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12 The Causeway, Horsham Job 2025-CAUS

April 2025 Revision 0

General:

These calculations and details are to be read in conjunction with all relevant Architect's and Engineer's drawings and specifications.

These drawings and calculations were prepared for the Client's use only and remain copyright. I am not liable for any use of the documents by other parties without reference to me first.

Full Building Regulation Approval should be obtained prior to the commencement of works on site, and any works carried out prior to this are undertaken at the Client's/Contractor's own risk.

Any dimensions stated in the calculations are for design purposes only, and must not be used for ordering lengths of components. The contractor is to be responsible for obtaining all site dimensions.

Any deviation from the design assumptions is to be reported to the Architect/Engineer prior to commencement of works.

The existing building is assumed to be in good structural order and any defects are to be reported to the Architect/Engineer.

The temporary stability of the structure during all stages of the construction work is the responsibility of the Contractor.

CDM: The contractor is expected to understand and follow the Construction (Design and Management) Regulations with regard to safety on site, even though they may not be legally applicable. In particular he must observe safe work methods regarding temporary stability of existing structures, tracing live services, avoiding foundation excavation instability and lifting heavy/long items (e.g. beams).

Party Wall Act: The property owner must obtain all necessary neighbour consents for structural work on or close to the boundaries of the site in accordance with the Act, and unless instructed otherwise these calculations will assume that placing loads onto party walls or alongside boundaries is acceptable from a design view point.

NB:

This design assumes that the new dumb waiter will be vertically self-supporting from the existing basement slab.

Element	Specification	Revision
Purlin	125 x 65 x 15 PFC	
Stair trimmer "A"	C24 2/ 47mm x 120mm, well spiked together	
Stair trimmers "B"	C24 3/ 47mm x 220mm, well spiked together	
Loft	C24 47mm x 195mm @ 400mm c/c	
Gnd floor joists, Gnd	C24 47mm x 145mm @ 400mm c/c	
B1	2/ Naylor P215 lintels (each 70mm high x 215mm wide), or equally approved, to lintel manufacturer's recommendations. Lintels installed side-by-side	
B2	152 x 89 x 16 UB	
B3	152 x 89 x 16 UB	
L1	2/ Naylor R6 lintels (each 140mm high x 100mm), or equally approved, to lintel manufacturer's recommendations, installed side-by-side	
L2	C24 2/ 47mm x 97mm, well spiked together	

- Dimensions used for calculations have been taken from Architect drawing(s) ref: 24877…210-215, all revision A. If the dimensions of structural members change from those used in the calculations, the Engineer is to be contacted to confirm appropriate structural sizing and detailing. No dimensions are to be scaled from Robert Linthorst drawings.
- Stability of the structure is to be the responsibility of the Contractor during the works.
- Any assumptions highlighted in the calculations and / or drawings are to be confirmed on site prior to procuring materials and the Engineer consulted if any discrepancies found.
- All lintels and beams are to have protection against fire in accordance with the Architect's details and specification.
- Any balustrade and metal staircases are to be by Specialist Sub-Contractor, who will provide all relevant calculations and details for Local Authority approval.

Steel:

- All new steelwork is to be Grade S275, unless noted otherwise in the calculations. Normal paint finish to be thoroughly wire brushed and painted with two coats of Zinc Phosphate primer. All damaged areas of paintwork are to be touched up after erection of the steelwork. All bolts are to be Grade 8.8, unless noted otherwise, and all welds are to be 6mm continuous fillet type, unless noted otherwise. All external steelwork is to be galvanised. All steelwork within cavity masonry to be galvanised or otherwise protected from moisture using Denso tape or another appropriate system.

Masonry:

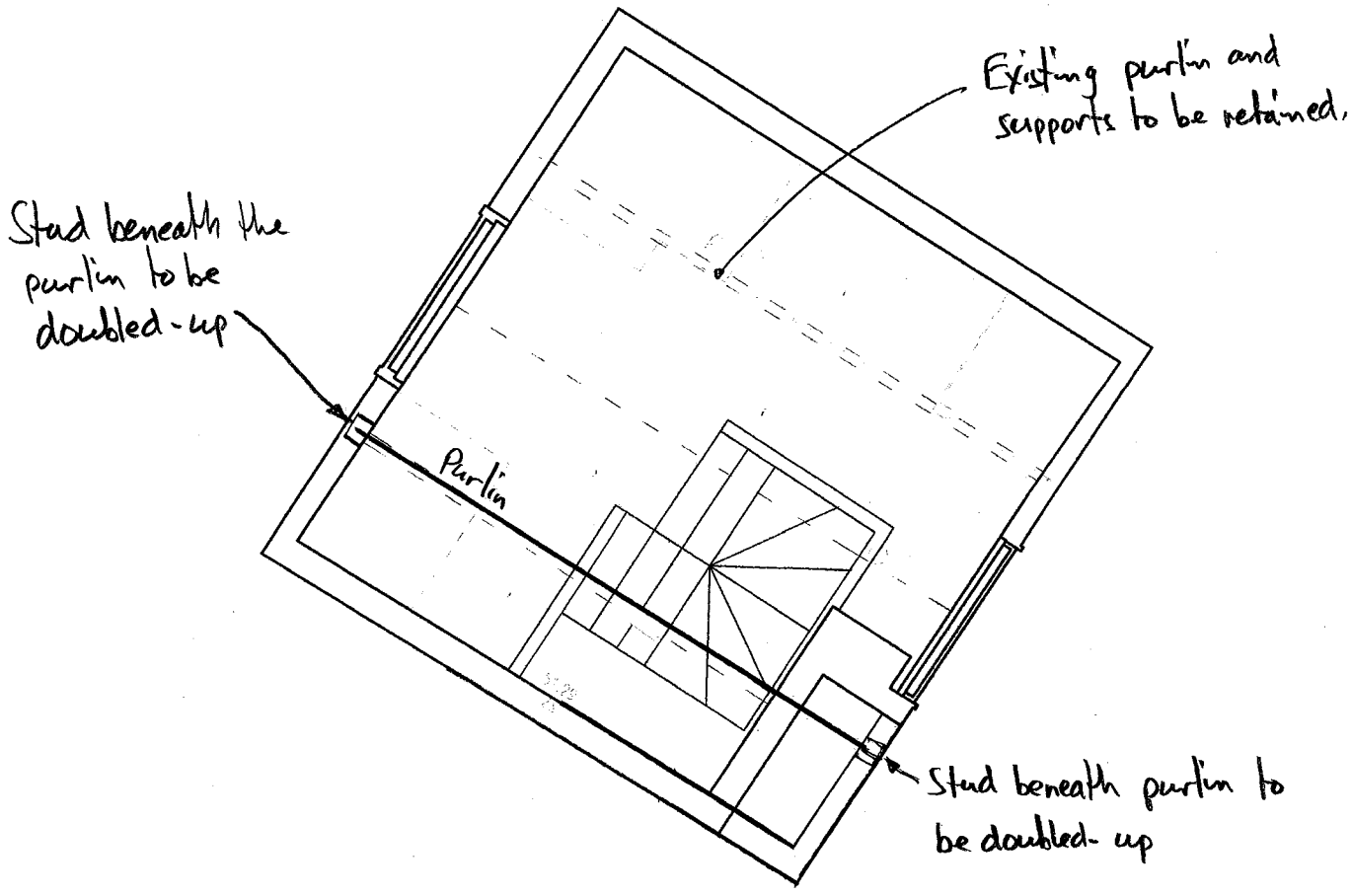
- Lintels are to be sized to suit span. Lintels to be installed to manufacturer's recommendations. Cavity lintels are to suit cavity width – site to confirm this prior to procuring lintel.
- Masonry to be minimum 3.6N/mm² block and/or 10N/mm² brick with minimum type (iii), i.e. M4 mortar, which typically has a 1:5 sand: Portland cement ratio, unless noted otherwise.

Timber:

- The timber sizes shown below are considered the most practicable / cost effective required. It would be considered acceptable for the Architect to increase the size of any timber member to suit construction detailing (e.g. insulation).
- 30 x 5.0mm thick galvanised mild steel lateral restraint straps, 900mm long with 150mm upstand, are to be provided between external walls and floors at 1200mm max. centres. Where straps are perpendicular to the span of the floor, they shall be taken across 3 No. joists, with solid timber noggin between. The strap's upstand shall be fixed to the solid masonry wall using 5x No. 12 screws in plugged holes.

NB

The loft floor is only designed for very light storage - NOT domestic loading.



12 The Causeway, Horsham

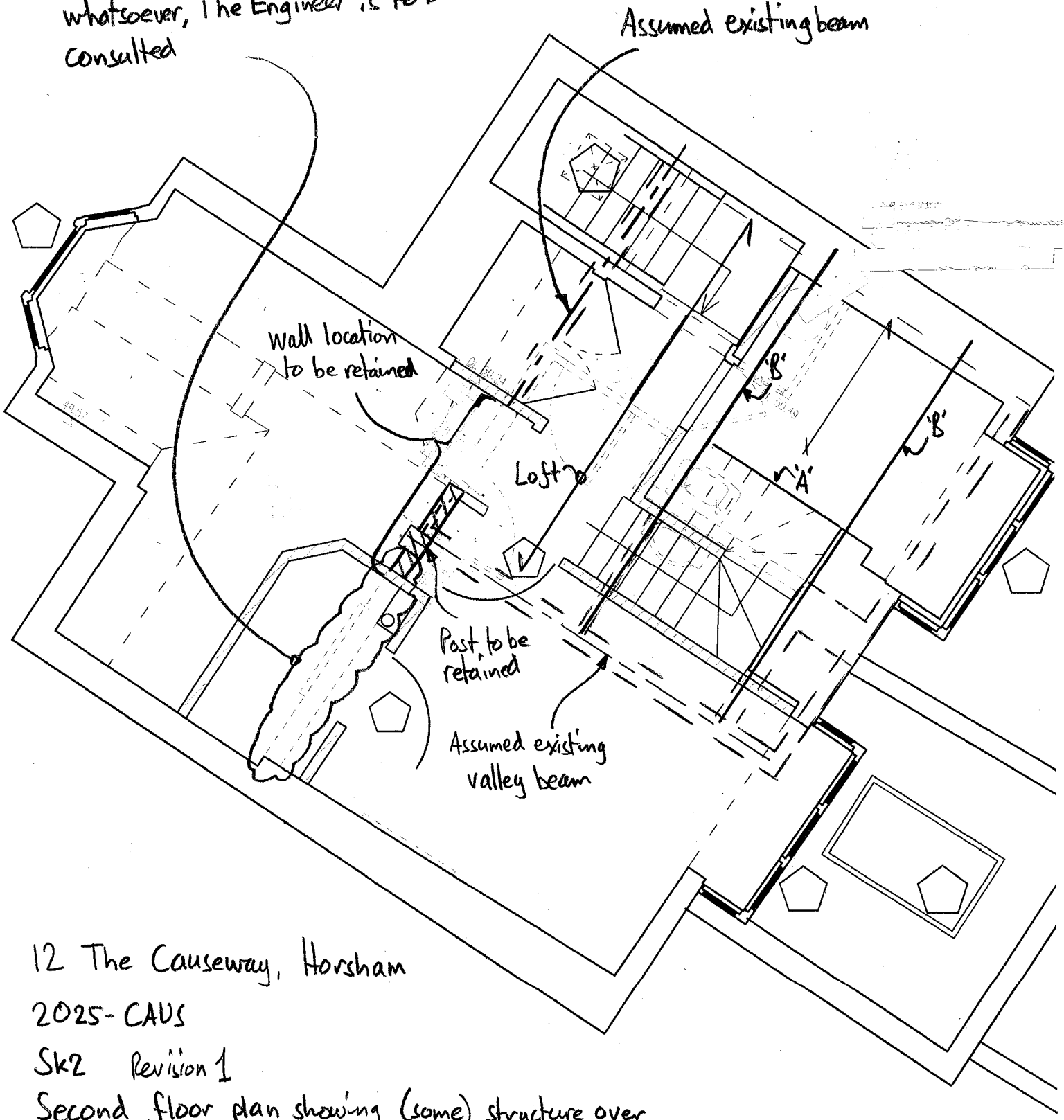
2025-CAUS

Sk1

Third (loft) floor plan showing structure over

R.L. April 2025

Site to expose existing ceiling joists and rafters in this area to prove the existing wall does not support any vertical loads. If in any doubt whatsoever, The Engineer is to be consulted



12 The Causeway, Horsham

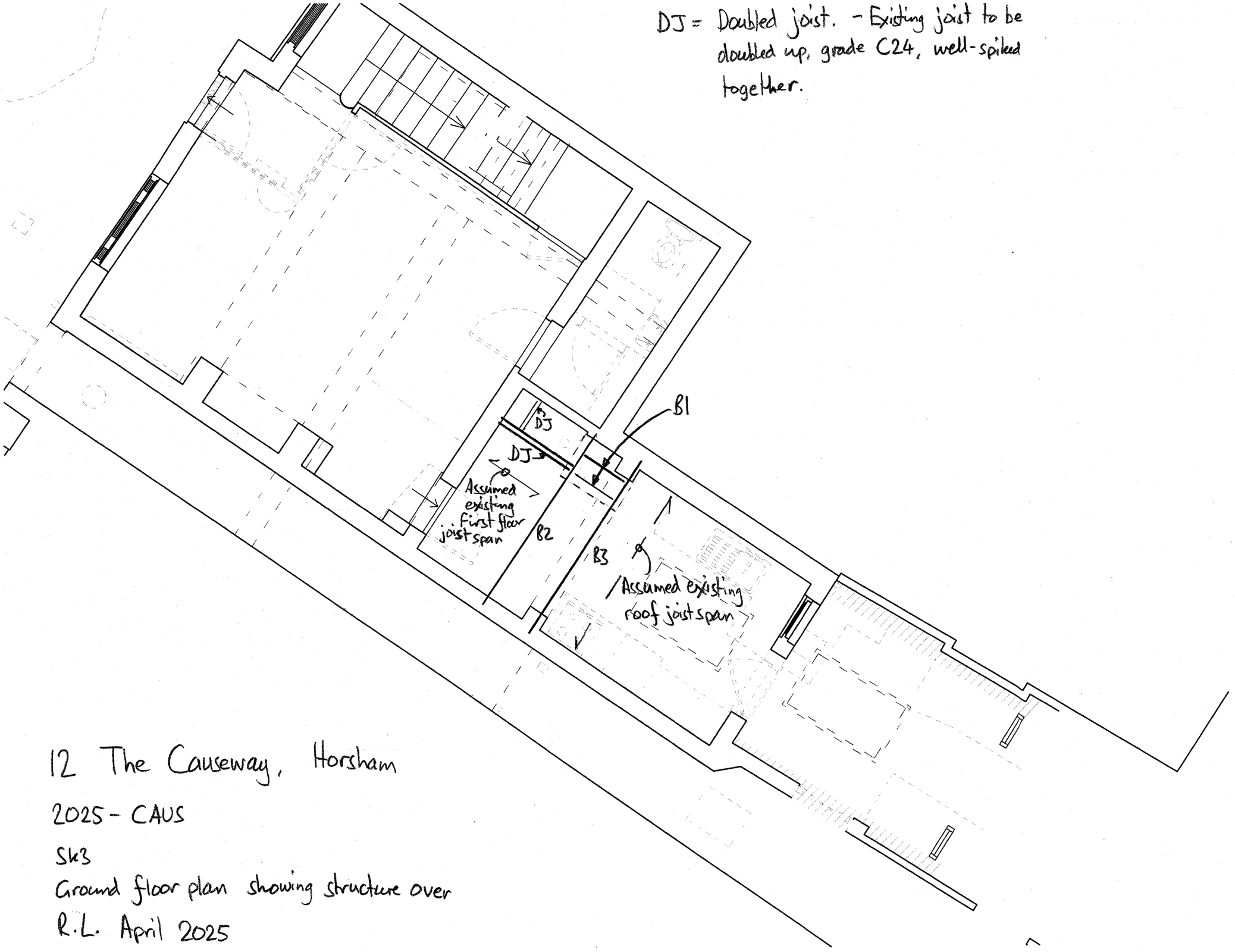
2025-CAUS

Sk2 Revision 1

Second floor plan showing (some) structure over

R.L. April 2025

DJ = Doubled joist. - Existing joist to be doubled up, grade C24, well-spiked together.



12 The Causeway, Horsham

2025 - CAUS

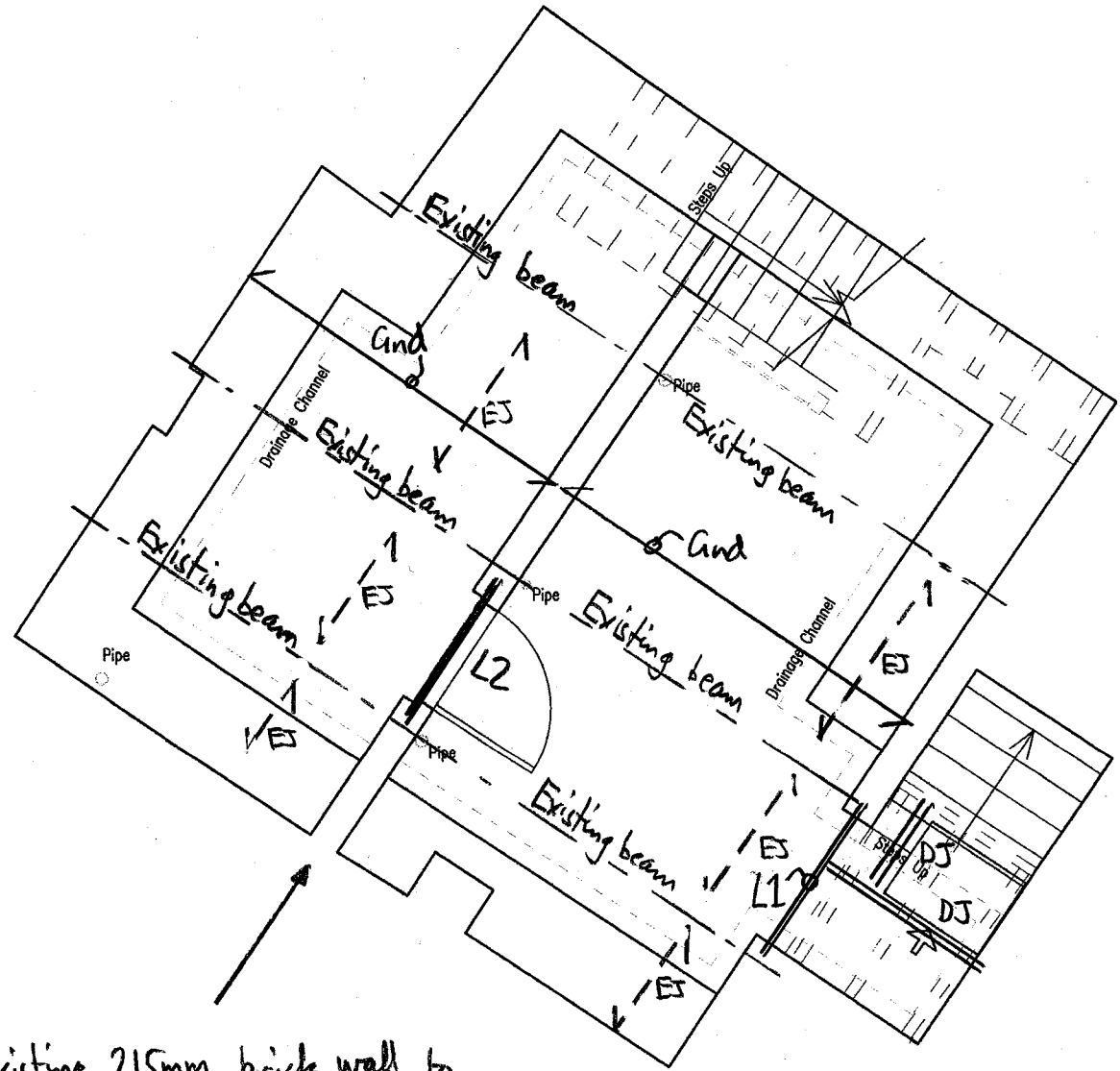
Sk3

Ground floor plan showing structure over

R.L. April 2025

EJ = Assumed span of existing joists

DJ = Doubled joists (Gnd)



Existing 215mm brick wall to be built up in timber or masonry to support the new floor joists above the existing. The existing are assumed to remain in-situ.

12 The Causeway, Horsham

2025-CAUS

Sk4

Basement plan showing structure over

R.L. April 2025

Project		Item		
12 The Causeway, Horsham				
Engineer: RL	Date: April 2025	Job no.: 2025-CAUS	Sheet: 1	Revision

Purlin

span 3.95m

DL+IL Roof $\frac{3.2m}{2} \times 2.6 kN/m^2$ = 4.16 kN/m

SWT = 0.2

Σ 4.36 kN/m

M $4.36 kN/m \times 3.95m^2/8$ = 8.5 kNm

Purlin

125 x 65 x 15 PFC has Mb of 10.9 kNm @ 5.0m Le

43.9 cm^4 reqd for span/360, 46.3 cm^4 provided

Stair trimmer 'A' - span 1.6m

DL+IL loft $2.0 kN/m^2 \times 4.25m/2$ = 4.25

Balustrade $0.6 kN/m + 0.4 kN/m^2 \times 1.1m$ = 1.04

Σ 5.29

see sheet 2

Stair trimmer 'B' span 4.25m

Stair load: $2 kN/m^2 \times \frac{1.6m}{2} \times \frac{2.2m}{2}$ = 1.76 kN

pt. from 'A' = 4.23

Σ 5.99

see sheet 3

Job Title	12 The Causeway, Horsham		Item	Starir trimmer "A"			
Designed by: RL	Date	02-Apr-25	Job No.	2025-CAUS	Sheet	2	Rev.

Biaxial bending enabled in sheet

Vertical Load (kN/m run)	5.290		Self wt. (kN/m)	0.0465	
Additional point load at midspan (kN)	0				
Horizontal Load (kN/m run)					
L (m)	1.6				
Moment due to vert load - $wL^2/8 + PL/4$ (kNm)	1.693		Manually input vertical bending moment (kNm)		
Moment due to horiz load - $wL^2/8$ (kNm)	0.000	0	Manually input horiz. moment (kNm)		
Stress due to vert loading M/Z (N/mm²)	7.504				
Stress due to horiz loading M/Z_{trans} (N/mm²)	0.000		R1	4.232	kN

Timber Grade - Strength class	C24	$K_{2\ bending}$	1		
Service Class	1	K_3	1		
Horizontal dim., b (mm)	94	K_7	1.106046539		
Vertical dim., d (mm)	120	$K_{7\ transverse}$	1.136159421		
Z (mm³)	225,600	K_8	1.1	1.1 for 2 or more timbers well spiked together	
A (mm²)	11,280				
Grade stress (bending) (N/mm²)	7.5	K_9	1.14	1.14 for 2x, 1.21 for 3	
Z - transverse (mm³)	176,720	K_{14}	1.106046539		
		Young's Modulus, E (N/mm²)	7200		min
Grade stress (tension) (N/mm²)	4.5		10800		mean
Tensile force per member (kN)	0	<610mm c/c?	No		
$\sigma_{m,a,\ parallel}$ (N/mm²)	7.50	I (mm^4)	1.35E+07		
$\sigma_{m,adm,\ parallel}$ (N/mm²)	9.12	**Bending stress ok**			
$\sigma_{t,a,\ parallel}$ (N/mm²)	0.00	EI(Nmm²)	1.11E+11		
$\sigma_{t,adm,\ parallel}$ (N/mm²)	5.47				
Combined σ_a / σ_{adm}	0.822	**Combined Bending and tensile stresses ok**			

Flexural deflection, assuming = Σδ from different loads(mm)	4.06	allowable deflection (mm)	4.8
Shear deflection (mm)	0.40		
Total deflection (mm)	**4.46**		
deflection / span	**0.00279**	**OK in deflection**	

Job Title	12 The Causeway, Horsham		Item	Starir trimmer "B"			
Designed by: RL	Date	02-Apr-25	Job No.	2025-CAUS	Sheet	3	Rev.

Biaxial bending enabled in sheet

Vertical Load (kN/m run)	0.200				
Additional point load 1 (kN)	5.99		2	Distance from support A (m)	
Additional point load 2 (kN)			4.3	Distance from support A (m)	
Horizontal Load (kN/m run)					
L (m)	4.25				
Moment from vert load - $wL^2/8 + \Sigma Mpt$ (kNm)	6.794	0	Manually input vertical bending moment (kNm)		
Moment due to horiz load - $wL^2/8$ (kNm)	0.000	0	Manually input horiz. moment (kNm)		
Stress due to vert loading M/Z (N/mm²)	5.973		R1 from pt loads	3.171176471	R1 tot 3.59618
Stress due to horiz loading M/Z_{trans} (N/mm²)	0.000		R2 from pt loads	2.818823529	R2tot 3.24382

Timber Grade - Strength class	C24	$K_{2\ bending}$	1		
Service Class	1	K_3	1		
Horizontal dim., b (mm)	141	K_7	1.034705704	*Service class 3 for thick timber?*	
Vertical dim., d (mm)	220	$K_{7\ transverse}$	1.086598836		
Z (mm³)	1,137,400	K_8	1.1	1.1 for 2 or more timbers well spiked together	
A (mm²)	31,020				
Grade stress (bending) (N/mm²)	7.5	K_9	1.21	1.14 for 2x, 1.21 for 3	
Z - transverse (mm³)	728,970	K_{14}	1.034705704		
		Young's Modulus, E (N/mm²)	7200	min	
Grade stress (tension) (N/mm²)	4.5		10800	mean	
Tensile force per member (kN)		<610mm c/c?	No		
$\sigma_{m,a,\ parallel}$ (N/mm²)	5.97	I (mm^4)	1.25E+08		
$\sigma_{m,adm,\ parallel}$ (N/mm²)	8.54	**Bending stress ok**			
$\sigma_{t,a,\ parallel}$ (N/mm²)	0.00				
$\sigma_{t,adm,\ parallel}$ (N/mm²)	5.12				
Combined σ_a / σ_{adm}	0.700	**Combined Bending and tensile stresses ok**			

Flexural deflection, assuming = $\Sigma\delta$ from different loads(mm)	9.51	(For one point load only)
ly supported beam(mm) Shear deflection (mm)	0.04	(For one point load only)
Total deflection (mm)	**9.55**	
deflection / span	0.00225	**OK in deflection**

Project		Item		
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Loft

span 4.25m

Trada: C24 47x195mm @ 400mm c/c

B1

span 0.8m

Chimney: $22kN/m^3 \times \frac{0.67m}{2} \times \frac{0.8m \times 1.1}{2} = 3.25 kN/m$

$\times 1.4 = 4.54 kN/m$

B1

Naylor P215 (215 wide x 70 high) ok to 20kN/m

B2, B3

span 2.6m

DL

Chimney: $22kN/m^3 \times \frac{0.9m}{2} \times 70\% \text{ solid} \times 7.7m = 53.4$

Wall $5.5kN/m^2 \times 4.5m$ = 24.75 — Not on B2 or B3

1st $3m/2$ (max.) $\times 0.5kN/m^2$ = 0.75

IL 1st $3m/2 \times 1.5kN/m^2$ = 2.25

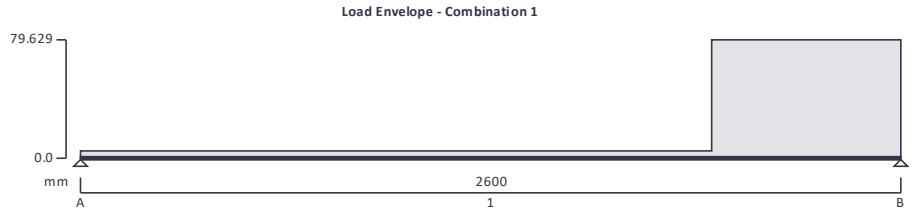
B2 **B3**

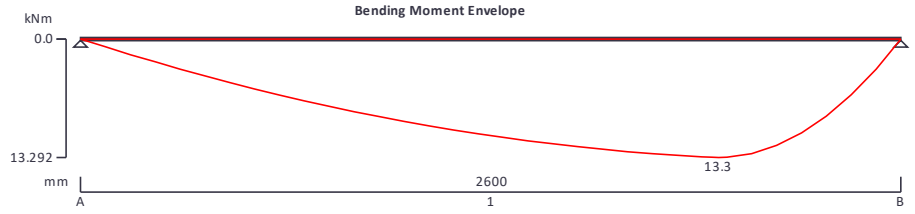
see sheets 5-8

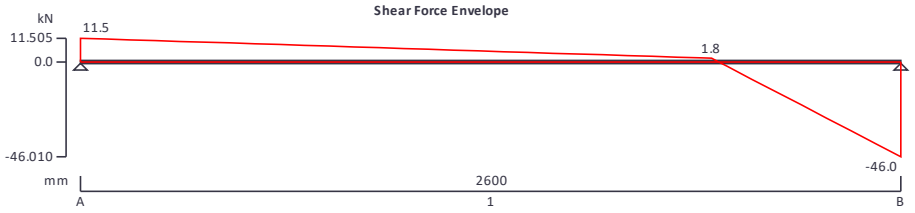
STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.07







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 53.4 kN/m from 2000 mm to 2600 mm
	Dead full UDL 0.75 kN/m
	Imposed full UDL 2.25 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

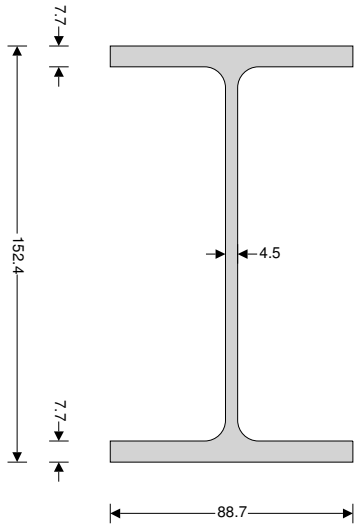
Maximum moment	M_{max} = **13.3** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **11.5** kN	V_{min} = **-46** kN
Deflection	δ_{max} = **3.4** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **11.5** kN	R_{A_min} = **11.5** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **4.9** kN	
Unfactored imposed load reaction at support A	$R_{A_Imposed}$ = **2.9** kN	
Maximum reaction at support B	R_{B_max} = **46** kN	R_{B_min} = **46** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **29.5** kN	
Unfactored imposed load reaction at support B	$R_{B_Imposed}$ = **2.9** kN	

Section details

Section type	**UKB 152x89x16 (Tata Steel Advance)**
Steel grade	**S275**

From table 9: Design strength p_y

Thickness of element	max(T, t) = **7.7** mm
Design strength	p_y = **275** 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	$K_{LT.A}$ = **1.20** + 2 × D
	$K_{LT.B}$ = **1.20** + 2 × D

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275\ N/mm^2 / p_y]}$ = **1.00**

Internal compression parts - Table 11

Depth of section	d = **121.8** mm	
	d / t = 27.1 × ε <= 80 × ε	Class 1 plastic

Outstand flanges - Table 11

Width of section — $b = B / 2 =$ **44.4** mm

$b / T = 5.8 \times \varepsilon <= 9 \times \varepsilon$ Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force — $F_v = \max(\text{abs}(V_{max}), \text{abs}(V_{min})) =$ **46** kN

$d / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area — $A_v = t \times D =$ **686** mm^2

Design shear resistance — $P_v = 0.6 \times p_y \times A_v =$ **113.2** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment — $M = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) =$ **13.3** kNm

Moment capacity low shear - cl.4.2.5.2 — $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) =$ **33.9** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling — $L_E = 1.2 \times L_{s1} + 2 \times D =$ **3425** mm

Slenderness ratio — $\lambda = L_E / r_{yy} =$ **162.961**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter — $u =$ **0.890**

Torsional index — $x =$ **19.566**

Slenderness factor — $v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25} =$ **0.688**

Ratio - cl.4.3.6.9 — $\beta_W =$ **1.000**

Equivalent slenderness - cl.4.3.6.7 — $\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]} =$ **99.748**

Limiting slenderness - Annex B.2.2 — $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5} =$ **34.310**

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

Bending strength - Section 4.3.6.5

Robertson constant — $\alpha_{LT} =$ **7.0**

Perry factor — $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0) =$ **0.458**

Euler stress — $p_E = \pi^2 \times E / \lambda_{LT}^2 =$ **203.4** N/mm^2

$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2 =$ **285.8** N/mm^2

Bending strength - Annex B.2.1 — $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5}) =$ **125.3** N/mm^2

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment — $M_2 =$ **6.4** kNm

Moment at centre-line of segment — $M_3 =$ **10.8** kNm

Moment at three quarter point of segment — $M_4 =$ **13.2** kNm

Maximum moment in segment — $M_{abs} =$ **13.3** kNm

Maximum moment governing buckling resistance — $M_{LT} = M_{abs} =$ **13.3** kNm

Equivalent uniform moment factor for lateral-torsional buckling

$m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44) =$ **0.829**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment — $M_b = p_b \times S_{xx} =$ **15.4** kNm

$M_b / m_{LT} =$ **18.6** 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 $\delta_{lim} = L_{s1} / 360 =$ **7.222** mm

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **3.432** mm

PASS - Maximum deflection does not exceed deflection limit

Project		Item		
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Existing ground floor:

Joists: C16 50 x 97mm @ 400mm c/c, approx.

Trada: ok to 1.98m @ 0.5 kN/m² DL

If loaded by additional joists & boards:

See sheet 10 → ok to 1.65m span - just.

Existing floor beams. span 2.7.

DL+IL $(0.85^{DL} + 1.5^{IL}) \times 3m/2$ = 3.525 kN/m

see sheet 11 Need to be 200mm x 100mm

Gnd

If new joists used, @ span < 2.8m

Trada: C24 47mm x 145mm @ 400mm c/c ok to 3.25m

Job Title	12 The Causeway, Horsham		Item	Existing ground floor joists			
Designed by: RL	Date	02-Apr-25	Job No.	2025-CAUS	Sheet	10	Rev.

Biaxial bending enabled in sheet

Vertical Load (kN/m run)	**0.340**		Self wt. (kN/m)	0.0181	
Additional point load at midspan (kN)	**0.9**				
Horizontal Load (kN/m run)					
L (m)	**1.65**				
Moment due to vert load - $wL^2/8 + PL/4$ (kNm)	0.487		Manually input vertical bending moment (kNm)		
Moment due to horiz load - $wL^2/8$ (kNm)	0.000	0	Manually input horiz. moment (kNm)		
Stress due to vert loading M/Z (N/mm²)	5.843				
Stress due to horiz loading M/Z_{trans} (N/mm²)	0.000		R1	0.731	kN

Timber Grade - Strength class	**C16**	$K_{2\ bending}$	1		
Service Class	**1**	K_3	**1**		
Horizontal dim., b (mm)	**50**	K_7	1.128452643		
Vertical dim., d (mm)	**100**	$K_{7\ transverse}$	1.17		
Z (mm³)	83,333	K_8	**1**	1.1 for 2 or more timbers well spiked together	
A (mm²)	5,000				
Grade stress (bending) (N/mm²)	5.3	K_9	**1**	1.14 for 2x, 1.21 for 3	
Z - transverse (mm³)	41,667	K_{14}	1.128452643		
		Young's Modulus, E (N/mm²)	5800		min
Grade stress (tension) (N/mm²)	3.2		8800		mean
Tensile force per member (kN)	**0**	<610mm c/c?	**Yes**		
$\sigma_{m,a,\ parallel}$ (N/mm²)	5.84	I (mm^4)	4.17E+06		
$\sigma_{m,adm,\ parallel}$ (N/mm²)	5.98	**Bending stress ok**			
$\sigma_{t,a,\ parallel}$ (N/mm²)	0.00	EI(Nmm²)	3.67E+10		
$\sigma_{t,adm,\ parallel}$ (N/mm²)	3.61				
Combined σ_a / σ_{adm}	0.977	**Combined Bending and tensile stresses ok**			

Flexural deflection, assuming = Σδ from different loads(mm)	3.19	allowable deflection (mm)	4.95
Shear deflection (mm)	0.05		
Total deflection (mm)	**3.24**		
deflection / span	**0.00197**	**OK in deflection**	

Job Title	12 The Causeway, Horsham		Item	Existing ground floor beams			
Designed by: RL	Date	02-Apr-25	Job No.	2025-CAUS	Sheet	11	Rev.

Biaxial bending enabled in sheet

Vertical Load (kN/m run)	3.525		Self wt. (kN/m)	0.0726	
Additional point load at midspan (kN)	0				
Horizontal Load (kN/m run)					
L (m)	2.7				
Moment due to vert load - $wL^2/8 + PL/4$ (kNm)	3.212		Manually input vertical bending moment (kNm)		
Moment due to horiz load - $wL^2/8$ (kNm)	0.000	0	Manually input horiz. moment (kNm)		
Stress due to vert loading M/Z (N/mm²)	4.818				
Stress due to horiz loading M/Z_{trans} (N/mm²)	0.000		R1	4.759	kN

Timber Grade - Strength class	C16	$K_{2\ bending}$	1		
Service Class	1	K_3	1		
Horizontal dim., b (mm)	100	K_7	1.045610747		
Vertical dim., d (mm)	200	$K_{7\ transverse}$	1.128452643		
Z (mm³)	666,667	K_8	1	1.1 for 2 or more timbers well spiked together	
A (mm²)	20,000				
Grade stress (bending) (N/mm²)	5.3	K_9	1	1.14 for 2x, 1.21 for 3	
Z - transverse (mm³)	333,333	K_{14}	1.045610747		
		Young's Modulus, E (N/mm²)	5800	min	
Grade stress (tension) (N/mm²)	3.2		8800	mean	
Tensile force per member (kN)	0	<610mm c/c?	No		
$\sigma_{m,a,\ parallel}$ (N/mm²)	4.82	I (mm^4)	6.67E+07		
$\sigma_{m,adm,\ parallel}$ (N/mm²)	5.54	**Bending stress ok**			
$\sigma_{t,a,\ parallel}$ (N/mm²)	0.00	EI(Nmm²)	3.87E+11		
$\sigma_{t,adm,\ parallel}$ (N/mm²)	3.35				
Combined σ_a / σ_{adm}	0.869	**Combined Bending and tensile stresses ok**			

Flexural deflection, assuming = Σδ from different loads(mm)	6.31	allowable deflection (mm)	8.1
Shear deflection (mm)	0.53		
Total deflection (mm)	**6.84**		
deflection / span	**0.00253**	**OK in deflection**	

Project		Item		
12 The Causeway, Horsham				
Engineer	Date	Job no.	Sheet	Revision
RL	April 2025	2025-CAUS	12	

L1

span 1.1m

DL wall $\frac{2.1m \times 1.1}{2} \times 5kN/m^2$ = 5.78

1st $\frac{4.1m}{2} \times 0.5kN/m^2$ = 1.03

Σ 6.81

X1.4 9.53

IL 1st $4.1m/2 \times 1.5kN/m^2$ = 3.08

X1.6 4.92

Σudl 14.45 kN/m

Naylor R7 (215x145) ok to 37 kN/m

(L1) OR 2x Naylor R6 (100x140) each ok to 26 kN/m @ 1.2m clear span

L2

span <0.9m

Gnd $2kN/m^2 \times 5.4m/2$ = 5.4kN/m

(L2) see sheet 13

Job Title	12 The Causeway, Horsham		Item	L2			
Designed by: RL	Date	02-Apr-25	Job No.	2025-CAUS	Sheet	13	Rev.

Biaxial bending enabled in sheet

Vertical Load (kN/m run)	5.400		Self wt. (kN/m)	0.0376	
Additional point load at midspan (kN)	0				
Horizontal Load (kN/m run)					
L (m)	0.9				
Moment due to vert load - $wL^2/8 + PL/4$ (kNm)	0.547		Manually input vertical bending moment (kNm)		
Moment due to horiz load - $wL^2/8$ (kNm)	0.000	0	Manually input horiz. moment (kNm)		
Stress due to vert loading M/Z (N/mm²)	3.709				
Stress due to horiz loading M/Z_{trans} (N/mm²)	0.000		R1	2.430	kN

Timber Grade - Strength class	C24	$K_{2\ bending}$	1		
Service Class	1	K_3	1		
Horizontal dim., b (mm)	94	K_7	1.132239879		
Vertical dim., d (mm)	97	$K_{7\ transverse}$	1.136159421		
Z (mm³)	147,408	K_8	1.1	1.1 for 2 or more timbers well spiked together	
A (mm²)	9,118				
Grade stress (bending) (N/mm²)	7.5	K_9	1.14	1.14 for 2x, 1.21 for 3	
Z - transverse (mm³)	142,849	K_{14}	1.132239879		
		Young's Modulus, E (N/mm²)	7200	min	
Grade stress (tension) (N/mm²)	4.5		10800	mean	
Tensile force per member (kN)	0	<610mm c/c?	No		
$\sigma_{m,a,\ parallel}$ (N/mm²)	3.71	I (mm^4)	7.15E+06		
$\sigma_{m,adm,\ parallel}$ (N/mm²)	9.34	**Bending stress ok**			
$\sigma_{t,a,\ parallel}$ (N/mm²)	0.00	EI(Nmm²)	5.87E+10		
$\sigma_{t,adm,\ parallel}$ (N/mm²)	5.60				
Combined σ_a / σ_{adm}	0.397	**Combined Bending and tensile stresses ok**			

Flexural deflection, assuming = Σδ from different loads(mm)	0.79	allowable deflection (mm)	2.7
Shear deflection (mm)	0.16		
Total deflection (mm)	**0.95**		
deflection / span	**0.00105**	**OK in deflection**	