loading

Beam loads	Dead self weight of beam × 1
	Dead full UDL 41 kN/m
	Imposed full UDL 9 kN/m

Load combinations

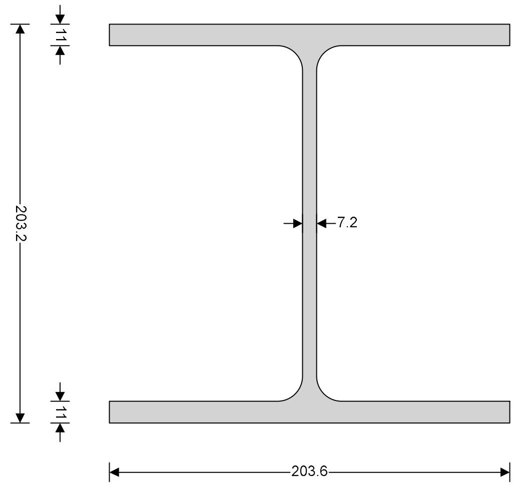
Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **71** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **101.4** kN	V_{min} = **-101.4** kN
Deflection	δ_{max} = **4.3** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **101.4** kN	R_{A_min} = **101.4** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **58** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **12.6** kN	
Maximum reaction at support B	R_{B_max} = **101.4** kN	R_{B_min} = **101.4** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **58** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **12.6** kN	

Section details

Section type **UC 203x203x46 (British Steel Section Range 2022 (BS4-1))** Steel grade **S355**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **0.88** Section classification **Semi-compact**

Shear capacity - Section 4.2.3

Design shear force F_v = **101.4** kN Design shear resistance P_v = **311.6** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **71** kNm Moment capacity low shear M_c = **175.6** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **154.1** kNm M_b / m_{LT} = **166.6** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection δ_{lim} = **5.6** mm Maximum deflection δ = **4.278** mm

PASS - Maximum deflection does not exceed deflection limit

B1-2

STEEL BEAM ANALYSIS & DESIGN (BS5950)

STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.08

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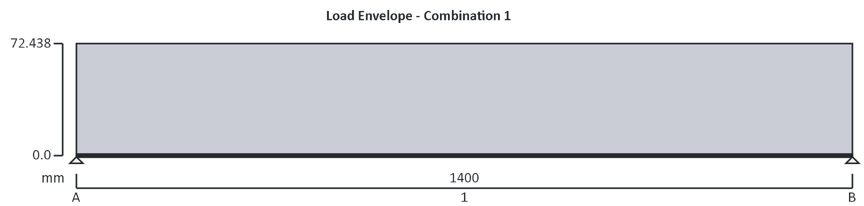
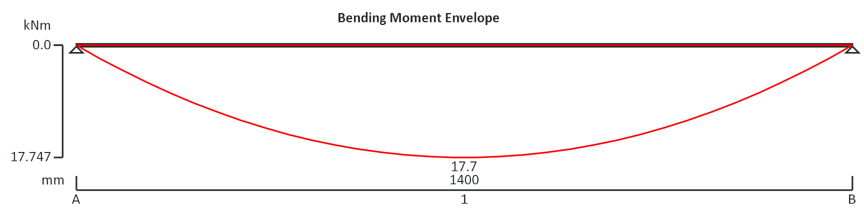
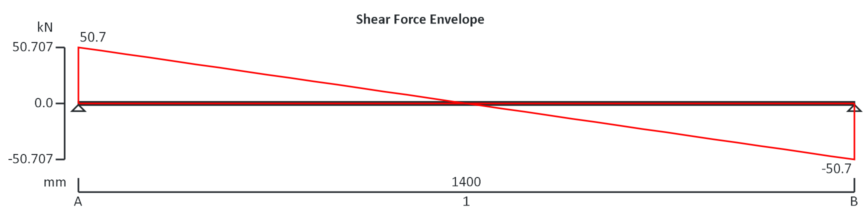






Support conditions

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

Applied loading

Beam loads	Dead self weight of beam × 1
	Dead full UDL 41 kN/m
	Imposed full UDL 9 kN/m

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **17.7** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **50.7** kN	V_{min} = **-50.7** kN
Deflection	δ_{max} = **0.3** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **50.7** kN	R_{A_min} = **50.7** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **29** kN	

Unfactored imposed load reaction at support A $R_{A\_Imposed}$ = **6.3** kN

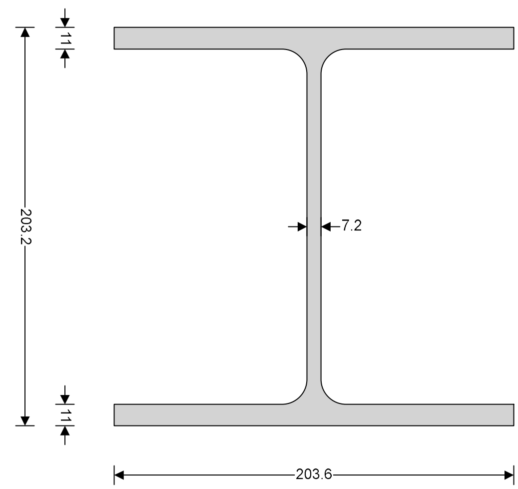
Maximum reaction at support B R_{B_max} = **50.7** kN R_{B_min} = **50.7** kN

Unfactored dead load reaction at support B R_{B_Dead} = **29** kN

Unfactored imposed load reaction at support B $R_{B\_Imposed}$ = **6.3** kN

Section details

Section type **UC 203x203x46 (British Steel Section Range 2022 (BS4-1))** Steel grade **S355**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **0.88** Section classification **Semi-compact**

Shear capacity - Section 4.2.3

Design shear force F_v = **50.7** kN Design shear resistance P_v = **311.6** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **17.7** kNm Moment capacity low shear M_c = **175.6** kNm

Buckling resistance moment - Section 4.3.6.4

Bending strength p_b = **355** N/mm^2 Buckling resistance moment M_b = **175.6** 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 δ_{lim} = **2.8** mm Maximum deflection δ = **0.267** mm

PASS - Maximum deflection does not exceed deflection limit

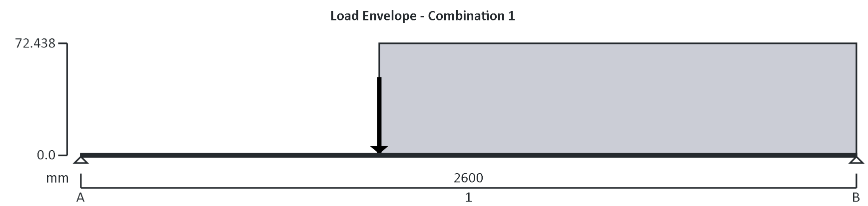
B1-3

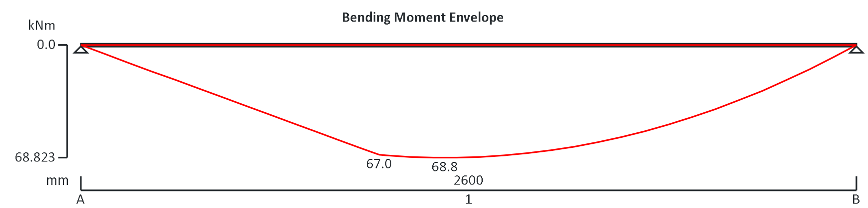
STEEL BEAM ANALYSIS & DESIGN (BS5950)

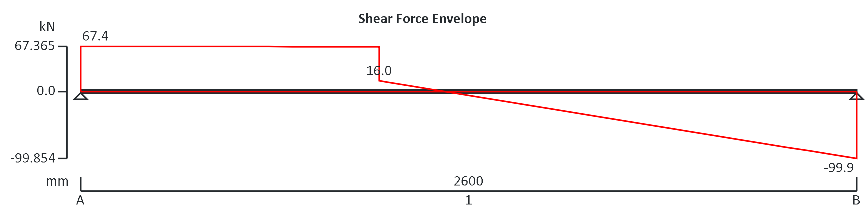
STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.08







Support conditions

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

Applied loading

Beam loads	Dead self weight of beam × 1 Dead partial UDL 41 kN/m from 1000 mm to 2600 mm Imposed partial UDL 9 kN/m from 1000 mm to 2600 mm Dead point load 29 kN at 1000 mm Imposed point load 6.3 kN at 1000 mm

Load combinations

Load combination 1	Support A	Dead × 1.40 Imposed × 1.60 Dead × 1.40 Imposed × 1.60

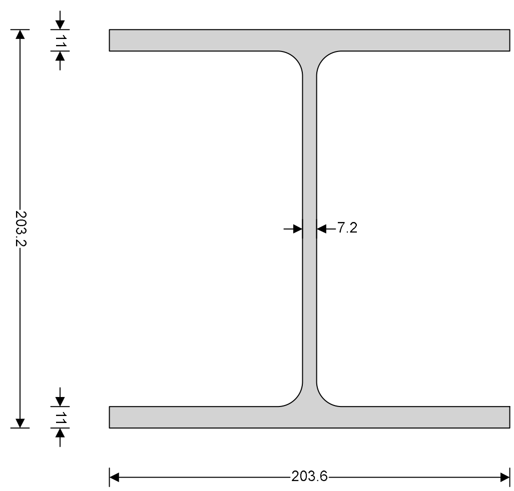
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **68.8** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **67.4** kN	V_{min} = **-99.9** kN
Deflection	δ_{max} = **3.4** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **67.4** kN	R_{A_min} = **67.4** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **38.6** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **8.3** kN	
Maximum reaction at support B	R_{B_max} = **99.9** kN	R_{B_min} = **99.9** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **57.2** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **12.4** kN	

Section details

Section type **UC 203x203x46 (British Steel Section Range 2022 (BS4-1))** Steel grade **S355**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **0.88** Section classification **Semi-compact**

Shear capacity - Section 4.2.3

Design shear force F_v = **99.9** kN Design shear resistance P_v = **311.6** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **68.8** kNm Moment capacity low shear M_c = **175.6** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **158.1** kNm M_b / m_{LT} = **175.3** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection δ_{lim} = **5.2** mm Maximum deflection δ = **3.44** mm

PASS - Maximum deflection does not exceed deflection limit

PADSTONE

PS1

ULS= 102kN – shared between 2 padstone so each padstone will carry 51kN

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = 51.00 kN (factored) Variable Load Safety Factor = 1.5
Factored Load at End of Beam Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = 2.6 N/mm² (Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
(A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)

Width of beam end bearing = 100 mm
Length of beam end bearing = 100 mm

γm = 3.0

Bearing Factor = 1.25

Results

Maximum Bearing Stress = 1.08 N/mm²
Actual Bearing Stress = 5.10 N/mm²

Padstone Required

Padstone Results

Characteristic strength of Padstone = 30.0 N/mm² (A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
(Concrete C15 = 15 N/mm²)
(Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

Width of Padstone = 140 mm
Length of Padstone = 400 mm

Allowable padstone stress = 12.50 N/mm²
Stress under beam end bearing = 5.10 N/mm² Therefore Padstone Stress OK
Allowable masonry stress = 1.08 N/mm²
Stress under padstone = 0.91 N/mm² Therefore Masonry Stress OK

PS2

68kN uls

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = 68.00 kN (factored)
Factored Load at End of Beam

Variable Load Safety Factor = 1.5
Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = 4.2 N/mm²
Width of beam end bearing = 100 mm
Length of beam end bearing = 100 mm

(Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
(A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)

$\gamma m = 3.0$

Bearing Factor = 1.25

Results

Maximum Bearing Stress = 1.75 N/mm²
Actual Bearing Stress = 6.80 N/mm²

Padstone Required

Padstone Results

Characteristic strength of Padstone = 30.0 N/mm²
Width of Padstone = 100 mm
Length of Padstone = 440 mm

(A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
(Concrete C15 = 15 N/mm²)
(Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

Allowable padstone stress = 12.50 N/mm²
Stress under beam end bearing = 6.80 N/mm² — Therefore Padstone Stress OK
Allowable masonry stress = 1.75 N/mm²
Stress under padstone = 1.55 N/mm² — Therefore Masonry Stress OK

PS3

51kN ULS

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = 51.00 kN (factored) Variable Load Safety Factor = 1.5
Factored Load at End of Beam Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = 2.6 N/mm² (Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
Width of beam end bearing = 100 mm (A Engineering Brick = 13.2 N/mm²)
Length of beam end bearing = 100 mm (B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)

γm = 3.0

Bearing Factor = 1.25

Results

Maximum Bearing Stress = 1.08 N/mm²
Actual Bearing Stress = 5.10 N/mm²

Padstone Required

Padstone Results

Characteristic strength of Padstone = 30.0 N/mm² (A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
Width of Padstone = 140 mm (Concrete C15 = 15 N/mm²)
Length of Padstone = 400 mm (Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

Allowable padstone stress = 12.50 N/mm²
Stress under beam end bearing = 5.10 N/mm² Therefore Padstone Stress OK
Allowable masonry stress = 1.08 N/mm²
Stress under padstone = 0.91 N/mm² Therefore Masonry Stress OK

PS4

100kN

COMPLIES WITH LATEST EUROPEAN DESIGN CODES

structural calculations for padstones

Beam End Reaction = 100.00 kN (factored) Variable Load Safety Factor = 1.5
Factored Load at End of Beam Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = 4.2 N/mm² (Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
Width of beam end bearing = 100 mm (A Engineering Brick = 13.2 N/mm²)
Length of beam end bearing = 100 mm (B Engineering Brick = 10.5 N/mm²)
(Weak Brickwork = approx 2.8 N/mm²)
(7.3N Blockwork usually = 4.2 N/mm²)
(10.4N Blockwork usually = 5.4 N/mm²)

$\gamma m = 3.0$

Bearing Factor = 1.25

Results

Maximum Bearing Stress = 1.75 N/mm²
Actual Bearing Stress = 10.00 N/mm²

Padstone Required

Padstone Results

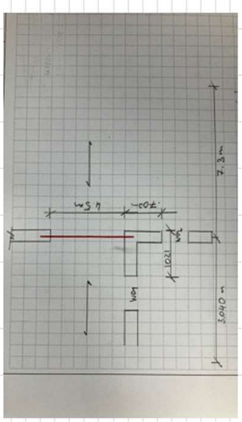
Characteristic strength of Padstone = 30.0 N/mm² (A Engineering Brick = 13.2 N/mm²)
(B Engineering Brick = 10.5 N/mm²)
Width of Padstone = 100 mm (Concrete C15 = 15 N/mm²)
Length of Padstone = 600 mm (Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

Allowable padstone stress = 12.50 N/mm²
Stress under beam end bearing = 10.00 N/mm² Therefore Padstone Stress OK
Allowable masonry stress = 1.75 N/mm²
Stress under padstone = 1.67 N/mm² Therefore Masonry Stress OK

	Project				Job Ref.	
	64 Muswell Hill-N10 3JR				P00607	
	Section				Sheet no./rev.	
	Structural Calculation Package				20	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	DK	April 25				

PIER CHECK BELOW B1-1

Below Typical arrangement of steel support to Brick pier support



BS 5628

d) — Constructed with aggregate concrete blocks having not more than 25% of formed voids and a ratio of height to least horizontal dimension of between 2.0 and 4.5

Mortar strength Class/Designation	Compressive strength of unit (N/mm²)ᵃ								
	2.9	3.6	5.2	7.3	10.4	17.5	22.5	30	40 or greater
M12 / (i)	2.8	3.5	5.0	6.8	8.8	12.5	15.0	18.7	22.1
M6 / (ii)	2.8	3.5	5.0	6.4	8.4	11.1	13.0	15.9	18.7
M4 / (iii)	2.8	3.5	5.0	6.4	8.2	10.1	12.0	14.5	16.8
M2 / (iv)	2.8	3.5	4.4	5.6	7.0	9.1	10.5	12.5	14.5

Formula to work out strength of blockwork requirement

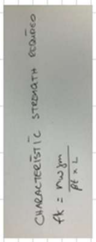


Table 4 — Partial safety factors for material strength

	Category of masonry units	Category of construction control	
		Special	Normal
Compression, γ_m	Category I	2.5	3.1
	Category II	2.8	3.5
Flexure, γ_m	Category I and II	2.5	3.0

Table 7 — Capacity reduction factor, β

Slenderness ratio h_{ef}/t_{ef}	Eccentricity at top of wall, e_x			
	Up to 0.05t (see Note 1)	0.1t	0.2t	0.3t
0	1.00	0.88	0.66	0.44
6	1.00	0.88	0.66	0.44
8	1.00	0.88	0.66	0.44
10	0.97	0.88	0.66	0.44
12	0.93	0.87	0.66	0.44
14	0.89	0.83	0.66	0.44
16	0.83	0.77	0.64	0.44
18	0.77	0.70	0.57	0.44
20	0.70	0.64	0.51	0.37
22	0.62	0.56	0.43	0.30
24	0.53	0.47	0.34	
26	0.45	0.38		
27	0.40	0.33		

NOTE 1 It is not necessary to consider the effects of eccentricities up to and including 0.05t.
NOTE 2 Linear interpolation between eccentricities and slenderness ratios is permitted.
NOTE 3 The derivation of β is given in Annex B.

Total pier length (m)	0.6
Area reduction factor	1.02
Wall height (m)	2.3
structural floor depth (m)	0
Wall thickness (m)	0.35
outer leaf thickness	0
t_{ef} cavity =	0.234
h_{ef} =	1.725
SR hef/tef =	7.38
table 7 β =	0.63

Load take down on to pier	Nw	102	(ULS)	1.4DL + 1.6LL
Compression partial safety factor	γm	3.5		

fk 2.7 n/mm2 check this value is within strength of table above

0.05t

	1	2	Interpolated value
x	14	16	7.38
y	0.83	0.89	0.63

0.1t

	1	2	Interpolated value
x	14	16	7.38
y	0.83	0.77	1.03

	1	2	Interpolated value
*t	0.1	0.05	0.005 t
y	1.03	0.63	0.27

Based on the loading the wall is adquate to carry the loading. All other walls are very load and the load has greater load distruption, by inspection works.

B+B BEAM AND BLOCK

Worst case span is 5m for standard dormstic imposed load 1.5kN/m2 a Bison Precast/Forterra IJ3 can span 5.3m therefore ok

BISON REF	BEAM SIZE (MM)	EFFECTIVE BEAM CENTRES (MM)	SLAB SELF WEIGHT KN/M²	SPANS INDICATED BELOW ALLOW FOR CHARACTERISTIC IMPOSED LOAD PLUS SELF WEIGHT PLUS 1.8KN/M² FOR FINISHES — CHARACTERISTIC IMPOSED LOAD KN/M² 1.5	2.0	2.5	3	4	5
				Clear span (m)					
IJ1	150 x 125	525	1.86	4.10	3.90	3.75	3.60	3.35	3.10
IJ2	150 x 125	413	1.96	4.55	4.35	4.20	4.00	3.75	3.50
IJ3	150 x 125	300	2.15	5.30	5.05	4.85	4.65	4.35	4.10
RDJ4	150 x 215	615	2.10	5.35	5.10	4.90	4.75	4.40	4.15
RDJ5	150 x 215	503	2.25	5.85	5.60	5.40	5.20	4.85	4.55
RDJ6	150 x 215	390	2.47	6.45	6.25	6.05	5.80	5.45	5.15
TJ1	225 x 135	535	2.30	6.45	6.15	5.90	5.70	5.35	5.00
TJ2	225 x 135	422	2.51	7.10	6.80	6.55	6.35	5.95	5.60
TJ3	225 x 135	310	2.89	7.75	7.75	7.45	7.20	6.80	6.40
				ψ_0 =0.7	ψ_1 =0.5	ψ_2 =0.3	ψ_0 =0.7	ψ_1 =0.7	ψ_2 =0.6
				Category A/B - Domestic, residential / office areas				Category C/D - Congregation areas /shopping	
				FLOOR CATEGORY OF USE (FROM BS EN 1991-1-1:2002), USED FOR DETERMINING THE COMBINATION OF ACTIONS FACTORS					

BISON PRECAST

Bison Precast Hoveringham, Nottingham NG14 7JX
tel: 01636 832000 **email:** concrete@bison.co.uk

forterra.co.uk

TYPICAL FOUNDATION

Roof
DL= 1 x 2.5=2.5kN/m , IL= 0.75x 2.5= 1.9kN/m

Wall
DL= 4.4x3= 13.2kN/m

Ground floor
DL= 5 x 2.5=12.5kN/m , IL= 1.5 x 2.5= 3.75kN/m

Total
L= 2.5+1.9+13.2+12.5+3.75= 33.85=34kN/m

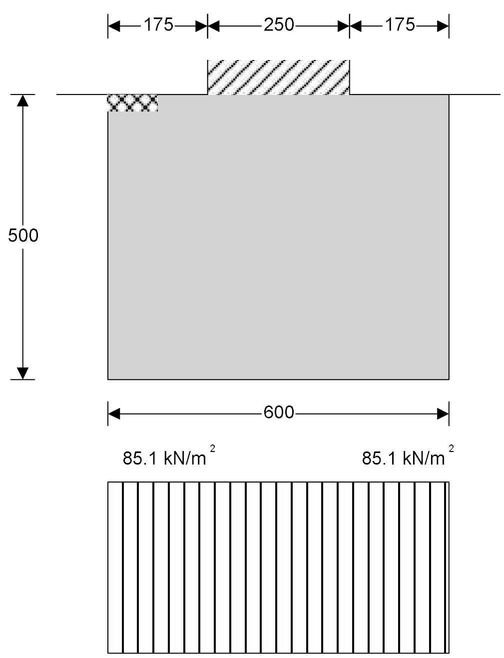
Point load = 50kN / 5= 10kN/m

Therefore 44kN/m

STRIP FOOTING ANALYSIS & DESIGN (BS8110)

STRIP FOOTING ANALYSIS AND DESIGN (BS8110-1:1997)

Tedds calculation version 2.0.07



Strip footing details

Width of strip footing	B = **600** mm	Depth of strip footing	h = **500** mm
Depth of soil over strip footing	h_{soil} = **0** mm	Density of concrete	ρ_{conc} = **23.6** kN/m^3

Load details

Load width	b = **250** mm	Load eccentricity	e_P = **0** mm

Soil details

Depth of soil over pad footing h_{soil} = **0** mm
Density of soil ρ_{soil} = **20.0** kN/m^3
Allowable bearing pressure $P_{bearing}$ = **100** kN/m^2

Axial loading on strip footing

Dead axial load P_G = **44.0** kN/m
Imposed axial load P_Q = **0.0** kN/m
Wind axial load P_W = **0.0** kN/m
Total axial load P = **44.0** kN/m

Foundation loads

Dead surcharge load F_{Gsur} = **0.000** kN/m^2
Imposed surcharge load F_{Qsur} = **0.000** kN/m^2
Strip footing self weight F_{swt} = **11.800** kN/m^2
Soil self weight F_{soil} = **0.000** kN/m^2
Total foundation load F = **7.1** kN/m

Calculate base reaction

Total base reaction T = **51.1** kN/m
Eccentricity of base reaction e_T = **0** mm

Base reaction acts within middle third of base

Calculate pad base pressures

Base pressures q_1 = **85.133** kN/m^2
q_2 = **85.133** kN/m^2
Minimum base pressure q_{min} = **85.133** kN/m^2
Maximum base pressure q_{max} = **85.133** kN/m^2

PASS - Maximum base pressure is less than allowable bearing pressure

Material details

Char.strength of concrete f_{cu} = **30** N/mm^2

Calculate minimum depth of unreinforced strip footing

Ave.pressure to left of footing q_L = **85.133** kN/m^2
Min.depth to left of footing h_{Lmin} = **175** mm
Ave.pressure to right of footing q_R = **85.133** kN/m^2
Min.depth to right of footing h_{Rmin} = **175** mm
Min.depth unreinforced footing h_{min} = **300** mm

PASS - Unreinforced strip footing depth is greater than minimum

WINDPOST

L= 0.7 x 8/4= 2.8kN/m x3= 8.4kN SWL, Use an Ancon WP2 140x70x4

Performance of WP2 Windposts to Eurocode 3

	Size	Total Uniformly Distributed Load per Post (kN, Design Resistance) for Various Windpost Spans							
	a x b x t	2.5m	3.0m	3.5m	4.0m	4.5m	5.0m	5.5m	6.0m
WP2	125x70x4	9.46	7.07	5.46	4.32	3.48	2.86	2.38	2.01
	140x70x4	12.28	9.25	7.20	5.74	4.66	3.84	3.21	2.72
	150x70x4	14.21	10.86	8.49	6.80	5.54	4.59	3.85	3.26
	130x70x6	15.83	11.93	9.30	7.42	6.03	4.98	4.17	3.53
	170x70x4	17.92	14.48	11.41	9.21	7.56	6.30	5.31	4.53
	160x70x5	20.33	15.94	12.54	10.11	8.30	6.91	5.82	4.96
	150x70x6	21.90	16.64	13.09	10.54	8.64	7.19	6.05	5.15
	170x70x5	22.75	18.29	14.44	11.69	9.63	8.04	6.79	5.80
	180x70x5	**24.76**	20.80	16.48	13.37	11.05	9.26	7.85	6.72
	150x80x8	**24.76**	22.59	17.76	14.31	11.74	9.77	8.23	7.01
	185x70x6	**24.76**	26.71	21.24	17.31	14.36	12.08	10.28	8.82
	170x80x8	**24.76**	**29.26**	23.81	19.31	15.96	13.37	11.33	9.70
	180x80x8	**24.76**	**29.26**	27.15	22.09	18.31	15.38	13.07	11.22

Note: *Table based on tie spacing of 225mm, no vertical movement joint and long leg restrained by the masonry. Figures in* **bold** *indicate capacity limited by tie capacity.*