

STRUCTURAL CALCULATIONS

FOR

SINGLE STOREY REAR EXTENSION

AT

SITE POST CODE: SE12 8AP

ON

26th SEPTEMBER 2025

BY

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REFERENCE:

CALCULATIONS ARE PREPARED IN ACCORDANCE WITH THE FOLLOWING
CODES OF PRACTICE:

BS 5268 [TIMBER SC3 GRADE]
CODE OF PRACTICE FOR USE OF TIMBER

BS 648 [WEIGHT OF BUILDING MATERIAL]
CODE OF PRACTICE FOR BUILDING MATERIAL

BS 5950 PART 1 – 2000
STRUCTURAL USE OF STEELWORK IN BUILDING

BS 5628 PART 1 – 1992
CODE OF PRACTICE FOR USE OF MASONRY

BS 6399 PART 1 – 1996
LOADING FOR BUILDINGS
[DEAD AND IMPOSED LOADS]

BS 6399 PART 3 - 1988 LOADING FOR BUILDINGS
[IMPOSED ROOF LOAD]

SPAN TABLES FOR SOLID TIMBER MEMBERS IN FLOORS, CEILINGS AND ROOFS
FOR DWELLINGS --TRADA 2004

LOAD CALCULATIONS:**FLAT ROOF**

	<u>DEAD LOAD (kN/m²)</u>	<u>LIVE LOAD (kN/m²)</u>
PLASTER BOARD	0.12	SNOW & REPAIR ACCESS = 0.75 kN/m ²
JOIST	0.18	-
FELT	0.15	-
CHIPPINGS	0.24	-
BOARDING	0.12	-
<u>TOTAL</u>	0.81 kN/m²	0.75 kN/m²

PITCHED ROOF

	<u>DEAD LOAD (kN/m²)</u>	<u>LIVE LOAD (kN/m²)</u>
RAFTERS /m ²	0.12	SNOW & REPAIR ACCESS = 0.75 kN
BATTENS	0.04	-
FELT	0.05	-
TILES	0.68	-
	0.89 (On Slope)	-
	0.89 / Cos 45 Degrees	-
	= 1.26 (On Plan)	0.75 kN/m²
<u>TOTAL</u>		

FLOOR

	<u>DEAD LOAD (kN/m²)</u>	<u>LIVE LOAD (kN/m²)</u>
CEILING	0.15	IMPOSED = 1.50 kN /m ²
JOIST	0.15	-
BOARDING	0.20	-
<u>TOTAL</u>	0.50 kN/m²	1.50 kN/m²

CEILING

	<u>DEAD LOAD (kN/m²)</u>	<u>LIVE LOAD (kN/m²)</u>
CEILING	0.25	-
	-----	-----
<u>TOTAL</u>	0.25 kN/m²	-
	-----	-----

BRICK WORK

	<u>DEAD LOAD (kN/m³)</u>	<u>LIVE LOAD (kN/m³)</u>
BRICKS	22.00	-
	-----	-----
<u>TOTAL</u>	22.00 kN/m³	-
	-----	-----

BLOCK WORK

	<u>DEAD LOAD (kN/m³)</u>	<u>LIVE LOAD (kN/m³)</u>
BLOCKS	14.00	-
	-----	-----
<u>TOTAL</u>	14.00 kN/m³	-
	-----	-----

INTERNAL STUDDING

	<u>DEAD LOAD (kN/m²)</u>	<u>LIVE LOAD (kN/m²)</u>
PLASTER BOARD	0.04	-
STUD	0.68	-
	-----	-----
<u>TOTAL</u>	0.72 kN/m²	-
	-----	-----

EXTERNAL STUDDING

	<u>DEAD LOAD (kN/m²)</u>	<u>LIVE LOAD (kN/m²)</u>
PLASTER BOARD	0.12	-
TILING	0.68	-
FELT	0.05	-
BATTENS	0.04	-
STUD	0.12	-
<u>TOTAL</u>	1.01 kN/m²	-

GENERAL AND SAFETY NOTES:

1. All dimensions, setting out and levels are to be verified on site with the architect prior to the commencement of any site work.
2. Building control approval must be obtained prior to the commencement of building works.
3. The contractor shall be responsible for and must take all necessary precautions to ensure the stability of the existing structure and earthworks on adjoining sites during the course of the contract.
4. Materials and constructions are to be in accordance with the relevant British Standards and Codes of Practice.
5. Any services or drainage which pass through the foundation are to be encased in a flexible sleeve.
6. The dimensions of all steel sections required should be measured on site by the client (or their representative contractor or steelwork fabricator). All Steel Beams to have minimum of 1/2hr Fire Resistance via 'Nullifire' Paint or 19mm Gyproc Plank tied with 1.6mm wire binding @ 100mm c/c and finished in Carlite Bonding 16mm thick.
7. It is the responsibility of the Client / Contractor to notify the designer of any discrepancies.
8. Note that all steel (Sizes & Quantity) shown on the drawings are should be checked prior to ordering any material.
9. Structural Drawings provided here are based on architectural drawings and site survey therefore are indicative only and are NOT TO SCALE.
10. All existing foundations and lintels to be exposed and to be checked for adequacy by Builder / Building Control Officer and or replaced if necessary.
11. Depth of all footings is to be approved by the local building inspector. Minimum of 1 m deep, advise engineer if footings are located within 30m of large trees or hedges. Also notify if water is struck, tree roots are found or clay soil appears very dry and brittle.

LOAD CALCULATIONS FOR STEEL BEAM 1:

CLEAR SPAN OF THE STEEL BEAM 1 = 2750mm

LOADING:

DEAD LOAD ON STEEL BEAM 1:

PITCHED ROOF = $1.26 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 1.26 \text{ kN/m}^2 \times 2.20\text{m}$$

$$= 2.77 \text{ kN/m}$$

CEILING JOISTS = $0.25 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.25 \text{ kN/m}^2 \times 2.5\text{m}$$

$$= 0.63 \text{ kN/m}$$

TIMBER FLOOR = $0.50 \text{ kN/m}^2 \times \text{SPAN OF FLOOR IN MTS}$

$$= 0.50 \text{ kN/m}^2 \times 2.5\text{m}$$

$$= 1.25 \text{ kN/m}$$

BRICK WORK = $22 \text{ kN/m}^3 \times \text{THICKNES OF WALL} \times \text{HEIGHT OF WALL IN MTS.}$
(225mm)

$$= 22 \times 0.225 \text{ kN/m}^3 \times 2.60\text{m}$$

$$= 12.87 \text{ kN/m}$$

FLAT ROOF = $0.81 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.81 \text{ kN/m}^2 \times 2.1\text{m}$$

$$= 1.70\text{kN/m}$$

THEREFORE TOTAL DEAD LOAD ON SB=2.77+0.63+1.25+12.87+1.70=19.22 kN/m

LIVE LOAD ON STEEL BEAM 1:

PITCHED ROOF = $0.75 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.75 \text{ kN/m}^2 \times 2.20\text{m}$$

$$= 1.65 \text{ kN/m}$$

CEILING JOISTS = $0.25 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.25 \text{ kN/m}^2 \times 2.5\text{m}$$

$$= 0.63 \text{ kN/m}$$

TIMBER FLOOR = $1.5 \text{ kN/m}^2 \times \text{SPAN OF FLOOR IN MTS.}$

$$= 1.5 \text{ kN/m}^2 \times 2.5\text{m}$$

$$= 3.75 \text{ kN/m}$$

FLAT ROOF = $0.75 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.75 \text{ kN/m}^2 \times 2.1\text{m}$$

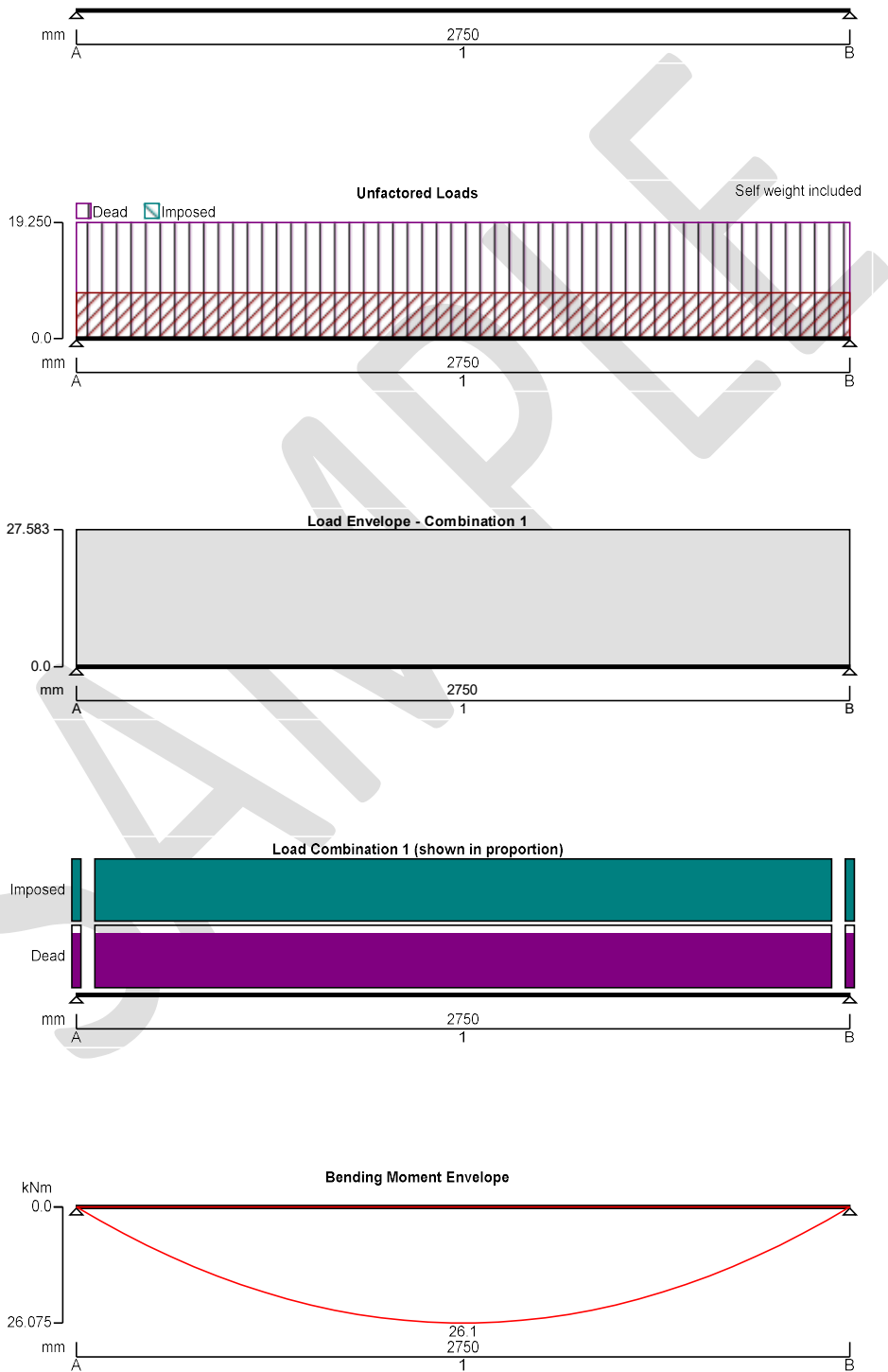
$$= 1.58 \text{ kN/m}$$

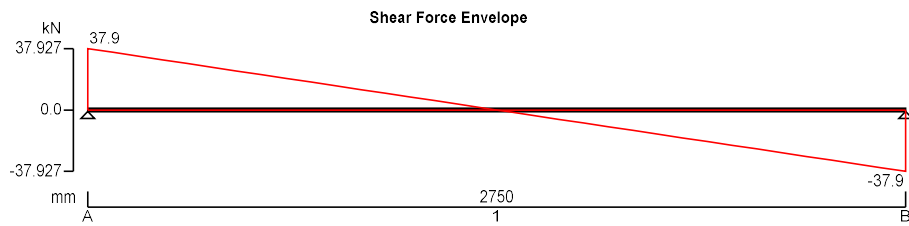
THEREFORE TOTAL LIVE LOAD ON SB1=1.65+0.63 +3.75+1.58=7.61 kN/m

STRUCTURAL REPORT FOR STEEL BEAM 1:

STEEL BEAM ANALYSIS & DESIGN (BS5950)

TEDDS calculation version 1.0.05





Support conditions

Support A

Vertically restrained

Rotationally free

Support B

Vertically restrained

Rotationally free

Applied loading

Beam loads

Dead self weight of beam $\times 1$

Dead full UDL 19.25 kN/m

Live full UDL 7.6 kN/m

Load combinations

Load combination 1

Support A

Dead $\times 1.40$

Imposed $\times 1.60$

Span 1

Dead $\times 1.40$

Imposed $\times 1.60$

Support B

Dead $\times 1.40$

Imposed $\times 1.60$

Analysis results

Maximum moment

$M_{\max} = 26.1$ kNm

$M_{\min} = 0$ kNm

Maximum moment span1

$M_{s1_{\max}} = 26.1$ kNm

$M_{s1_{\min}} = 0$ kNm

Maximum shear

$V_{\max} = 37.9$ kN

$V_{\min} = -37.9$ kN

Maximum shear span1

$V_{s1_{\max}} = 37.9$ kN

$V_{s1_{\min}} = -37.9$ kN

Deflection span1

$\delta_{s1_{\max}} = 1.6$ mm

$\delta_{s1_{\min}} = 0$ mm

Reactions at support A

$R_{A_{\max}} = 37.9$ kN

$R_{A_{\min}} = 37.9$ kN

Unfactored dead load reaction at support A

$R_{A_{\text{Dead}}} = 27.1$ kN

Reactions at support B

$R_{B_{\max}} = 37.9$ kN

$R_{B_{\min}} = 37.9$ kN

Unfactored dead load reaction at support B

$R_{B_{\text{Dead}}} = 27.1$ kN

Section details

Section type

UC 203x203x46

Steel grade

S355

From table 9: Design strength p_y

Thickness of element

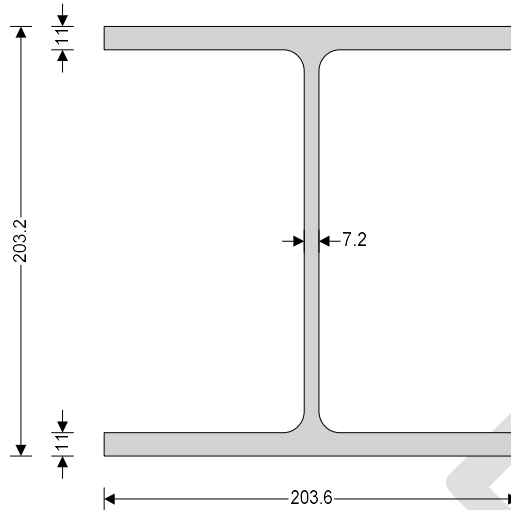
$\max(T, t) = 11.0$ mm

Design strength

$p_y = 355$ N/mm²

Modulus of elasticity

$E = 205000$ N/mm²



Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis

$K_x = 1.00$

Effective length factor in minor axis

$K_y = 1.00$

Effective length factor for lateral-torsional buckling

$K_{LT,A} = 1.00$

$K_{LT,B} = 1.00$

Classification of cross sections - Section 3.5

$\epsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]} = 0.88$

Internal compression parts - Table 11

Depth of section

$d = 160.8 \text{ mm}$

$d / t = 25.4 \times \epsilon \leq 80 \times \epsilon$

Class 1 plastic

Outstand flanges - Table 11

Width of section

$b = B / 2 = 101.8 \text{ mm}$

$b / T = 10.5 \times \epsilon \leq 15 \times \epsilon$

Class 3 semi-compact

Section is class 3 semi-compact

Shear capacity - Section 4.2.3

Design shear force

$F_v = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 37.9 \text{ kN}$

$d / t < 70 \times \epsilon$

Web does not need to be checked for shear buckling

Shear area

$A_v = t \times D = 1463 \text{ mm}^2$

Design shear resistance

$P_v = 0.6 \times p_y \times A_v = 311.6 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment

$M = \max(\text{abs}(M_{s1_{\max}}), \text{abs}(M_{s1_{\min}})) = 26.1 \text{ kNm}$

Effective plastic modulus - Section 3.5.6

Limiting value for class 2 compact flange

$\beta_{2f} = 8.801$

Limiting value for class 3 semi-compact flange

$\beta_{3f} = 13.202$

Limiting value for class 2 compact web

$\beta_{2w} = 88.014$

Limiting value for class 3 semi-compact web

$\beta_{3w} = 105.617$

Effective plastic modulus - cl.3.5.6.2

$$S_{\text{eff}} = \min(Z_{xx} + (S_{xx} - Z_{xx}) \times \min(\frac{((\beta_{3w} / (d / t))^2 - 1)}{((\beta_{3w} / \beta_{2w})^2 - 1)}, \frac{((\beta_{3f} / (b / T) - 1)}{(\beta_{3f} / \beta_{2f} - 1)})), S_{xx}) = 490411 \text{ mm}^3$$

Moment capacity - Section 4.2.5

Moment capacity low shear - cl.4.2.5.2 $M_c = \min(p_y \times S_{\text{eff}}, 1.2 \times p_y \times Z_{xx}) = 174.1 \text{ kNm}$

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling $L_E = 1.0 \times L_{s1} = 2750 \text{ mm}$

Slenderness ratio $\lambda = L_E / r_{yy} = 53.562$

Equivalent slenderness - Section 4.3.6.7

Buckling parameter $u = 0.847$

Torsional index $x = 17.713$

Slenderness factor $v = 1 / [1 + 0.05 \times (\lambda / x)^{2.025}] = 0.910$

Ratio - cl.4.3.6.9 $\beta_w = S_{\text{eff}} / S_{xx} = 0.986$

Equivalent slenderness - cl.4.3.6.7 $\lambda_{LT} = u \times v \times \lambda \times \sqrt{\beta_w} = 40.975$

Limiting slenderness - Annex B.2.2 $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5} = 30.198$

$\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant $\alpha_{LT} = 7.0$

Perry factor $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0) = 0.075$

Euler stress $p_E = \pi^2 \times E / \lambda_{LT}^2 = 1205.1 \text{ N/mm}^2$

$$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2 = 825.5 \text{ N/mm}^2$$

Bending strength - Annex B.2.1 $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5}) = 321.9 \text{ N/mm}^2$

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment $M_2 = 19.6 \text{ kNm}$

Moment at centre-line of segment $M_3 = 26.1 \text{ kNm}$

Moment at three quarter point of segment $M_4 = 19.6 \text{ kNm}$

Maximum moment in segment $M_{\text{abs}} = 26.1 \text{ kNm}$

Equivalent uniform moment factor for lateral-torsional buckling

$$m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{\text{abs}}, 0.44) = 0.925$$

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment $M_b = p_b \times S_{\text{eff}} = 157.8 \text{ kNm}$

$$M_b / m_{LT} = 170.6 \text{ kNm}$$

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead, imposed and live loads

Limiting deflection $\delta_{\text{lim}} = L_{s1} / 360 = 7.6 \text{ mm}$

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{\text{max}}), \text{abs}(\delta_{\text{min}})) = 1.567 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit

LOAD CALCULATIONS FOR STEEL BEAM 2:

CLEAR SPAN OF THE STEEL BEAM 2 = 4450mm

LOADING:

DEAD LOAD ON STEEL BEAM 2:

FLAT ROOF = $0.81 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.81 \text{ kN/m}^2 \times 2.10\text{m}$$

$$= 1.70\text{kN/m}$$

BRICK WORK = $22 \text{ kN/m}^3 \times \text{THICKNES OF WALL} \times \text{HEIGHT OF WALL IN MTS.}$
(100mm)

$$= 22 \text{ kN/m}^3 \times 0.100\text{m} \times 0.6\text{m} (\text{x2 walls})$$

$$= 2.64 \text{ kN/m}$$

THEREFORE TOTAL DEAD LOAD ON SB=1.70 + 2.64 = 4.34 kN/m

LIVE LOAD ON STEEL BEAM 2:

FLAT ROOF = $0.75 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

$$= 0.75 \text{ kN/m}^2 \times 2.10\text{m}$$

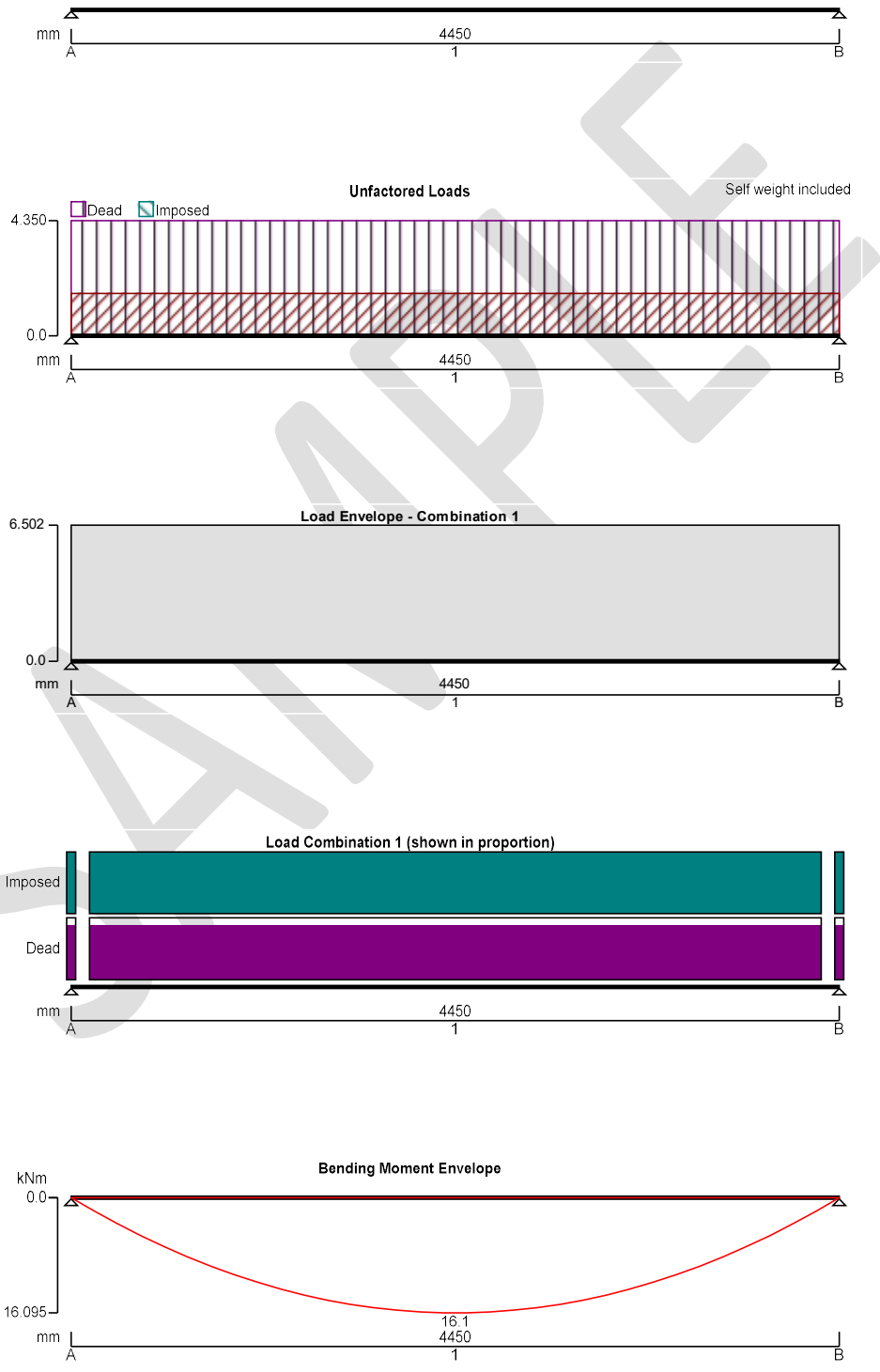
$$= 1.58 \text{ kN/m}$$

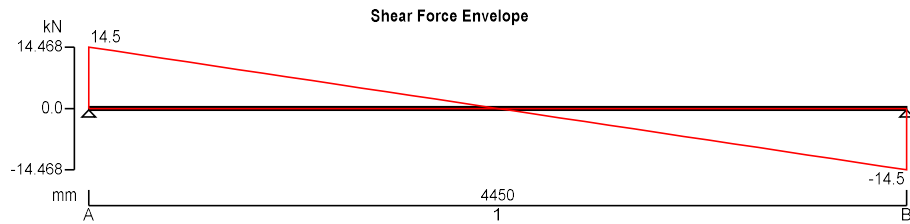
THEREFORE TOTAL LIVE LOAD ON SB2 = 1.58kN/m

STRUCTURAL REPORT FOR STEEL BEAM 2:

STEEL BEAM ANALYSIS & DESIGN (BS5950)

TEDDS calculation version 1.0.05





Support conditions

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

Applied loading

Beam loads

Dead self weight of beam $\times 1$
 Dead full UDL 4.35 kN/m
 Live full UDL 1.6 kN/m

Load combinations

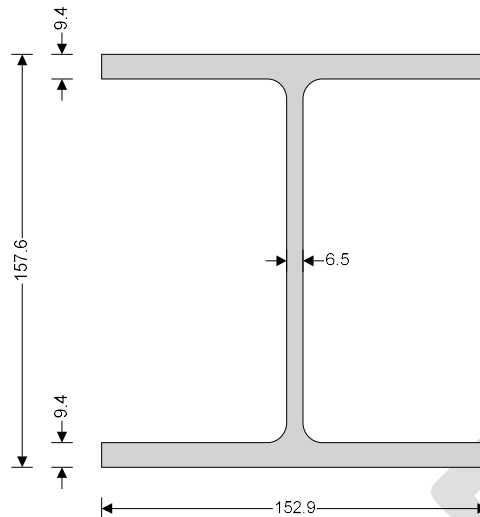
Load combination 1	Support A	Dead $\times 1.40$ Imposed $\times 1.60$
	Span 1	Dead $\times 1.40$ Imposed $\times 1.60$
	Support B	Dead $\times 1.40$ Imposed $\times 1.60$

Analysis results

Maximum moment	$M_{\max} = 16.1$ kNm	$M_{\min} = 0$ kNm
Maximum moment span1	$M_{s1_{\max}} = 16.1$ kNm	$M_{s1_{\min}} = 0$ kNm
Maximum shear	$V_{\max} = 14.5$ kN	$V_{\min} = -14.5$ kN
Maximum shear span1	$V_{s1_{\max}} = 14.5$ kN	$V_{s1_{\min}} = -14.5$ kN
Deflection span1	$\delta_{s1_{\max}} = 6.6$ mm	$\delta_{s1_{\min}} = 1.1 \times 10^{-14}$ mm
Reactions at support A	$R_{A_{\max}} = 14.5$ kN	$R_{A_{\min}} = 14.5$ kN
Unfactored dead load reaction at support A	$R_{A_{\text{Dead}}} = 10.3$ kN	
Reactions at support B	$R_{B_{\max}} = 14.5$ kN	$R_{B_{\min}} = 14.5$ kN
Unfactored dead load reaction at support B	$R_{B_{\text{Dead}}} = 10.3$ kN	

Section details

Section type	UC 152x152x30
Steel grade	S355
From table 9: Design strength p_y	
Thickness of element	$\max(T, t) = 9.4$ mm
Design strength	$p_y = 355$ N/mm ²
Modulus of elasticity	$E = 205000$ N/mm ²



Lateral restraint

Span 1 has lateral restraint at supports only

Effective length factors

Effective length factor in major axis

$K_x = 1.00$

Effective length factor in minor axis

$K_y = 1.00$

Effective length factor for lateral-torsional buckling

$K_{LT,A} = 1.00$

$K_{LT,B} = 1.00$

Classification of cross sections - Section 3.5

$\epsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]} = 0.88$

Internal compression parts - Table 11

Depth of section

$d = 123.6 \text{ mm}$

$d / t = 21.6 \times \epsilon \leq 80 \times \epsilon$

Class 1 plastic

Outstand flanges - Table 11

Width of section

$b = B / 2 = 76.5 \text{ mm}$

$b / T = 9.2 \times \epsilon \leq 10 \times \epsilon$

Class 2 compact

Section is class 2 compact

Shear capacity - Section 4.2.3

Design shear force

$F_v = \max(\text{abs}(V_{\max}), \text{abs}(V_{\min})) = 14.5 \text{ kN}$

$d / t < 70 \times \epsilon$

Web does not need to be checked for shear buckling

Shear area

$A_v = t \times D = 1024 \text{ mm}^2$

Design shear resistance

$P_v = 0.6 \times p_y \times A_v = 218.2 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment

$M = \max(\text{abs}(M_{s1_{\max}}), \text{abs}(M_{s1_{\min}})) = 16.1 \text{ kNm}$

Moment capacity - Section 4.2.5

Moment capacity low shear - cl.4.2.5.2

$M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) = 87.9 \text{ kNm}$

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling

$L_E = 1.0 \times L_{s1} = 4450 \text{ mm}$

Slenderness ratio

$\lambda = L_E / r_{yy} = 116.272$

Equivalent slenderness - Section 4.3.6.7

Buckling parameter

$u = 0.849$

Torsional index	$x = 15.999$
Slenderness factor	$v = 1 / [1 + 0.05 \times (\lambda / x)^{2.025}] = 0.724$
Ratio - cl.4.3.6.9	$\beta_w = 1.000$
Equivalent slenderness - cl.4.3.6.7	$\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_w]} = 71.423$
Limiting slenderness - Annex B.2.2	$\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5} = 30.198$

$\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant	$\alpha_{LT} = 7.0$
Perry factor	$\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0) = 0.289$
Euler stress	$p_E = \pi^2 \times E / \lambda_{LT}^2 = 396.6 \text{ N/mm}^2$
	$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2 = 433 \text{ N/mm}^2$
Bending strength - Annex B.2.1	$p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5}) = 216.9 \text{ N/mm}^2$

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment	$M_2 = 12.1 \text{ kNm}$
Moment at centre-line of segment	$M_3 = 16.1 \text{ kNm}$
Moment at three quarter point of segment	$M_4 = 12.1 \text{ kNm}$
Maximum moment in segment	$M_{abs} = 16.1 \text{ kNm}$
Equivalent uniform moment factor for lateral-torsional buckling	$m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44) = 0.925$

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment	$M_b = p_b \times S_{xx} = 53.7 \text{ kNm}$
	$M_b / m_{LT} = 58.1 \text{ kNm}$

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead, imposed and live loads	
Limiting deflection	$\delta_{lim} = L_{s1} / 360 = 12.4 \text{ mm}$
Maximum deflection span 1	$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) = 6.618 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit

LOAD CALCULATIONS FOR FLAT ROOF JOISTS:

SPAN OF JOISTS = 4200mm

ASSUME FLAT ROOF = 50mm x 200mm

TIMBER GRADE = C24

JOISTS CENTERS = 400mm

LOADING:

DEAD LOAD ON FLAT ROOF JOISTS:

FLAT ROOF = $0.81 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

= $0.81 \text{ kN/m}^2 \times 0.4\text{m}$

= 0.32 kN/m

THEREFORE TOTAL DEAD LOAD ON FLAT ROOF JOISTS= 0.32 kN/m

LIVE LOAD ON FLAT ROOF JOISTS:

PITCHED ROOF = $0.75 \text{ kN/m}^2 \times \text{SPAN OF ROOF IN MTS.}$

= $0.75 \text{ kN/m}^2 \times 0.4\text{m}$

= 0.30 kN/m

THEREFORE TOTAL LIVE LOAD ON FLAT ROOF JOISTS = 0.30 kN/m

LOAD CALCULATIONS FOR FLAT ROOF JOISTS:

Analysis for a simply-supported single-span timber beam to BS 5268

TEDDS calculation version 1.0.02

Span length & partial factors for loading

Span (mm)	Factors for moments & forces			Factors for deflection		
	γ_{fd}	γ_{fi}	γ_{fw}	γ_{dd}	γ_{di}	γ_{dw}
4200	1.00	1.00	1.00	1.00	1.00	1.00

Loading data (unfactored)

Ref.	Category	Type	Load kN/m	Position mm	Load kN/m	Position mm
1	"Dead"	UDL	0.3	0	-	4200
2	"Imposed"	UDL	0.3	0	-	4200

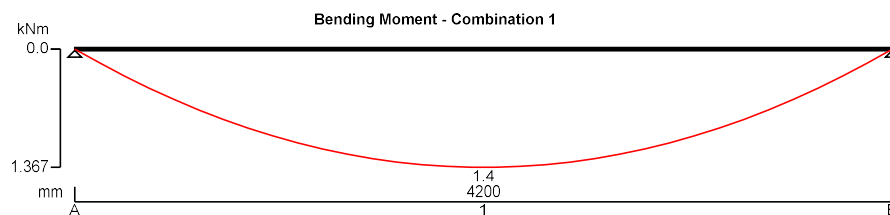
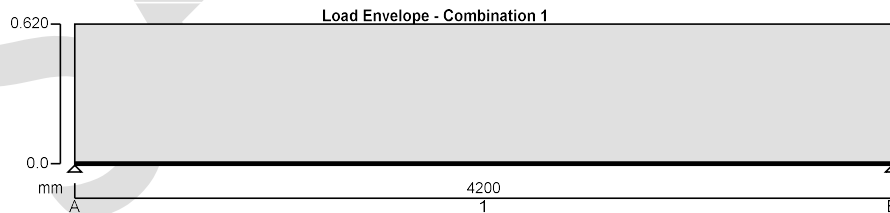
Analysis results - entire span

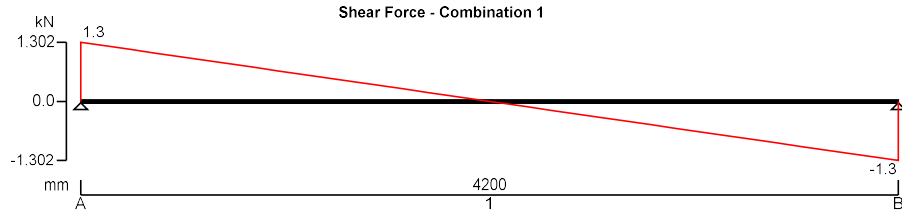
R_a kN (fac)	R_b kN (fac)	V kN (fac)	M kNm (fac)	Deflection: δEI kNm ³	Direction
1.3	1.3	1.3	1.4	2.51	"Sagging"

Unfactored support reactions

Support A	Dead load -0.7 kN	Live load -0.6 kN	Wind load 0.0 kN
Support B	Dead load -0.7 kN	Live load -0.6 kN	Wind load 0.0 kN

Beam Loads





Member design checks for a simply-supported single-span timber beam to BS 5268

Timber member design BS 5268-2:2002

Summary of results				
Section size	D = 200 mm	B = 50 mm	A = 10000 mm ²	
Section properties (x-x)	$I_{xx} = 33333330 \text{ mm}^4$	$Z_{xx} = 333333 \text{ mm}^3$	$r_{xx} = 57.7 \text{ mm}$	
(y-y)	$I_{yy} = 2083330 \text{ mm}^4$	$Z_{yy} = 83333 \text{ mm}^3$	$r_{yy} = 14.4 \text{ mm}$	
Grade	"C24"		$\sigma_c = 7.90 \text{ N/mm}^2$	
Check	Stress	Capacity	Notes	Result
Bending stress	$\sigma_{m.a,para} = M / Z_{xx} = 4.10 \text{ N/mm}^2$	$\sigma_{m.adm,para} = 7.84 \text{ N/mm}^2$	Moment M = 1.4 kNm	Pass
Shear stress	$\tau_a = 0.20 \text{ N/mm}^2$	$\tau_{adm} = 0.71 \text{ N/mm}^2$	Shear V = 1.3 kN	Pass
Deflection	$\delta = 7.2 \text{ mm}$	14 mm		Pass
	$\delta / L_s = 0.00172$	0.003		Pass

Padstone Calculator

COMPLIES WITH LATEST DESIGN CODES

structural calculations for padstones for Steel Beam 1:

Beam End Reaction = **38.00** kN (factored) Variable Load Safety Factor = 1.5
Factored Load at End of Beam Permanent Load Safety Factor = 1.35

Characteristic strength of masonry = **2.8** N/mm² (Brickwork usually = 4.5 N/mm²)
(3.6N Blockwork usually = 2.6 N/mm²)
Width of beam end bearing = **203** mm (A Engineering Brick = 13.2 N/mm²)
Length of beam end bearing = **200** 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 = **1.17** N/mm²
Actual Bearing Stress = **0.94** N/mm²

Padstone Not 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 = **225** mm (Concrete C15 = 15 N/mm²)
Length of Padstone = **330** 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 = **0.94** N/mm² **Therefore Padstone Stress OK**
Allowable masonry stress = **1.17** N/mm²
Stress under padstone = **0.51** N/mm² **Therefore Masonry Stress OK**

Padstone Calculator

COMPLIES WITH LATEST DESIGN CODES

structural calculations for padstones for Steel Beam 2:

Beam End Reaction = **14.50** 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 = **152** mm (A Engineering Brick = 13.2 N/mm²)
Length of beam end bearing = **200** 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

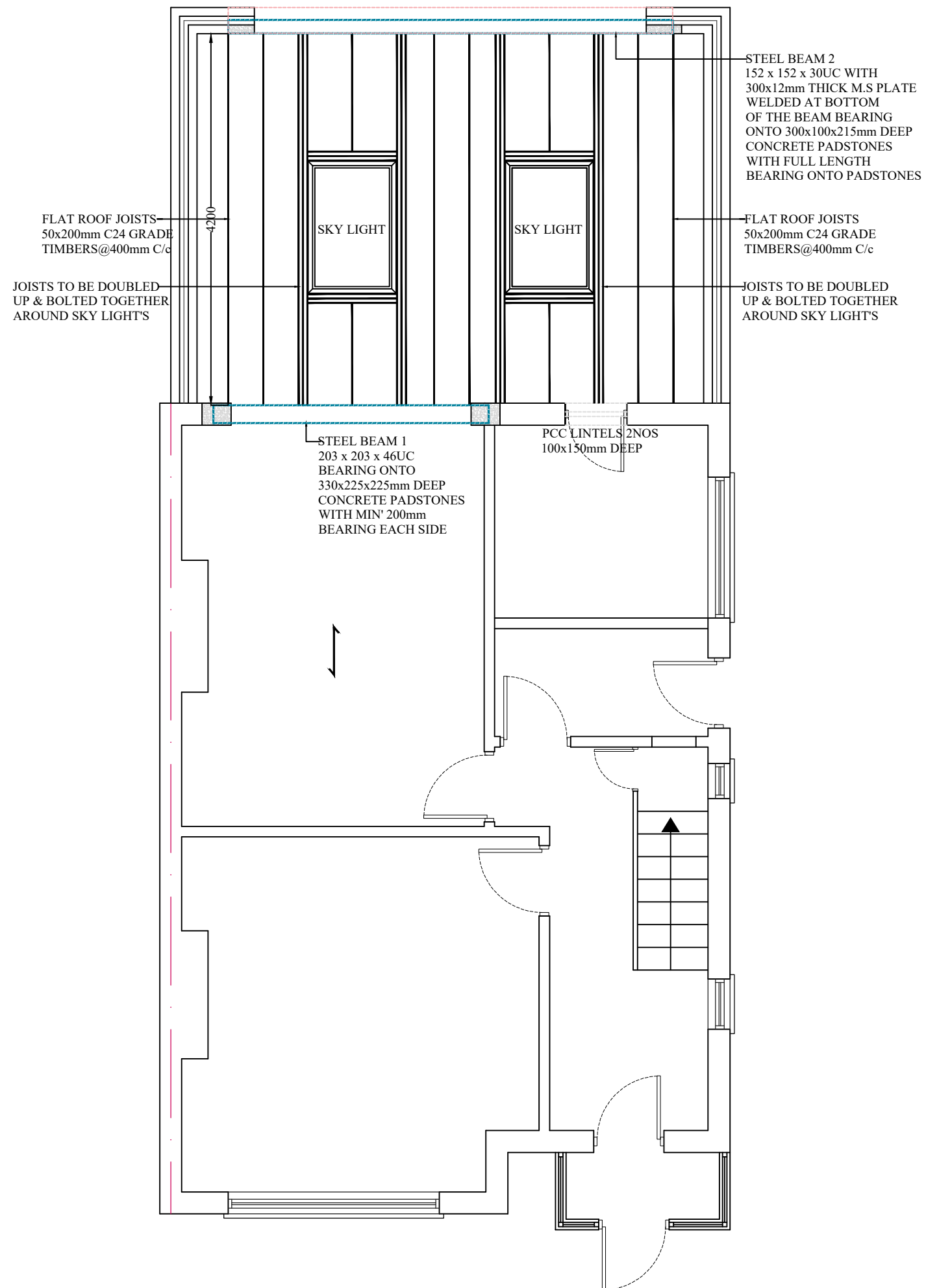
Maximum Bearing Stress = **1.08** N/mm²
Actual Bearing Stress = **0.48** N/mm²

Padstone Not 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 = **300** mm (Concrete C30 = 30 N/mm²)
(Concrete C40 = 40 N/mm²)
(Steel Plate = 275 N/mm²)

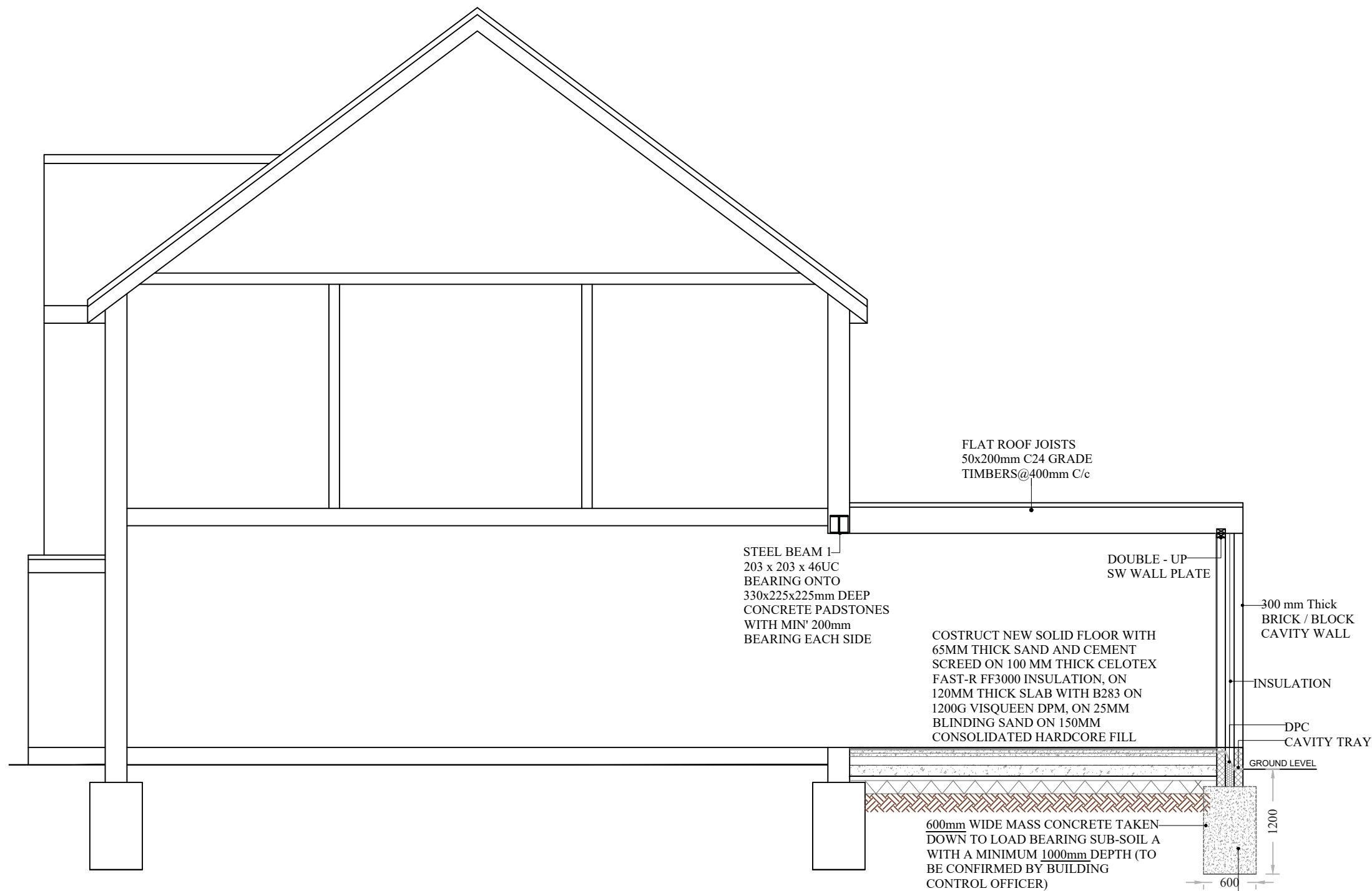
Allowable padstone stress = **12.50** N/mm²
Stress under beam end bearing = **0.48** N/mm² **Therefore Padstone Stress OK**
Allowable masonry stress = **1.08** N/mm²
Stress under padstone = **0.48** N/mm² **Therefore Masonry Stress OK**



PROJECT	SE12 8AP
DESCRIPTION	PROPOSED GROUND FLOOR STRUCTURAL PLAN
SCALE	NOT TO SCALE
DRAWINGS NO.	S01
DATE	24-12-2025



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CONSTRUCT NEW SOLID FLOOR WITH
 65MM THICK SAND AND CEMENT
 SCREED ON 100 MM THICK CELOTEX
 FAST-R FF3000 INSULATION, ON
 120MM THICK SLAB WITH B283 ON
 1200G VISQUEEN DPM, ON 25MM
 BLINDING SAND ON 150MM
 CONSOLIDATED HARDCORE FILL

600mm WIDE MASS CONCRETE TAKEN
 DOWN TO LOAD BEARING SUB-SOIL A
 WITH A MINIMUM 1000mm DEPTH (TO
 BE CONFIRMED BY BUILDING
 CONTROL OFFICER)

FOUNDATION IS TO BE 600mm WIDE TRENCH
 CONCRETE FOOTING WITH 1:2:4 CONCRETE
 MIX. FOUNDATION TO BE 1M DEEP (TO BE
 DETERMINED BY BUILDING CONTROL). ANY
 DRAINS PASSING THROUGH FOUNDATION ARE
 TO BE PROTECTED USING UPVC SLEEVING AND
 150X100mm RC BLOCK LINTEL.

FOUNDATION DEPTH ACCORDING TO NHBC
 FOUNDATION CALCULATOR. FINAL DESIGN
 AND DEPTHS TO BE DETERMINED BY BUILDING
 CONTROL

PROJECT	SE12 8AP
DESCRIPTION	PROPOSED SECTION
SCALE	NOT TO SCALE
DRAWINGS NO.	S02
DATE	26-09-2025


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