

PRELIMINARY STRUCTURAL CONDITION REPORT

UPON

HOLLY TREE HOUSE

FENGATE

MOULTON CHAPEL

SPALDING, LINCOLNSHIRE

PE12 0XL



PROJECT No: SW 25-266

DOCUMENT REF: SW 25-266-REP-01

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1. INTRODUCTION

This preliminary report and opinion has been prepared for the purpose stated herein. It has been prepared for the exclusive use of our client Mrs J. Stanberry and their professional consultants.

This document, or any part of its contents shall not be disclosed to any other persons except those specifically mentioned below.

- Local Authority Planning Department
- Local Authority Building Control
- Oglesby & Limb Architects
- Any other person with written permission of Mrs J. Stanberry

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Shields Wilson Ltd have been requested to carry out a visual inspection and subsequent assessment of the existing derelict dwelling, Holly Tree House, Fengate, Moulton Chapel.

We confirm that the visual inspection took place on Monday 9th June 2025.

In principle, the building is a traditional brick built two storey dwelling, with a slate tiled roof supported by a timber raised collar roof structure, forming partial sloped ceilings to the 1st floor areas.

The first floor is of standard timber joist construction, with some larger areas having principal and secondary joists. The ground floors are generally ground bearing concrete slabs.

The building appears to have been built over two periods. The main 'L' shaped building has been extended with a more recent extension off the Northern gable towards the neighbouring farm yard, following the same 2 storey profile.

Off the East elevation there is a modern UPVC conservatory attached to the extended part of the dwelling, together with a timber framed, asbestos clad lean-to structure forming a utility room and WC to the original part of the dwelling.

The external brickwork elevations are coated with a lime wash or painted treatment and numerous areas of the original brickwork have been crudely repaired with un-matched common bricks, generally on the South and East elevation and around the openings where the traditional materials have been replaced with UPVC doors & windows.





2. ROOF STRUCTURE

The roof structure was surveyed and the existing timber sizes measured. The roof to the extended area is of similar construction to the main original roof.

The rafters are 50mm x 70mm at 400mm c/c with 35mm x 125mm raised collar ceiling ties at the same centres.



Numerous cracks were noted to the ceiling finishes.



Analysis and design checks have been carried out (Appendix A) to find that the existing timbers are **not** adequate for actual British Standard loadings, therefore a full scheme of Structural remedial works will be required to rectify this issue. It was also noted that certain areas of ceiling were suffering from ingress of moisture from failed roof coverings/flashings, therefore it would be fair to expect that the roof timbers local to these areas will have some decay and will require replacing.



3. 1ST FLOOR

The coverings to the 1st floor structure were not removed during our survey, so existing joist sizes have not been checked. Although, large deflection of the principal joist support beam above the lounge was noted, photo below, with a deflection of 88mm along its length which is beyond allowable and causes unacceptable slopes of the 1st floor bedroom floors.



There were also large areas of ceiling damaged by damp, including areas where ceilings have collapsed.



Therefore, we would recommend that the affected floor structure is strengthened, repaired or replaced.

4. GROUND FLOORS

The ground floors are of concrete ground bearing slab construction with either tiled or carpet coverings. They appeared in fair condition, although no structural details were taken or checked. It is assumed that no below slab insulation would be present. Therefore during any refurbishment works, they would need to be excavated and replaced with suitable new slabs with insulation and DPM.

5. WALLS

The internal and external walls have serious issues from rising damp at ground floor, together with damp areas at first floor level from failed roof coverings and flashing and the poor condition of the external masonry, allowing the damp to penetrate.







The roof separating walls also slope outwards from 1st floor level. This slope was measured as 30mm horizontal over 910mm vertical, therefore approx. 2° movement.



We feel that this is due to the defective roof structure as noted previously and that this movement will be progressive and continue to move, without any suitable remedial works.

Numerous movement cracks were also noted to the external elevations of both the original part together with the extension.







The foundations to both areas were exposed and were found to be unsuitably shallow and narrow.

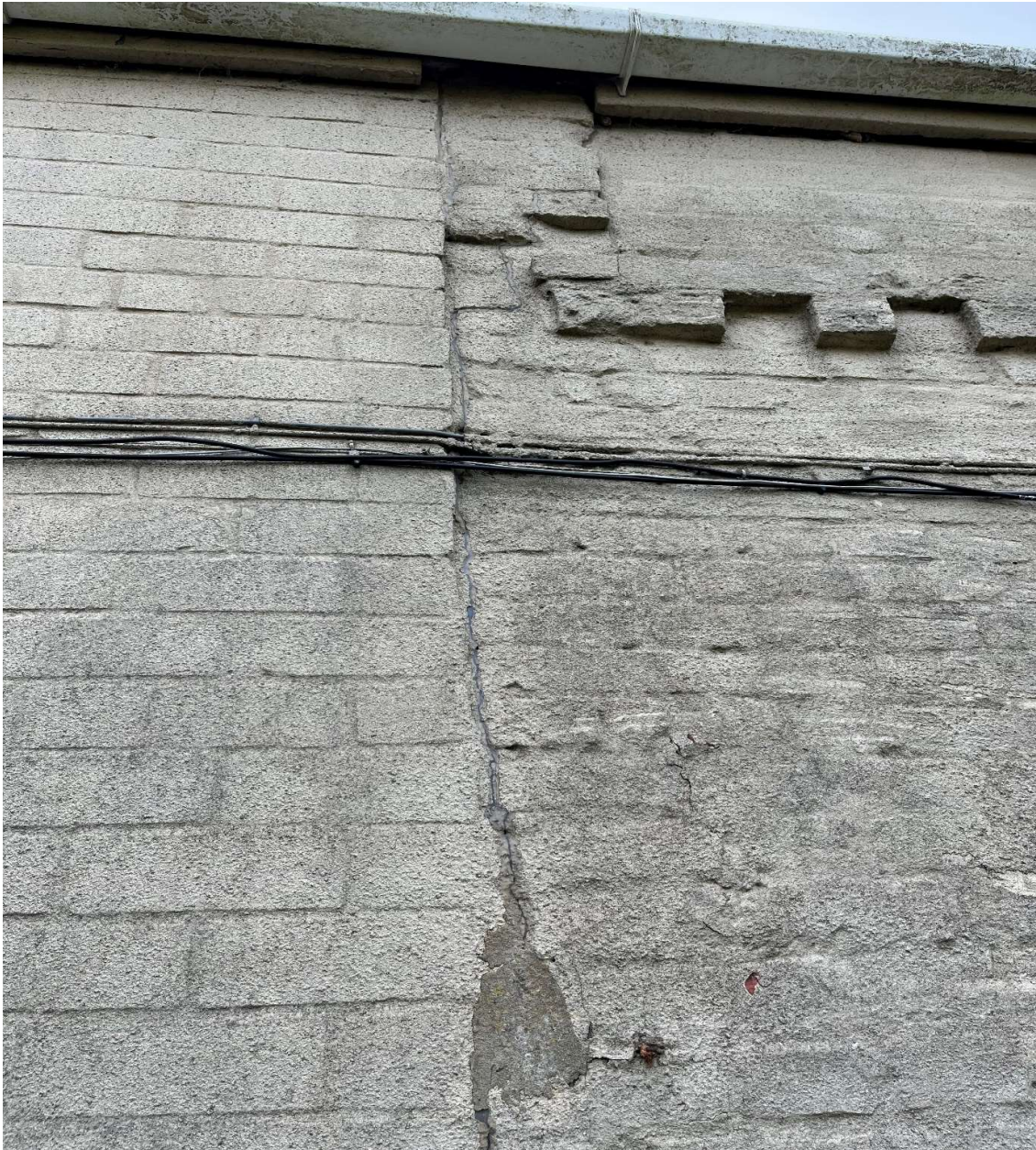
The depth of footing to the original part is only 300mm below ground level and the depth of the extension footing is limited to 450mm below ground level.



This is clearly not deep enough and is causing the noticeable movement cracking to the structural walls. We recommend that a full scheme of structural underpinning to the external and internal walls is provided together with the installation of a suitable DPC, as the current injected damp proof is clearly not working with the large areas of damp noted.



The joint between the existing building and newer extension also shows signs of progressive movement, with signs of patch repair and silicone sealant to try and fill the gap.



Remedial ties will be required to these joints to eliminate any future issues.

With the damp issues we would also recommend that all plaster finishes are removed and affected mortar and masonry units removed and replaced to provide a suitable load bearing structure. Any external brickwork that has spalled should also be replaced.

6. CONCLUSIONS & RECCOMENDATIONS

Due to the extent of structural remedial and replacement works recommended from the foundation upwards, together with the current condition of the existing fabric, there is clearly an extensive amount of work required to bring it up to be a suitable and safe living standard. We feel that the costs of these remedial works will be much greater than the cost to re-build the structure to current modern standards and to meet the current Building Regulations Approved Documents with a suitable architect designed dwelling to suit the users needs. Therefore we recommend that the building in its current form is not suitable for an economic refurbishment and suggest full demolition and reconstruction is the most viable option.

For and on behalf of **SHIELDS WILSON LIMITED**

M Shields IEng AMIStructE, Director

June 2025

APPENDIX

Shields Wilson

Cloud 98e51

Bank House

Broad Street

Spalding, PE11 1TB

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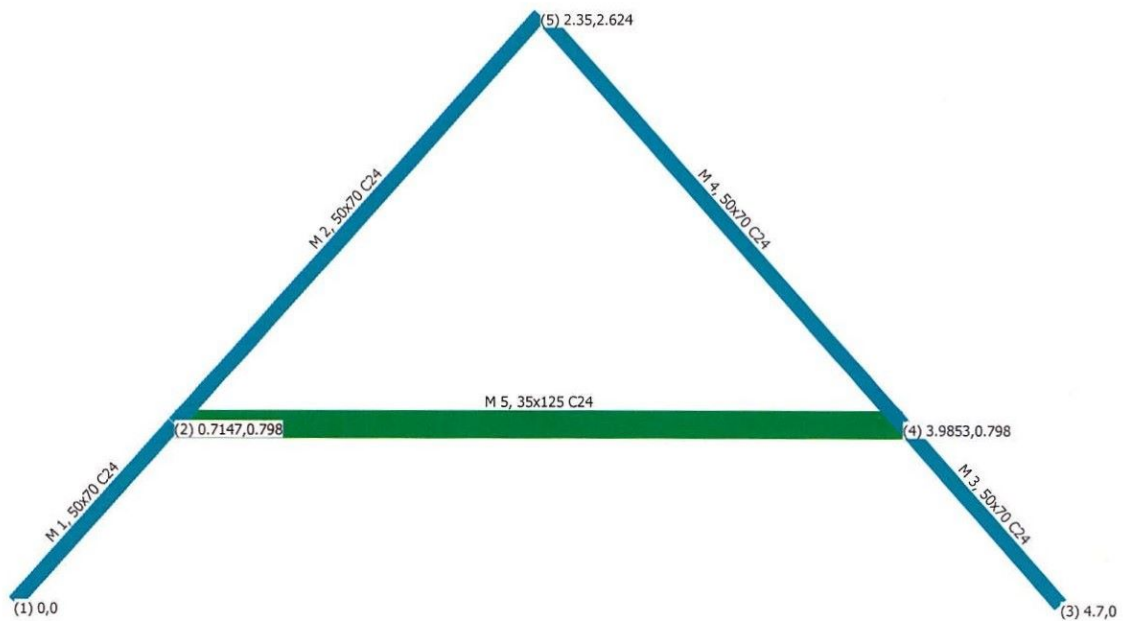
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Y
Z — X

**Frame Geometry - (Full Frame) - Front View****Not to Scale**

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Cloud 98e51

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MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live

Load Combination	+ 1.00 UT + 1.00 D1 + 1.00 L1
Load Duration	Medium Term

Load Case 002 : Live Only (Serviceability)

Load Combination	+ 1.00 UT + 1.00 L1
Load Duration	Medium Term

Load Case 003 : Dead Only (Serviceability)

Load Combination	+ 1.00 UT + 1.00 D1
Load Duration	Long Term

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	0.715	0.798	0.000
3	4.700	0.000	0.000	4	3.985	0.798	0.000
5	2.350	2.624	0.000				

Member Properties

Members 1-4

M	...	...	50x70 C24 E 10.80E6 G .675E6 TG C24	1000000
A	35.0E-4		Ix 142.9E-8 Iy 72.92E-8	J 291.7E-8

Member 5

M	...	...	35x125 C24 E 10.80E6 G .675E6 TG C24	1000000
A	43.75E-4		Ix 569.7E-8 Iy 44.66E-8	J 178.6E-8

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm ²	Density kN/m ³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Members 1 & 3

D1 UDLY	-000.408	(kN/m)
L1 UDLY	-000.120	(kN/m)

Members 1-5 - MasterFrame Pro Loads

D1 D	010.000	(kN/m ³)
------	---------	-----------------------

Members 2 & 4

D1 UDLY	-000.344	(kN/m)
L1 UDLY	-000.120	(kN/m)

Member 5

D1 UDLY	-000.064	(kN/m)
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Member End Releases

Symbols	End 1 torsion-minor-major	End 2 torsion-minor-major	O Released	® Fixed
4	®®® ®®®	5 ®®® ®®®		

Nodal Loading and Support Conditions

NODE 1

UT Rs 1 1 1 0 0 0 (Pinned)

NODE 3

UT RS 0 1 0 0 0 0

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Nodal Deflections (001 : Dead plus Live)

Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	$\delta X \rightarrow$	$\delta Y \uparrow$	$\Phi Z \nearrow$	δXY		$\delta X \rightarrow$	$\delta Y \uparrow$	$\Phi Z \nearrow$	δXY
1	0.00	0.00	-5.03	0.00	2	61.28	-54.92	-3.19	82.29
3	122.62	0.00	5.03	122.62	4	61.34	-54.92	3.19	82.33
5	61.31	-55.02	1.85	82.38					

Nodal Deflections (002 : Live Only (Serviceability))

Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	$\delta X \rightarrow$	$\delta Y \uparrow$	$\Phi Z \nearrow$	δXY		$\delta X \rightarrow$	$\delta Y \uparrow$	$\Phi Z \nearrow$	δXY
1	0.00	0.00	-1.00	0.00	2	12.21	-10.95	-0.64	16.40
3	24.44	0.00	1.00	24.44	4	12.23	-10.95	0.64	16.41
5	12.22	-10.97	0.38	16.42					

Nodal Deflections (003 : Dead Only (Serviceability))

Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	$\delta X \rightarrow$	$\delta Y \uparrow$	$\Phi Z \nearrow$	δXY		$\delta X \rightarrow$	$\delta Y \uparrow$	$\Phi Z \nearrow$	δXY
1	0.00	0.00	-4.03	0.00	2	49.06	-43.97	-2.55	65.88
3	98.18	0.00	4.03	98.18	4	49.11	-43.97	2.55	65.92
5	49.09	-44.05	1.47	65.96					

Member Forces (001 : Dead plus Live)

Mem ber No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	1.069C	0.958	0.000		
	2	0.760C	0.681	0.878	@	4.466 0.611
2	2	1.202C	-0.076	0.878		28.771
	5	0.573C	-0.640	0.000	@	1.079
3	3	1.069C	-0.958	0.000		4.466
	4	0.760C	-0.681	-0.878	@	0.611
4	4	1.202C	0.076	-0.878		28.771
	5	0.573C	0.640	0.000	@	1.079
5	2	0.859T	0.176	0.000	0.144	2.609
	4	0.859T	-0.176	0.000	@ 1.570	@ 1.635

Members ordered by parts of physical members. Member numbers in *Italic* are part of the preceeding regular member number.**Member Forces (002 : Live Only (Serviceability))**

Mem ber No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.210C	0.188	0.000		0.873
	2	0.146C	0.131	0.171	@	0.611

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Member Forces (002 : Live Only (Serviceability))

Mem ber No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
2	2	0.267C	-0.004	0.171		5.861
	5	0.121C	-0.135	0.000	@	1.103
3	3	0.210C	-0.188	0.000		0.873
	4	0.146C	-0.131	-0.171	@	0.611
4	4	0.267C	0.004	-0.171		5.861
	5	0.121C	0.135	0.000	@	1.103
5	2	0.181T	0.000	0.000	0.000	0.000
	4	0.181T	0.000	0.000	@ 0.000	@ 0.000

Members ordered by parts of physical members. Member numbers in *Italic* are part of the preceeding regular member number.

Member Forces (003 : Dead Only (Serviceability))

Mem ber No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.859C	0.770	0.000		3.593
	2	0.614C	0.550	0.707	@	0.611
2	2	0.935C	-0.072	0.707		22.910
	5	0.452C	-0.505	0.000	@	1.079
3	3	0.859C	-0.770	0.000		3.593
	4	0.614C	-0.550	-0.707	@	0.611
4	4	0.935C	0.072	-0.707		22.910
	5	0.452C	0.505	0.000	@	1.079
5	2	0.677T	0.176	0.000	0.144	2.609
	4	0.677T	-0.176	0.000	@ 1.570	@ 1.635

Members ordered by parts of physical members. Member numbers in *Italic* are part of the preceeding regular member number.

Support Reactions (001 : Dead plus Live)

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↺ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↺ (kN.m)
1	0.000	1.436	0.000	3	0.000	1.436	0.000
Total	0.000	2.871	0.000				

Support Reactions (002 : Live Only (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↺ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↺ (kN.m)
1	0.000	0.282	0.000	3	0.000	0.282	0.000
Total	0.000	0.564	0.000				

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Support Reactions (003 : Dead Only (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↻ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↻ (kN.m)
1	0.000	1.154	0.000	3	0.000	1.154	0.000
Total	0.000	2.307	0.000				

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MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TB L1 Id 1 @ Level 1

Summary Design Data

Design Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Deflection Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Section Size	b = 50, h = 70, 70x50 in Strength Class C24
Section Properties (cm ² , cm ³ , cm)	Area 35, Z _x 40.8, Z _y 29.2, r _x 2.02, r _y 1.44
Specification	1 : Internal use in continuously heated building Long term loading
Integrated Design Critical Case	: Dead Only (Serviceability)
Member Details	F = 0.859 kN, L = 1.071 m, L _x = 1.071 m, L _y = 0.4 m, L _{ex} = 1.0 L _x , L _{ey} = 1.0 L _y Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2 \cdot K_3 \cdot K_{7x} \cdot K_8 \cdot \sigma_m$	1.00 x 1.00 x 1.17 x 1.00 x 7.50	8.78 N/mm ²
$\sigma_{my.adm} = K_2 \cdot K_3 \cdot K_{7y} \cdot K_8 \cdot \sigma_m$	1.00 x 1.00 x 1.17 x 1.00 x 7.50	8.78 N/mm ²
$\sigma_{c.adm} = K_2 \cdot K_3 \cdot K_8 \cdot \sigma_c$	1.00 x 1.00 x 1.00 x 7.90	7.90 N/mm ²
$\sigma_{c.adm} = K_2 \cdot K_3 \cdot K_4 \cdot K_8 \cdot \sigma_c$	1.00 x 1.00 x 1.14 x 1.00 x 1.90	2.17 N/mm ²
$\tau_{adm} = K_2 \cdot K_3 \cdot K_8 \cdot \tau$	1.00 x 1.00 x 1.00 x 0.71	0.71 N/mm ²
$E = K_2 \cdot K_{20} \cdot E_{mean} \text{ (Compression)}$	1.00 x 1.00 x 10800	7200.0 N/mm ²
$E = K_2 \cdot E_{mean} \text{ (Deflection)}$	1.00 x 10800	10800.0 N/mm ²

Compression Resistance

$\lambda = \text{Max}(\lambda_x, \lambda_y)$	$\text{Max}(107/2.021, 40/1.443) \leq 180$	53.0	OK
$K_{12} = \text{fn}(\lambda, K_3, \sigma_c, E)$	53.00, 7.90, 7200	0.715	
$\sigma_{c.adm} = K_{12} \cdot \sigma_{c.adm}$	0.715 x 7.90	5.65 N/mm ²	
$\sigma_{c.a} = F/\text{Area}$	0.859 / 35 $\leq$ 5.65	0.25 N/mm ²	OK

Axial Load with Moments Check

Critical Design Location	X = 1.071		
$\sigma_{mx.a} = M_x/Z_x$	0.707 / 40.83 $\leq$ 8.78	17.31 N/mm ²	Warning
$\sigma_{mx.adm} = \sigma_{mx.adm} (1 - 1.5 K_{12} \cdot \sigma_{c.a} / \sigma_c)$	8.78 (1 - 1.5 x 0.715 x 0.25 / 7.90)	8.68 N/mm ²	
$\sigma_c / \sigma_{c.adm} + \sigma_{mx} / \sigma_{mx.adm}$	0.25 / 5.65 + 17.31 / 8.68	2.037	Warning

Shear and Bearing Check

Critical Design Location	X = 0.000		
$\tau_a = 1.5 F_v / \text{Area}$	1.5 x 0.77 / 35 $\leq$ 0.71	0.33 N/mm ²	OK
$\sigma_{cax} = F_v x / (b \cdot B_x)$	0.77 / (50 x 75) $\leq$ 2.17	0.21 N/mm ²	OK

Deflection Check (Shear Deflection NOT Included)

Critical Load Case 001 : Dead plus Live			
$\delta = \delta_m$	In-span 4.47 $\leq$ L/333	4.47 mm	Warning

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MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TB L1 Id 2 @ Level 1

Summary Design Data

Design Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Deflection Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Section Size	b = 50, h = 70, 70x50 in Strength Class C24
Section Properties (cm ² , cm ³ , cm)	Area 35, Zx 40.8, Zy 29.2, rx 2.02, ry 1.44
Specification	1 : Internal use in continuously heated building Medium term loading
Integrated Design Critical Case	: Dead plus Live
Member Details	F = 1.202 kN, L = 2.451 m, Lx = 2.451 m, Ly = 0.4 m, Lex = 1.0 Lx, Ley = 1.0 Ly Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2.K_3.K_{7x}.K_8.\sigma_m$	$1.00 \times 1.25 \times 1.17 \times 1.00 \times 7.50$	10.97 N/mm ²
$\sigma_{my.adm} = K_2.K_3.K_{7y}.K_8.\sigma_m$	$1.00 \times 1.25 \times 1.17 \times 1.00 \times 7.50$	10.97 N/mm ²
$\sigma_{c.adm} = K_2.K_3.K_8.\sigma_c$	$1.00 \times 1.25 \times 1.00 \times 7.90$	9.88 N/mm ²
$\sigma_{c.adm} = K_2.K_3.K_4.K_8.\sigma_c$	$1.00 \times 1.25 \times 1.14 \times 1.00 \times 1.90$	2.71 N/mm ²
$\tau_{adm} = K_2.K_3.K_8.\tau$	$1.00 \times 1.25 \times 1.00 \times 0.71$	0.89 N/mm ²
$E = K_2.K_{20}.E_{mean}(\text{Compression})$	$1.00 \times 1.00 \times 10800$	7200.0 N/mm ²
$E = K_2.E_{mean}(\text{Deflection})$	1.00×10800	10800.0 N/mm ²

Compression Resistance

$\lambda = \text{Max}(L_{ex}/r_x, L_{ey}/r_y)$	$\text{Max}(245/2.021, 40/1.443) \leq 180$	121.3	OK
$K_{12} = \text{fn}(\lambda, K_3.\sigma_c, E)$	121.29, 9.88, 7200	0.258	
$\sigma_{c.adm} = K_{12}.\sigma_{c.adm}$	0.258×9.88	2.54 N/mm ²	
$\sigma_{c.a} = F/\text{Area}$	$1.202 / 35 \leq 2.54$	0.34 N/mm ²	OK

Axial Load with Moments Check

Critical Design Location	X = 0.000		
$\sigma_{mx.a} = M_x/Z_x$	$0.878 / 40.83 \leq 10.97$	21.50 N/mm ²	Warning
$\sigma_{mx.adm} = \sigma_{mx.adm} (1 - 1.5 K_{12}.\sigma_{c.a}/\sigma_e)$	$10.97 (1 - 1.5 \times 0.258 \times 0.34 / 4.83)$	10.67 N/mm ²	
$\sigma_c/\sigma_{c.adm} + \sigma_{mx}/\sigma_{mx.adm}$	$0.34/2.54 + 21.50/10.67$	2.151	Warning

Shear and Bearing Check

Critical Design Location	X = 2.359		
$\tau_a = 1.5 F_v / \text{Area}$	$1.5 \times 0.62 / 35 \leq 0.89$	0.27 N/mm ²	OK
$\sigma_{cax} = F_v x / (b.Bx)$	$0.62 / (50 \times 75) \leq 2.71$	0.17 N/mm ²	OK

Deflection Check (Shear Deflection NOT Included)

Critical Load Case 001 : Dead plus Live			
$\delta = \delta_m$	In-span $28.77 \leq L/333$	28.77 mm	Warning

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MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TB L1 Id 3 @ Level 1

Summary Design Data

Design Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Deflection Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Section Size	b = 50, h = 70, 70x50 in Strength Class C24
Section Properties (cm ² , cm ³ , cm)	Area 35, Zx 40.8, Zy 29.2, rx 2.02, ry 1.44
Specification	1 : Internal use in continuously heated building Long term loading
Integrated Design Critical Case	: Dead Only (Serviceability)
Member Details	F = 0.859 kN, L = 1.071 m, Lx = 1.071 m, Ly = 0.4 m, Lex = 1.0 Lx, Ley = 1.0 Ly Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2.K_3.K_{7x}.K_8.\sigma_m$	1.00 x 1.00 x 1.17 x 1.00 x 7.50	8.78 N/mm ²
$\sigma_{my.adm} = K_2.K_3.K_{7y}.K_8.\sigma_m$	1.00 x 1.00 x 1.17 x 1.00 x 7.50	8.78 N/mm ²
$\sigma_{c.adm} = K_2.K_3.K_8.\sigma_c$	1.00 x 1.00 x 1.00 x 7.90	7.90 N/mm ²
$\sigma_{c.adm} = K_2.K_3.K_4.K_8.\sigma_c$	1.00 x 1.00 x 1.14 x 1.00 x 1.90	2.17 N/mm ²
$\tau_{adm} = K_2.K_3.K_8.\tau$	1.00 x 1.00 x 1.00 x 0.71	0.71 N/mm ²
$E = K_2.K_{20}.E_{mean}(\text{Compression})$	1.00 x 1.00 x 10800	7200.0 N/mm ²
$E = K_2.E_{mean}(\text{Deflection})$	1.00 x 10800	10800.0 N/mm ²

Compression Resistance

$\lambda = \text{Max}(Lex/rx, Ley/ry)$	Max(107/2.021, 40/1.443) ≤ 180	53.0	OK
$K_{12} = \text{fn}(\lambda, K_3.\sigma_c, E)$	53.00, 7.90, 7200	0.715	
$\sigma_{c.adm} = K_{12}.\sigma_{c.adm}$	0.715 x 7.90	5.65 N/mm ²	
$\sigma_{c.a} = F/\text{Area}$	0.859 / 35 ≤ 5.65	0.25 N/mm ²	OK

Axial Load with Moments Check

Critical Design Location	X = 1.071		
$\sigma_{mx.a} = Mx/Zx$	0.707 / 40.83 ≤ 8.78	17.31 N/mm ²	Warning
$\sigma_{mx.adm} = \sigma_{mx.adm}(1 - 1.5 K_{12}.\sigma_{c.a}/\sigma_c)$	8.78 (1 - 1.5x0.715x0.25/25.30)	8.68 N/mm ²	
$\sigma_c/\sigma_{c.adm} + \sigma_{mx}/\sigma_{mx.adm}$	0.25/5.65 + 17.31/8.68	2.037	Warning

Shear and Bearing Check

Critical Design Location	X = 0.000		
$\tau_a = 1.5 F_v / \text{Area}$	1.5 x 0.77 / 35 ≤ 0.71	0.33 N/mm ²	OK
$\sigma_{cax} = F_{vx} / (b.Bx)$	0.77 / (50 x 75) ≤ 2.17	0.21 N/mm ²	OK

Deflection Check (Shear Deflection NOT Included)

Critical Load Case 001 : Dead plus Live			
$\delta = \delta_m$	In-span 4.47 ≤ L/333	4.47 mm	Warning

Shields Wilson

Cloud 98e51

Bank House
Broad Street
Spalding, PE11 1TB
Tel: 01775 729252

Job Ref : 25-266
Sheet : 2/10
Made by : MAS
Date : 23 June 2025 / Ver. 2023.09.15
Checked :
Approved :

MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TB L1 Id 4 @ Level 1

Summary Design Data

Design Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Deflection Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Section Size	b = 50, h = 70, 70x50 in Strength Class C24
Section Properties (cm ² , cm ³ , cm)	Area 35, Zx 40.8, Zy 29.2, rx 2.02, ry 1.44
Specification	I : Internal use in continuously heated building Medium term loading
Integrated Design Critical Case	: Dead plus Live
Member Details	F = 0.935 kN, L = 2.451 m, Lx = 2.451 m, Ly = 0.4 m, Lex = 1.0 Lx, Ley = 1.0 Ly Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx,adm} = K_2 \cdot K_3 \cdot K_{7x} \cdot K_8 \cdot \sigma_m$	$1.00 \times 1.25 \times 1.17 \times 1.00 \times 7.50$	10.97 N/mm ²
$\sigma_{my,adm} = K_2 \cdot K_3 \cdot K_{7y} \cdot K_8 \cdot \sigma_m$	$1.00 \times 1.25 \times 1.17 \times 1.00 \times 7.50$	10.97 N/mm ²
$\sigma_{c,adm} = K_2 \cdot K_3 \cdot K_8 \cdot \sigma_c$	$1.00 \times 1.25 \times 1.00 \times 7.90$	9.88 N/mm ²
$\sigma_{c,adm} = K_2 \cdot K_3 \cdot K_4 \cdot K_8 \cdot \sigma_c$	$1.00 \times 1.25 \times 1.14 \times 1.00 \times 1.90$	2.71 N/mm ²
$\tau_{adm} = K_2 \cdot K_3 \cdot K_8 \cdot \tau$	$1.00 \times 1.25 \times 1.00 \times 0.71$	0.89 N/mm ²
$E = K_2 \cdot K_{20} \cdot E_{mean} \text{ (Compression)}$	$1.00 \times 1.00 \times 10800$	7200.0 N/mm ²
$E = K_2 \cdot E_{mean} \text{ (Deflection)}$	1.00×10800	10800.0 N/mm ²

Compression Resistance

$\lambda = \text{Max}(\lambda_{rx}, \lambda_{ry})$	$\text{Max}(245/2.021, 40/1.443) \leq 180$	121.3	OK
$K_{12} = \text{fn}(\lambda, K_3 \cdot \sigma_c, E)$	121.29, 9.88, 7200	0.258	
$\sigma_{c,adm} = K_{12} \cdot \sigma_{c,adm}$	0.258×9.88	2.54 N/mm ²	
$\sigma_{c,a} = F/\text{Area}$	$0.935 / 35 \leq 2.54$	0.27 N/mm ²	OK

Axial Load with Moments Check

Critical Design Location	X = 0.000		
$\sigma_{mx,a} = M_x/Z_x$	$0.878 / 40.83 \leq 10.97$	21.50 N/mm ²	Warning
$\sigma_{mx,adm} = \sigma_{mx,adm} (1 - 1.5 K_{12} \cdot \sigma_{c,a} / \sigma_c)$	$10.97 (1 - 1.5 \times 0.258 \times 0.27 / 4.83)$	10.73 N/mm ²	
$\sigma_c / \sigma_{c,adm} + \sigma_{mx} / \sigma_{mx,adm}$	$0.27 / 2.54 + 21.50 / 10.73$	2.108	Warning

Shear and Bearing Check

Critical Design Location	X = 2.359		
$\tau_a = 1.5 F_v / \text{Area}$	$1.5 \times 0.62 / 35 \leq 0.89$	0.27 N/mm ²	OK
$\sigma_{cax} = F_v x / (b \cdot B_x)$	$0.62 / (50 \times 75) \leq 2.71$	0.17 N/mm ²	OK

Deflection Check (Shear Deflection NOT Included)

Critical Load Case 001 : Dead plus Live			
$\delta = \delta_m$	In-span $28.77 \leq L/333$	28.77 mm	Warning

Shields Wilson

Cloud 98e51

Bank House

Broad Street

Spalding, PE11 1TB

Tel: 01775 729252

Job Ref : 25-266

Sheet : 2/11

Made by : MAS

Date : 23 June 2025 / Ver. 2023.09.15

Checked :

Approved :

MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TB L1 Id 5 @ Level 1

Summary Design Data

Design Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Deflection Cases Covered	1.0 D1 + 1.0 L1, 1.0 L1, 1.0 D1
Section Size	b = 35, h = 125, 125x35 in Strength Class C24
Section Properties (cm ² , cm ³ , cm)	Area 43.8, Z _x 91.1, Z _y 25.5, r _x 3.61, r _y 1.01
Specification	1 : Internal use in continuously heated building Long term loading
Integrated Design Critical Case	: Dead Only (Serviceability)
Member Details	F = -0.677 kN, L = 3.271 m, L _x = 3.271 m, L _y = 3.271 m, L _{ex} = 1.0 L _x , L _{ey} = 1.0 L _y Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2 \cdot K_3 \cdot K_{7x} \cdot K_8 \cdot \sigma_m$	$1.00 \times 1.00 \times 1.10 \times 1.00 \times 7.50$	8.26 N/mm ²
$\sigma_{my.adm} = K_2 \cdot K_3 \cdot K_{7y} \cdot K_8 \cdot \sigma_m$	$1.00 \times 1.00 \times 1.17 \times 1.00 \times 7.50$	8.78 N/mm ²
$\sigma_{t.adm} = K_2 \cdot K_3 \cdot K_8 \cdot K_{14} \cdot \sigma_t$	$1.00 \times 1.00 \times 1.00 \times 1.10 \times 4.50$	4.95 N/mm ²
$\sigma_{c.adm} = K_2 \cdot K_3 \cdot K_4 \cdot K_8 \cdot \sigma_c$	$1.00 \times 1.00 \times 1.14 \times 1.00 \times 1.90$	2.17 N/mm ²
$\tau_{adm} = K_2 \cdot K_3 \cdot K_8 \cdot \tau$	$1.00 \times 1.00 \times 1.00 \times 0.71$	0.71 N/mm ²
$E = K_2 \cdot E_{mean}$	1.00×10800	10800.0 N/mm ²

Tensile Resistance

$\sigma_{t.a} = F/Area$	$0.677 / 43.75 \leq 4.95$	0.15 N/mm ²	OK
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Axial Load with Moments Check

Critical Design Location	X = 1.570		
$\sigma_{mx.a} = M_x/Z_x$	$0.141 / 91.15 \leq 8.26$	1.55 N/mm ²	OK
$\sigma_t / \sigma_{t.adm} + \sigma_{mx} / \sigma_{mx.adm}$	$0.15 / 4.95 + 1.55 / 8.26$	0.219	OK

Shear and Bearing Check

Critical Design Location	X = 0.000		
$\tau_a = 1.5 F_v / Area$	$1.5 \times 0.176 / 43.75 \leq 0.71$	0.06 N/mm ²	OK
$\sigma_{cax} = F_{vx} / (b \cdot B_x)$	$0.176 / (35 \times 75) \leq 2.17$	0.07 N/mm ²	OK

Deflection Check (Shear Deflection NOT Included)

Critical Load Case 001 : Dead plus Live			
$\delta = \delta_m$	In-span $2.61 \leq L/333$	2.61 mm	OK