

STRUCTURAL ENGINEER'S CALCULATIONS

130 Renfields
Haywards Heath

FOR
**Ground Floor
Lintel Openings**

Client: Gemma Lintott

Date: June 2023

JOB NUMBER: 23087

GENERAL, TIMBER & MASONRY

- All details to be read in line with architects drawings and relevant specifications.
- The contractor is fully responsible for all temporary works. Adequate systems of support to be submitted to the contract administrator (CA) by the contractor where structures existing, or ground, to be supported during construction.
- Current codes of practice, British Standards and building regulation documents to be adhered to during all works.
- A building control officer (BCO)(local authority/private) is to be informed of the construction progress at all stages of the work and allowed an opportunity to visit the site to ensure building regulation compliance. Foundation excavations or existing foundations to be approved by BCO prior to concreting, or loading.
- The CA is to be informed of any differences found on or between drawings, and other documents before work commences.
- The CA must be told if any stability problems arise during the construction, and made safe until further advice is received.
- Base/footing of open foundation trenches to be blinded with 50mm 20N/mm² concrete if left open for length of time. On recommencement, CA to re-examine soft areas to ensure even bearing pressure prior to bases/footings being poured.
- Timber used is to be grade C16 redwood/whitewood (unless otherwise detailed).
- All existing timber will be examined for infestation/rot. A specialist will be asked for advice on the condition and treatment of timber should any problems be found. Within a structure the infected timbers will be removed and replaced. Splices need to be approved by the CA. The ends of new timber built into external walls will be treated to resist rot.
- External studwork walls should be ply-sheathed with 12mm external grade plywood, fixed at 300mm c/c and 150mm c/c around edges, with 75mm long nails.
- Internal load bearing studwork to have one face ply-sheathed with 9mm plywood under any plasterboard layers.
- Joist hangers will be the hook over restraint type.
- All brickwork and blockwork shall be designed/ constructed in line with current issue of BS 5628 parts 1,2 and 3.
- All masonry will be constructed in line with the requirements of BS 5628.
- In existing lime mortar brickwork the characteristic compressive stress (fk) is assumed as 2.0N/mm² maximum.
- Brick, block and mortar strengths are as detailed on paperwork, (nominal 3.5N/mm² in class III mortar).
- It is essential that temporary support be given to partly constructed walls/complete walls not incorporated in the structure, so as to ensure they do not fall (either because of lateral or accidental loading).
- Timber wall plates are to be held down using 30x5mm thick galvanised mild steel vertical restraint straps, 1200mm long with 100mm flat return, at 2000mm max centres (and either side of wide windows). The strap should be fixed to the solid masonry wall using 5no.x 12no. Screws in plugged holes if existing walls, and built into the walls if new.
- Selections of bricks and blocks will be crushed by an independent laboratory, should the CA require tests to be carried out to confirm the strength of the masonry units.

STEELWORK & CONCRETE

- Unless detailed on drawings/calculations, all steelwork to be grade S275 (grade 43).
 - Grade S275, grade 8.8 bolts shall be used to join all connections, unless otherwise stated on drawings/calculations.
 - BCO to examine and approve all steelwork, before concealing.
 - All welding to be carried out in line with current codes of practice.
 - Shot blasting or mechanical wire will be used to thoroughly clean all steelwork, removing all rust and scale.
 - Severely corroded existing exposed steelwork needs to be reported to the consultant as soon as possible.
 - Steelwork to be within concrete should be thoroughly cleaned to remove rust or protective paintwork
 - On completion of erection, all damaged areas shall be cleaned and re-painted. On completion of tightening, all bolted areas require painting.
 - Paintwork shall be undertaken alongside the paint supplier's specification. Prior to leaving the works, 1No. Coat of approved high build primer shall be applied.
 - If required, finishing coats of paint to be compatible with primer- to be applied in line with supplier's specification.
-
- Drawings/calculations will specify the concrete grade.
 - Concrete will be made in the proportions to provide the minimum specified 28 day strength, from Portland Cement to BS12, fine aggregate, coarse aggregate and water
 - 'H' denotes high yield steel reinforcement to BS 4449
 - Drawings/calculations shall specify reinforcement cover
 - Fabric reinforcement to BS 4483, min. laps 300 mm.
 - When air temperature is below 20°C on a falling thermometer, or below 10°C on a rising thermometer, during the winter, concrete works shall be suspended. Provided that the formwork is clear of ice, the air temperature is above 20°C and below 40°C, and the mixed and cast concrete maintains a temperature above 5°C for 4 days, then work may proceed.
 - A 50mm thick layer of concrete to be used to blind the bottom of reinforced concrete foundation excavations. Only once blinding about to be placed shall the bottom 75mm of soil be removed.
 - Concrete must be kept constantly moist after placing, maintained above 5°C for a minimum of 4 days after casting. Once concrete placed and finished, all surfaces exposed to fierce sunlight/drying winds to be immediately covered.
 - Engineers details will show approved positions for construction joints. A good bond needs to be established between existing concrete and new works. The existing needs to be cleaned and well roughened to ensure this.
 - Ready mixed concrete must be in position within 30mins of delivery. The engineer requires supplier details prior to the contract commencing
 - All site works to be carried out in accordance with BS8110 and all relevant British Standards and Codes of Practice.

STANDARD LOADINGS FOR BUILDINGS

00 DEAD LOADS

Roofs

Sloping Roofs

Tiles	0.5	0.75 kN/m ²
Battens and Felt		0.10 kN/m ²
Rafters		0.10 kN/m ²
Slope Correction = (#) x 0.95 = kN/m ²		
(Lath and Plaster/face + 0.10)		

Flat Roofs

Chippings and Felt	0.32 kN/m ²
Boards and Joists	0.32 kN/m ²
Insulation and Soffit	0.16 kN/m ²
	0.80 kN/m ²

Floors

Timber

Boards and Joists	0.30 kN/m ²
Soffit	0.15 kN/m ²
	0.45 kN/m ²

Concrete

Screed (75mm)	1.75 kN/m ²
Pre-cast beam and block	2.25 kN/m ²
Ceiling	0.20 kN/m ²
	4.20 kN/m ²

Walls

Internal Stud Walls

Studding and Insulation	0.10 kN/m ²
2 x Plasterboard	0.30 kN/m ²
	0.40 kN/m ²

100mm Medium Dense Block Wall

Blockwork	0.70 kN/m ²
2 x Plaster	0.50 kN/m ²
	1.20 kN/m ²

215mm Dense Block Party Wall

215 Party Wall Blocks	4.20 kN/m ²
2 x Plaster	0.50 kN/m ²
	4.70 kN/m ²

Timber Stud Party Wall

2 x Studding	0.20 kN/m ²
4 x Plaster Board	0.60 kN/m ²
Insulation	0.01 kN/m ²
	0.81 kN/m ²

Ceiling

Joists and Insulation	0.10 kN/m ²
Soffit	0.15 kN/m ²
	0.25 kN/m ²

Roof slop correction:-

25 = 1.1 30 = 1.16 35 = 1.22

40 = 1.3 45 = 1.4 50 = 1.56

Party Floors +

2 x 19mm Gyproc	0.34 kN/m ²
Sound Insulation	0.10 kN/m ²
(+ Soundblock)	0.44 kN/m ²

290mm Cavity Wall

Brickwork	2.15 kN/m ²
Insulation	0.01 kN/m ²
140mm Med Den Blocks	1.50 kN/m ²
Plaster	0.25 kN/m ²
	3.91 kN/m ²

External Studwork and Tile Hanging

Tiles	0.60 kN/m ²
Battens, Felt, Ply Sheath	0.20 kN/m ²
Studding and Insulation	0.11 kN/m ²
Plasterboard	0.13 kN/m ²
	1.04 kN/m ²

LIVE LOADS (See BS 6399 for full description)

Roof Snow load Max	0.75 kN/m ²
Roof Slope	0.60 – 0.30 kN/m ²
Roof Space	0.25 kN/m ²
Corridors/Stairs, Hotels, Off.	4.00 kN/m ²
Floors, Residential	1.50 kN/m ²

Corridors, Flats < 4	3.00 kN/m ²
Bedrooms, Hotels	2.00 kN/m ²
Floor, Offices	3.00 kN/m ²
Floor, Shops	4.00 kN/m ²

SPAN 1200

LOADING MAY INNER LCAF.

				DL	LL
Roof	4.9/2	x 1.1	= 2.69		
Imposed	4.9/2	x 0.6	=		1.47
2nd floor	4.9/2	x 0.75	= 1.84		
Imposed	4.9/2	x 1.50	=		3.68
1st floor	4.9/2	x 0.75	= 1.84		
Imposed	4.9/2	x 1.50	=		3.68
CAVITY.	7	x 2.50	= 17.50		

total ucl = 32.7 kN/m. $\{ 23.87 \leq 8.83$

FACTOR = $(23.87 \times 1.4) + (1.6 \times 8.83) = \underline{47.5 \text{ kN/m}}$

TRY 100 x 215 v p s/c 54.74 kN/m. For 1.2m

TD 100 x 140 v p s/c 35 kN/m For 0.9m

FOR TRIANGLE CARRY

TAKE 1st floor + 1.2m wall.

$\therefore 2.5 + 5.52 = 8 \text{ kN/m} < 14 \text{ kN/m}$
for 100 x 140 v p

ADOPS 2nd 100 x 140 v p pcc.

R = $23.87 \times 1.2/2 = 14.32 \text{ kN}$
 $8.83 \times 1.2/2 = 5.29 \text{ kN}$

Ellis Structures

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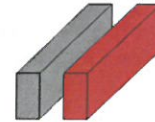
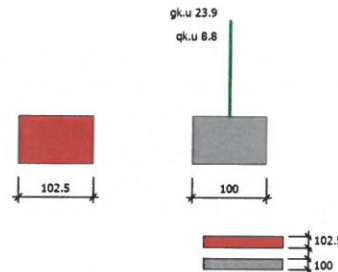
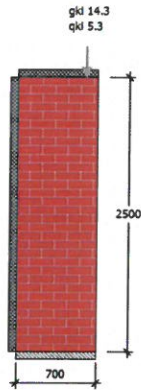
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Job Ref :
 Sheet : /
 Made by :
 Date : 28 June 2023 / Ver. 2019.06
 Checked :
 Approved : 02

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS 5628 : 2005

Brief Title

**Summary of Design Data**

Wall Dimensions
 Support Conditions
 Cavity Wall (mm)
 Limiting Dimensions

$h=2.500$ m, $h_{ef}=0.700$ m, $L=0.700$ m, $L_{ef}=0.700$ m
 Bottom Simple, Top Cont., Left Cont., Right Free
 $t_1=102.5$, $t_2=100$, $t_{ef}=135$
 $\lambda=5.2 < \lambda_{lim}=27$

0.192 OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})
 Unit Material

Construction Normal, Unit Manufacture Normal
 Clay water absorption > 12%, Standard bricks, $\gamma=20$ kN/m³
 Normalised mean compressive strength 20 N/mm²
 M4/(iii), 4 N/mm²

3.5/3 Table 4a/4b

Mortar Material

Compressive Strength (fk)

Section Properties

Critical axial compressive case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, β $F_r = \beta \cdot f_k \cdot t_k / \gamma_{mc}$

Fd/Fr

Standard bricks
 $Area=1025$ cm²/m, $Z_p=1751$ cm³/m

4.04 N/mm² Small Area $1.4(\gamma \cdot t_k \cdot h)$ $X=0$ m, $Y=1.5$ m < f_k/γ_{mc} 0.07 N/mm² OK $X=0.35$ m, $Y=1.5$ m averaged over width of 0.7 m

7.18 kN/m

 $ex=0.0$ mm, $h_{ef}=700$ mm, $t_{ef}=135.0$ mm, $t=102.5$ mm

0.990

 $0.990 \times 4.04 \times 102.5 / 3.5$

117.1 kN/m

 $7.2 / 117.1$

0.061

OK

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})
 Unit Material

Construction Normal, Unit Manufacture Normal
 Concrete Blocks, Solid block wall, $\gamma=20$ kN/m³
 Normalised mean compressive strength 7.3 N/mm²
 M4/(iii), 4 N/mm²

3.5/3 Table 4a/4b

Mortar Material

Unit Ratio

Compressive Strength (fk)

Loads from above

Section Properties

Critical axial compressive case

Max local stress @

Max axial buckling force @

Capacity reduction factor top, β $F_r = \beta \cdot f_k \cdot t_k / \gamma_{mc}$

Fd/Fr

Unit height=215, Least horizontal dimensions=100
 Solid block wall

2.15

Dead Load=23.9 kN/m, Live Load=8.83 kN/m

5.15 N/mm² Small Area $Area=1000$ cm²/m, $Z_p=1667$ cm³/m $1.4(\gamma \cdot t_k \cdot h + g_k + g_{ku}) + 1.6q_k + 1.6q_{ku}$ $X=0$ m, $Y=1.5$ m < f_k/γ_{mc} 0.95 N/mm² OK $X=0.35$ m, $Y=1.5$ m averaged over width of 0.7 m

95.34 kN/m

 $ex=0.0$ mm, $h_{ef}=700$ mm, $t_{ef}=135.0$ mm, $t=100.0$ mm

0.990

 $0.990 \times 5.15 \times 100 / 3.5$

145.7 kN/m

 $95.3 / 145.7$

0.654

OK

Point load design method

Design based on axial load take down for wall compression design.

No design for bending due to point loads.

Point Load at 0.6m

Spreader details

Bearing Stress

Local Bearing Capacity

 g_k 14.32 kN, q_k 5.3 kN, Bearing Length 100 mm width 100 mm

Spreader length 330 mm, Spreader depth 215 mm

 $(1.4 \cdot 14.32 + 1.6 \cdot 5.3) \cdot 1000 / (265 \cdot 100)$ 1.08 N/mm²No Bearing enhancement, $1.00 \cdot f_k / \gamma_{mc}$ 1.47 N/mm²

OK

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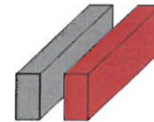
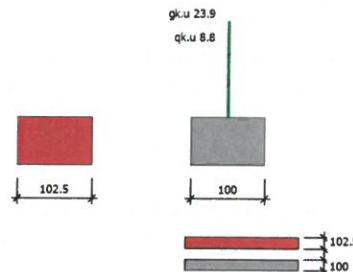
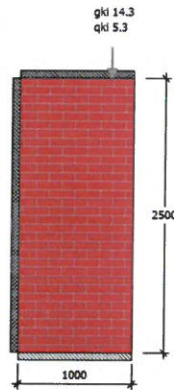
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 Checked :
 Approved :

03

Two Way Spanning, Vertically Loaded, Cavity Wall

Design to BS 5628 : 2005

Brief Title (New Brief)

**Summary of Design Data**

Wall Dimensions
 Support Conditions
 Cavity Wall (mm)
 Limiting Dimensions

$h=2.500$ m, $h_{ef}=1.000$ m, $L=1.000$ m, $L_{ef}=1.000$ m
 Bottom Simple, Top Cont., Left Cont., Right Free
 $t_1=102.5$, $t_2=100$, $t_{ef}=135$
 $\lambda=7.4 \leq \lambda_{lim}=27$

0.274 OK

Outer-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})
 Unit Material

Construction Normal, Unit Manufacture Normal
 Clay water absorption > 12%, Standard bricks, $\gamma=20$ kN/m³
 Normalised mean compressive strength 20 N/mm²
 M4/(iii), 4 N/mm²

3.5/3 Table 4a/4b

Mortar Material

Compressive Strength (fk)

Standard bricks

4.27 N/mm² Small Area

Section Properties

Area=1025 cm²/m, $Z_p=1751$ cm³/m

Critical axial compressive case

 $1.4(\gamma_{tk}.h)$

Max local stress @

 $X=0$ m, $Y=1.5$ m < f_k/γ_{mc} 0.07 N/mm²

OK

Max axial buckling force @

 $X=0.5$ m, $Y=1.5$ m averaged over width of 1 m

7.18 kN/m

Capacity reduction factor top, β $e_x=0.0$ mm, $h_{ef}=1000$ mm, $t_{ef}=135.0$ mm, $t=102.5$ mm

0.990

 $F_r=\beta.f_k.t_k/\gamma_{mc}$ $0.990 \times 4.27 \times 102.5 / 3.5$

123.8 kN/m

Fd/Fr

7.2/123.8

0.058

OK

Inner-Leaf Design

Partial Safety Factor (γ_{mc}/γ_{mf})
 Unit Material

Construction Normal, Unit Manufacture Normal
 Concrete Blocks, Solid block wall, $\gamma=20$ kN/m³
 Normalised mean compressive strength 3.6 N/mm²
 M4/(iii), 4 N/mm²

3.5/3 Table 4a/4b

Mortar Material

Unit Ratio

Unit height=215, Least horizontal dimensions=100

2.15

Compressive Strength (fk)

Solid block wall

2.98 N/mm² Small Area

Loads from above

Dead Load=23.9 kN/m, Live Load=8.83 kN/m

Section Properties

Area=1000 cm²/m, $Z_p=1667$ cm³/m

Critical axial compressive case

 $1.4(\gamma_{tk}.h + g_k + g_{ku}) + 1.6q_k + 1.6q_{ku}$

Max local stress @

 $X=0$ m, $Y=1.5$ m < f_k/γ_{mc} 0.83 N/mm²

OK

Max axial buckling force @

 $X=0.5$ m, $Y=1.5$ m averaged over width of 1 m

83.12 kN/m

Capacity reduction factor top, β $e_x=0.0$ mm, $h_{ef}=1000$ mm, $t_{ef}=135.0$ mm, $t=100.0$ mm

0.990

 $F_r=\beta.f_k.t_k/\gamma_{mc}$ $0.990 \times 2.98 \times 100 / 3.5$

84.2 kN/m

Fd/Fr

83.1/84.2

0.988

OK

Point load design method

Design based on axial load take down for wall compression design.

Point Load at 0.8m

No design for bending due to point loads.

Spreader details

gk 14.32 kN, qk 5.3 kN, Bearing Length 100 mm width 100 mm

Bearing Stress

Spreader length 330 mm, Spreader depth 215 mm

Local Bearing Capacity

 $(1.4 \times 14.32 + 1.6 \times 5.3) \times 1000 / (330 \times 100)$ 0.86 N/mm²BS5628-1:2005 Figure 4 - Bearing Type 1, $1.25 \cdot f_k/\gamma_{mc}$ 1.06 N/mm²

OK

SPAN 1900mm.

LOADING

	m	kN/m		kN/m
TRUSS BRG	$6.3/2 \times 1.6$	=	5.04	

CEILING	$6.3/2 \times 0.5$	=	1.58	
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≤ 6.62

FOR SPAN. 1950 TRY 100x140 DP PCC

TRY 100x140 DP PCC SWL = 8.8 kN/m² - OK
TO FIX PLATE.

FOR TIMBER OPTION: 2no 47x195 AS
DESIGN

STEEL 152 UB16 BY INSPECTOR

HOT DIP CO OR RHS.

~~100x~~ TRY 90x90x5 RHS

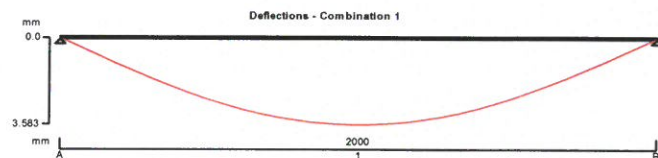
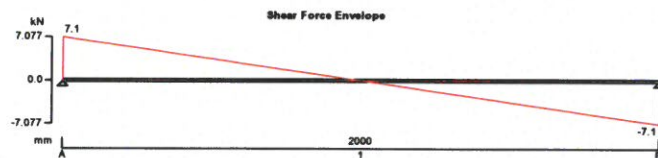
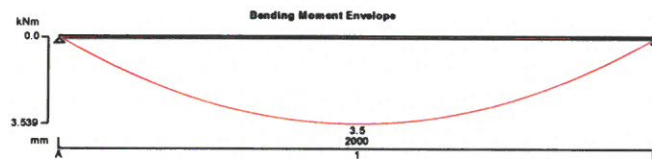
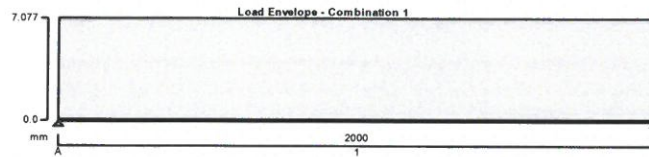
ADAPT 90x90x5 SH1

S6C CANS FOR STEEL.

Project 130 Renfields Road- Haywards Heath				Job Ref. 23087	
Section TIMBER LINTEL				Sheet no./rev. 05	
Calc. by PJE	Date 28/06/2023	Chk'd by	Date	App'd by	Date

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.4.00



Applied loading

Beam loads

TRUSS ROOF AND CEILING

Dead full UDL 7.000 kN/m

Dead self weight of beam $\times 1$

Load combinations

Load combination 1

Support A

Dead $\times 1.00$

Imposed $\times 1.00$

Span 1

Dead $\times 1.00$

Imposed $\times 1.00$

Support B

Dead $\times 1.00$

Imposed $\times 1.00$

Analysis results

Design moment

$M = 3.539 \text{ kNm}$

Design shear

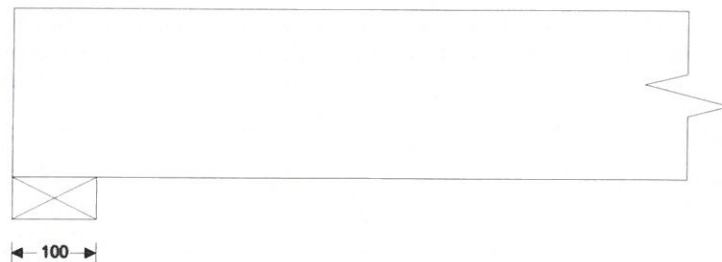
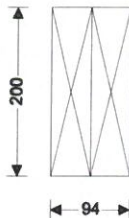
$F = 7.077 \text{ kN}$

Total load on beam

$W_{\text{tot}} = 14.155 \text{ kN}$

Project 130 Renfields Road- Haywards Heath				Job Ref. 23087	
Section TIMBER LINTEL				Sheet no./rev. 06	
Calc. by PJE	Date 28/06/2023	Chk'd by	Date	App'd by	Date

Reactions at support A $R_{A_max} = 7.077$ kN $R_{A_min} = 7.077$ kN
 Unfactored dead load reaction at support A $R_{A_Dead} = 7.077$ kN
 Reactions at support B $R_{B_max} = 7.077$ kN $R_{B_min} = 7.077$ kN
 Unfactored dead load reaction at support B $R_{B_Dead} = 7.077$ kN



Timber section details

Breadth of section $b = 47$ mm Depth of section $h = 200$ mm
 Number of sections $N = 2$ Breadth of beam $b_b = 94$ mm
 Timber strength class **C24**

Beam details

Length of bearing $L_b = 100$ mm Service class of timber **3**
 Load duration **Long term**

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

Check lateral stability of beam

Permiss.depth-to-breadth ratio **2.13** **3.00** Actual depth-to-breadth ratio

PASS - Lateral support is adequate

Check bearing stress

Permissible bearing stress $\sigma_{c_adm} = 1.584$ N/mm² Applied bearing stress $\sigma_{c_a} = 0.753$ N/mm²

PASS - Compressive stress not exceeded at bearing

Check beam in bending

Permissible bending stress $\sigma_{m_adm} = 6.901$ N/mm² Applied bending stress $\sigma_{m_a} = 5.647$ N/mm²

PASS - Bending stress within permissible limits

Check beam in shear

Permissible shear stress $\tau_{adm} = 0.703$ N/mm² Applied shear stress $\tau_a = 0.565$ N/mm²

PASS - Shear stress within permissible limits

Check deflection

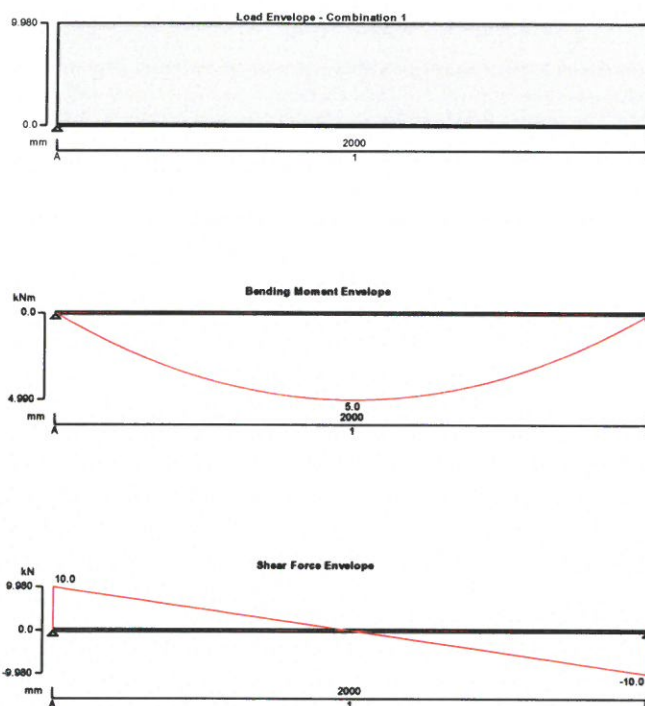
Permissible deflection $\delta_{adm} = 6.000$ mm Total deflection $\delta_a = 4.134$ mm

PASS - Deflection is within permissible limits

Project		130 Renfield, Haywards Heath		Job Ref.		23087
Section		STEEL LINTEL		Sheet no./rev.		07
Calc. by	PJE	Date	28/06/2023	Chk'd by		
				Date		
				App'd by		
				Date		

STEEL BEAM ANALYSIS & DESIGN (BS5950)

TEDDS calculation version 1.0.05



Applied loading

Beam loads

Dead full UDL 7 kN/m
Dead self weight of beam $\times 1$

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 $\times 1.60$

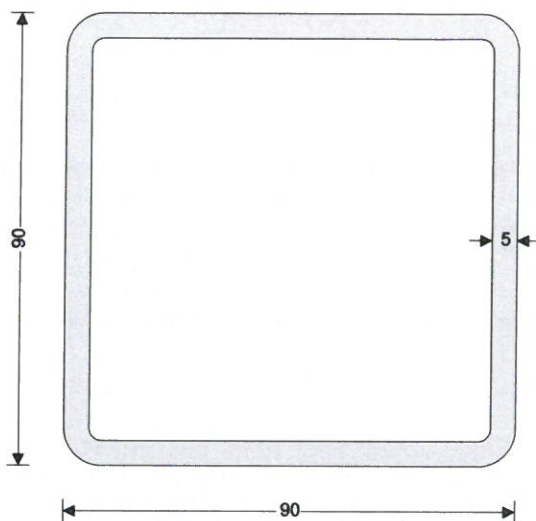
Analysis results

Maximum moment	$M_{max} = 5 \text{ kNm}$	$M_{min} = 0 \text{ kNm}$
Maximum shear	$V_{max} = 10 \text{ kN}$	$V_{min} = -10 \text{ kN}$
Deflection span1	$\delta_{s1_max} = 3.6 \text{ mm}$	$\delta_{s1_min} = 1.5 \times 10^{-15} \text{ mm}$
Reactions at support A	$R_{A_max} = 10 \text{ kN}$	$R_{A_min} = 10 \text{ kN}$
Unfactored dead load reaction at support A	$R_{A_Dead} = 7.1 \text{ kN}$	
Reactions at support B	$R_{B_max} = 10 \text{ kN}$	$R_{B_min} = 10 \text{ kN}$
Unfactored dead load reaction at support B	$R_{B_Dead} = 7.1 \text{ kN}$	

Section details

Section type	SHS 90x90x5.0	Steel grade	S275
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PJE	28/06/2023					



Classification of cross sections - Section 3.5

Tensile strain coefficient $\varepsilon = 1.00$

Section classification

Plastic

Shear capacity - Section 4.2.3

Design shear force $F_v = 10 \text{ kN}$

Design shear resistance $P_v = 138 \text{ kN}$

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment $M = 5 \text{ kNm}$

Moment capacity low shear $M_c = 14.6 \text{ kNm}$

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection $\delta_{lim} = 5.6 \text{ mm}$

Maximum deflection $\delta = 3.63 \text{ mm}$

PASS - Maximum deflection does not exceed deflection limit