JP Chick & Partners Ltd
Consulting Civil & Structural Engineers
8 Atlantic Square Witham Essex CM8 2TL
[redacted] www.chick.co.uk

28 April 2022
CG22/0043

Mr Joe Fairs
Operations Manager
Mill Construction
Woodheyes
Purdis Avenue
Ipswich IP3 8UE

Dear Mr Fairs,

RE: VEHICLE STRIKE, THE OLD SHIP INN, 2 VALLEY ROAD, CLACTON ON SEA, ESSEX CO15 4AR.

Introduction.

J.P Chick & Partners were commissioned to undertake an urgent structural inspection following a vehicle strike at the Old Ship Inn pub, Clacton on Sea. Sam Drake and Adrian Kurti of JP Chick & Partners attended the property on Monday 25th April 2022 for the inspection. Joe Fairs from Mills Construction was also present.

At the time of the inspection the building had been evacuated and hoardings erected around the damaged areas externally. The adjacent highway, B1027 Valley Road had been closed to prevent excessive vibration from road traffic causing further destabilisation of the structure. The vehicle responsible for the impact had been removed from site.

This document intends to itemise the structural damage to the building resulting from the vehicle strike, advise temporary propping to make the building safe in the short term and propose remedial works to reinstate the structure to a safe and stable condition.

Photographs are provided in Appendix A. Temporary works and propping details are provided in Appendix B. An indicative plan of the building is provided, with defect locations annotated, in Appendix C. Structural calculations are provided in Appendix D.

Description of the Building.

The building is a 17c Grade II listed pub, having rendered 9" brickwork external walls at ground floor and an oak frame at 1st floor and roof levels. The ground floor has a suspended timber structure with joists spanning in a front to back direction, the 1st floor is a framework of exposed oak beams, with oak joists spanning between beams as shown on the enclosed sketch. The pitched roof carcass was not inspected internally and is finished externally with plain clay tiles.

It is understood that the vehicle impacted the building on the north-east corner.

Structural Damage.

- The external wall panel at the point of impact has been detroyed between ground level and eaves level (Item 1), causing the timber lintel over the entrance door to lose its bearing.

- A horizontal crack in the brickwork continues around the front elevation (north) external wall approximately 1m above ground level (Item 2).

- 1st floor joists notched into the Oak beam over the bay window have been displaced and lost around 10mm of bearing (Item 3).

- An Oak beam supporting the 1st floor appeared excessively deflected. The plywood cladding around the beam was removed and the beam was found to have split through its full depth (Item 5). This beam also appears to have been subject to an historic woodworm infestation and has rotted. We do not consider that the split was caused by the vehicle impact, as historic dust and debris was found inside the split timber. This defect needs to be addressed and rectified as part of the remedial work, prior to this area being reopened to the public.

- A portion of the plasterboard ceiling appeared to be sagging excessively (Item 4).

Temporary propping.

A temporary propping scheme was discussed and agreed with the contractor on site. Sketches TW01 & TW02 were produced to illustrate the propping requirements and provided to the contractor to be implemented. These sketches have been reproduced in Appendix B of this report.

We consider that the closed Valley Road highway can be reopened once all of the props are in place as shown.

When the props are in place and the affected areas have been closed off to the public with the hoardings in place as shown in sketches TW01 & TW02, The Publican and their family can move back into the pub and reopen the bar.

During construction, whilst the oak beam is being replaced and the joists re-seated on the new structure, the rooms above this area should not be used.

Structural Remedial Works.

- Install props as indicated on enclosed sketches TW01 & TW02. Pack below ground floor joists at mid span as shown on Sketch TW01.

- Remove external render and internal finishes and carefully take down external wall brickwork for extents shown on Photographs 1 & 2 in Appendix C of this report. If any purlins or beams not identified in this report are found to be bearing on this wall, stop work and identify JP Chick & Partners immediately.

- Rebuild brickwork to reinstate the external wall. New brickwork is to be bonded into the existing. Brick units and bond are to match the existing arrangement. Any lintel and/or beam bearings must be rebuilt into the brickwork taking care to tightly pack any voids between the timber and brickwork with steel shims or well rammed dry pack. Any lintels damaged by the impact are to be identified to JP Chick & Partners for new lintel design.

- Pack voids between 1st floor joists and beam over the bay window with glued timber shims.

- Take down sagging ceiling finishes (Item 4). Inspect the exposed 1st floor joists and report any defects or excessive deflection in the joists themselves to JP Chick & Partners. If joists are in good condition replace the ceiling finishes with new plasterboard.

- Replace or repair the split Oak beam (Item 5) as shown on the enclosed sketch RW02, subject to approval by English Heritage.
  We have provided two options for consideration.

  A) Complete removal and replacement of the original beam with a new Oak section. We consider this the least intrusive option, as no shortening of the existing 1st floor joists will be necessary. The propping arrangement will need to be reconfigured to allow removal of the existing Oak beam. See Sketch RW02 in Appendix C.

  B) The most desirable and unintrusive option would be to repair the existing oak beam, however given its current condition, we do not believe this is likely to be possible. A historic timber repair specialist could be commissioned to inspect the beam and advise whether it could be repaired. Contact JP Chick & Partners if required and we will advise a suitable specialist.

  We did look into the option of augmenting the existing, failed oak beam with steelwork either side, however this proved impractical due to the existing arrangement of the building and the disruption it would cause.

- On completion of the works described above, internal and external finishes should be made good using materials to match existing.

I trust the above meets with your requirements. Should you require anything further please do not hesitate to contact the undersigned in the first instance.

Kind Regards

[redacted]

Sam Drake – Associate
For and on behalf of J.P Chick & Partners

APPENDIX A
Photographs

Impact damage to external wall. (Item 1).

Impact damage to external wall. (Item 1 & 2).

Impact damage to external wall. (Item 1 & 2).

Impact damage to external wall, internal view. (Item 1).

Partial loss of bearing to 1st floor joists over bay window. (Item 3).

Excessively deflected Oak beam. Historic woodworm. Rot. Split beam. (Item 5).

Split Oak beam. (Item 5).

Sagging ceiling finishes. (Item 4).

APPENDIX B

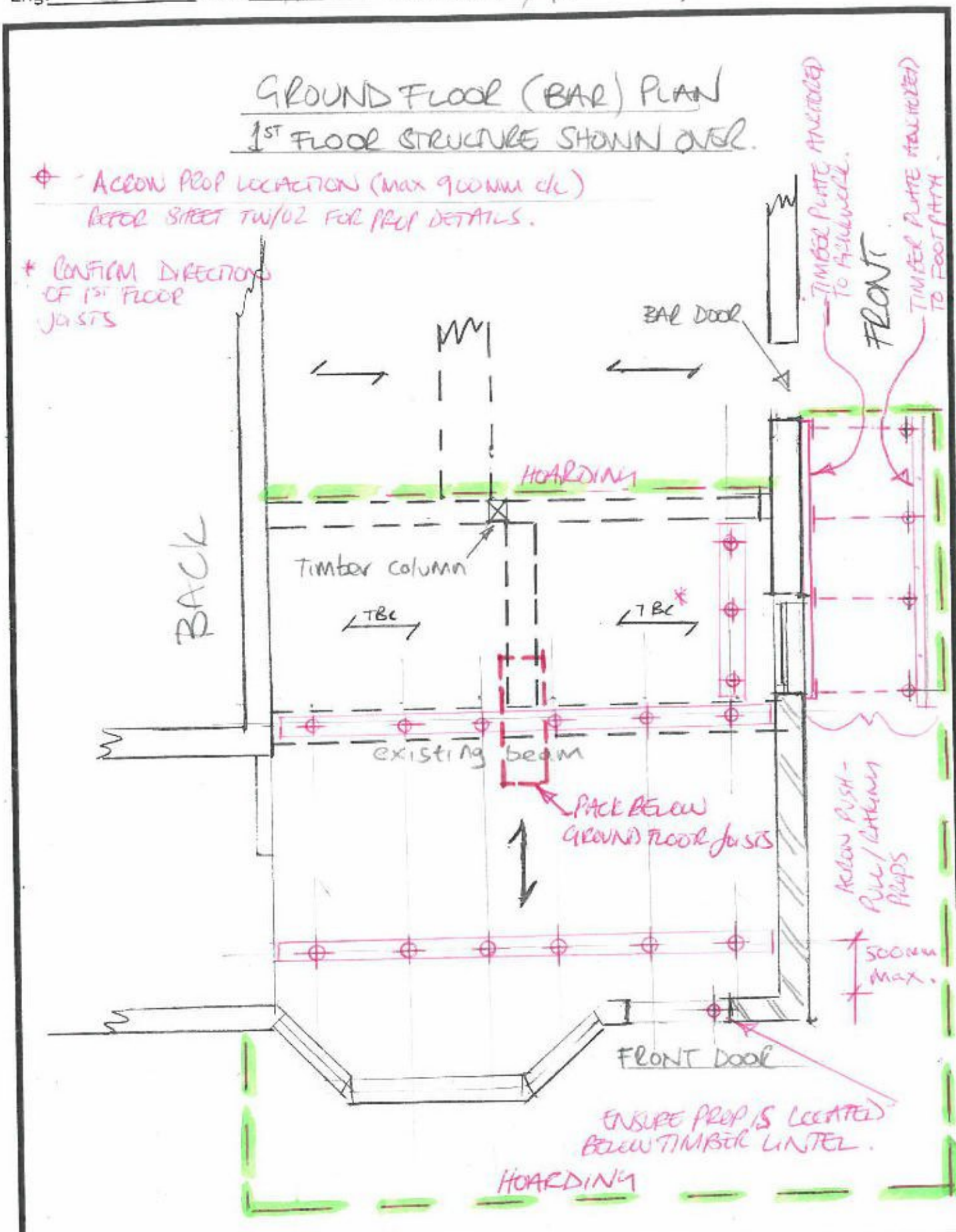
Temporary propping details

SKETCH SHEET

LOCATION: THE SHIP INN, CLACTON

JP Chick & Partners Ltd
Consulting Civil & Structural Engineers

Eng: SD Date: 4/22 Job No.: CC22/045 Sheet TW of 01



SKETCH SHEET

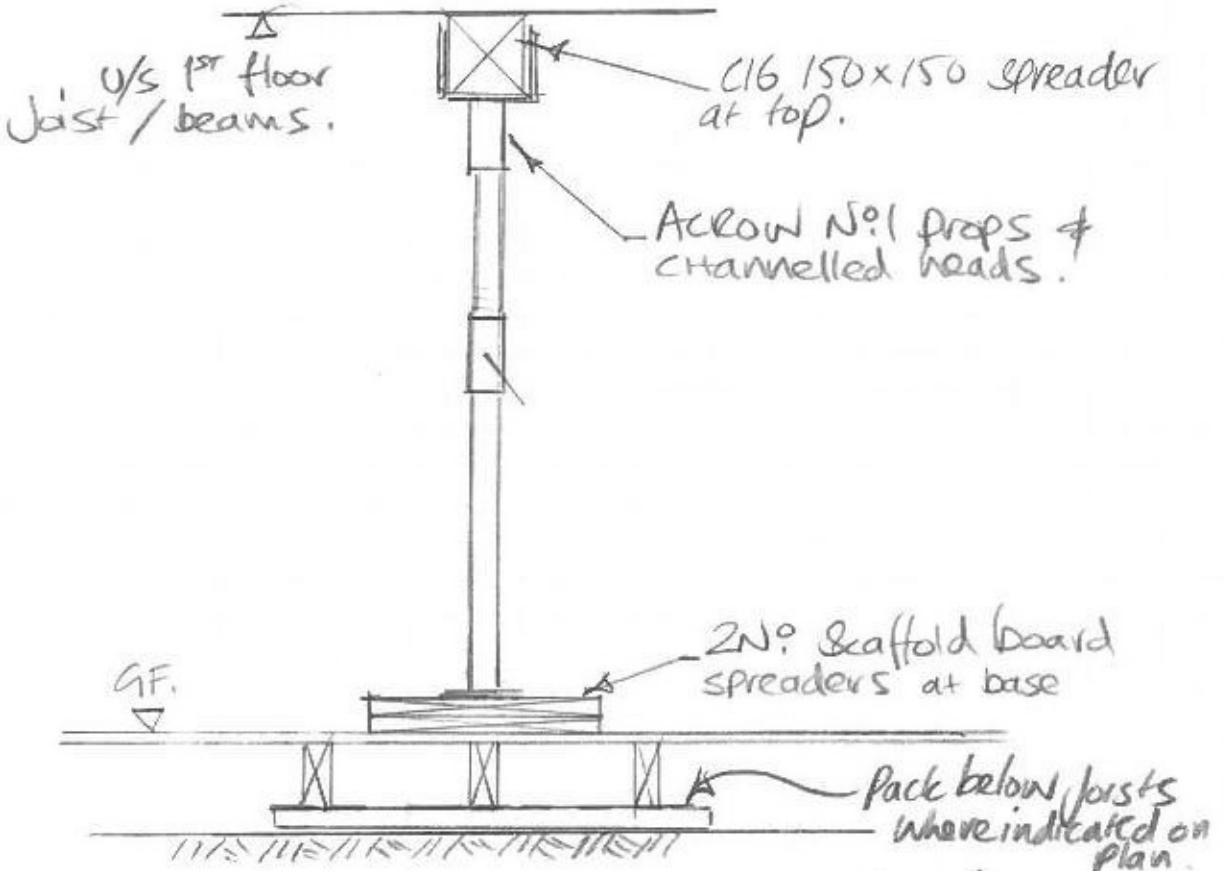
LOCATION: THE SHIP INN, CLACTON

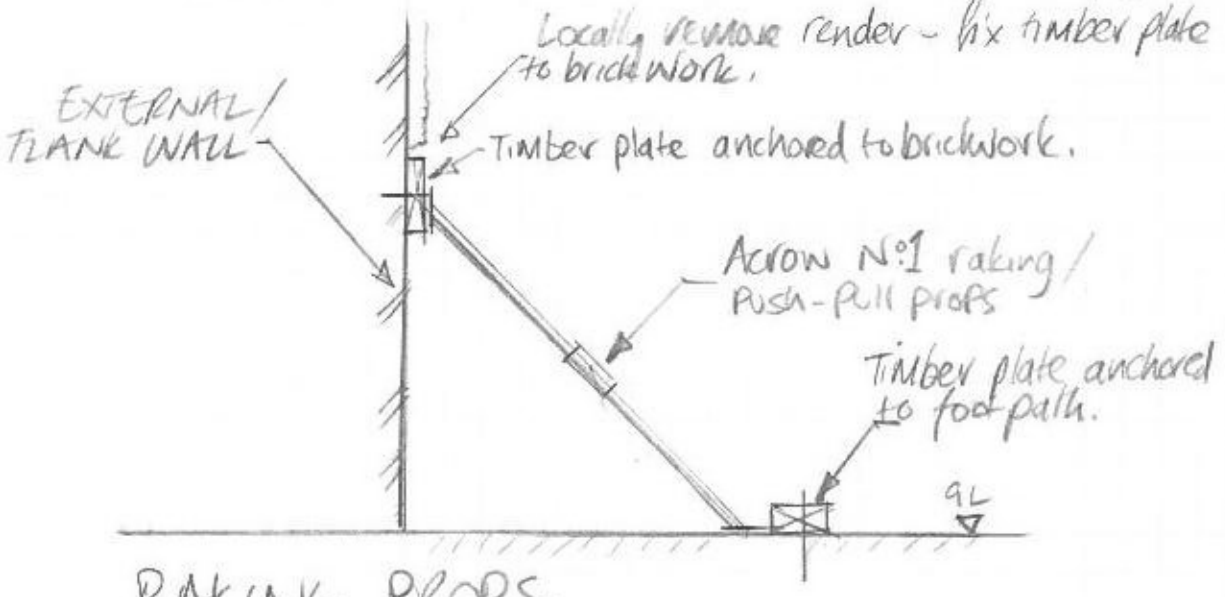
JP Chick & Partners Ltd
Consulting Civil & Structural Engineers

Eng: SD Date: 4/22 Job No.: 22/043 Sheet TW/02 of 02

PROP & SPREADER BEAM DETAILS

INTERNAL PROPS





RAKING PROPS.

APPENDIX C

Details of Structural Remedial Work.

SKETCH SHEET

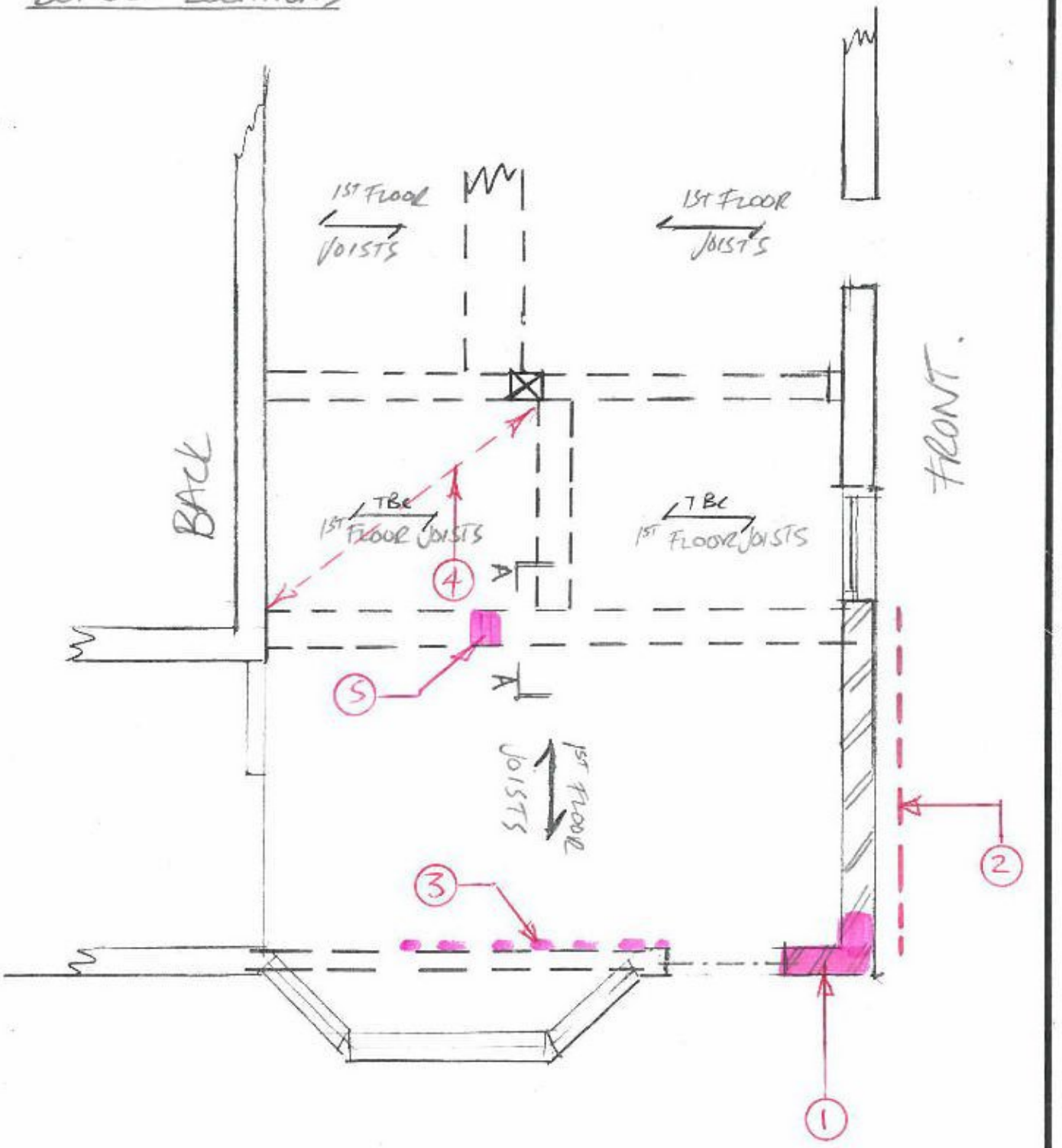
LOCATION: THE SHIP INN, CLACTON

JP Chick & Partners Ltd
Consulting Civil & Structural Engineers

Eng: SD Date: 27/4/22 Job No.: CC22/443 Sheet R.W. of Q.1

PART GROUND FLOOR (BAR) PLAN
1ST FLOOR STRUCTURE SHOWN OVER

DEFECT LOCATIONS



SKETCH SHEET

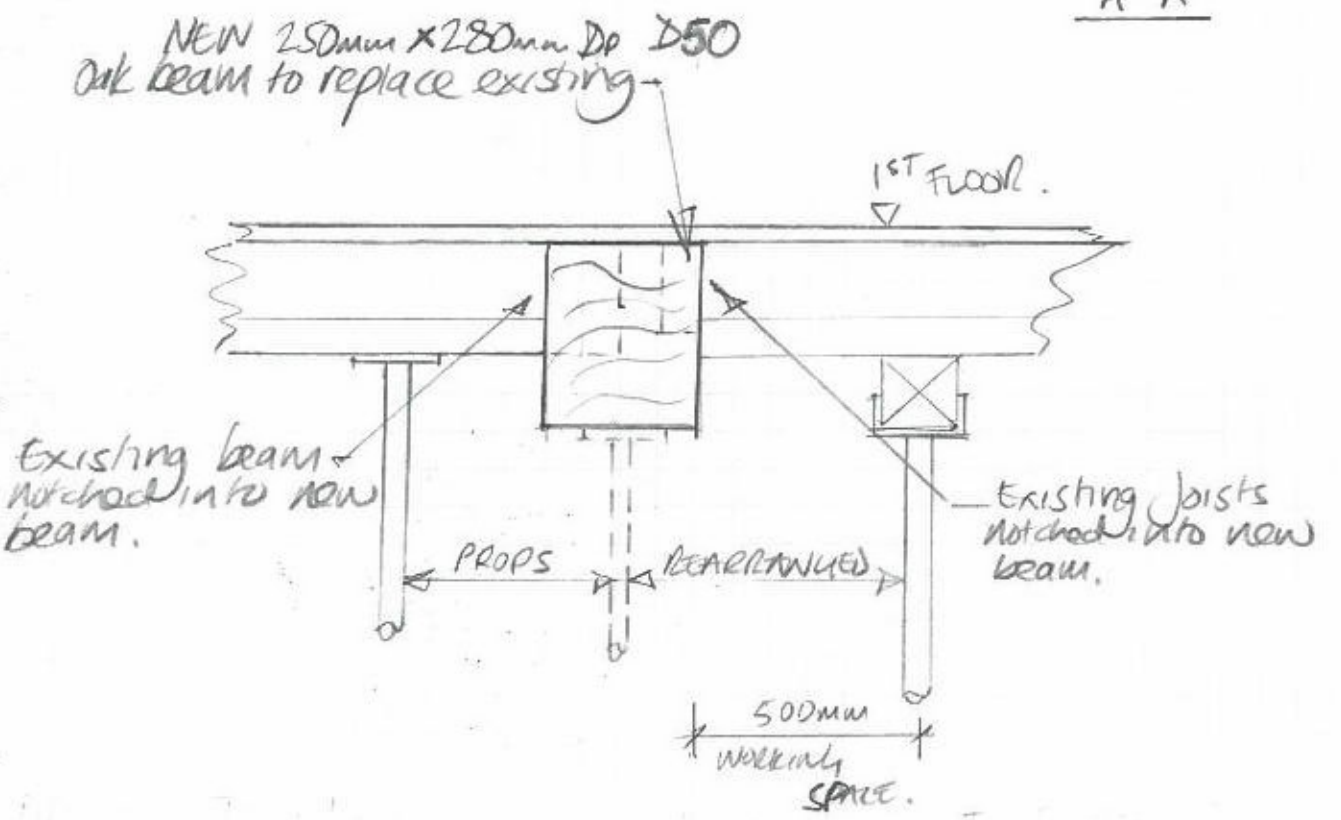
LOCATION: THE SHIP INN, CLACTON

JP Chick & Partners Ltd
Consulting Civil & Structural Engineers

Eng: SD Date: 27/04/22 Job No. ~~22/043~~ Sheet RW/02 of 02

OPTION A. REPLACE EXISTING BEAM.

TYPICAL SECTION A-A



PHOTOGRAPH (1)

PHOTOGRAPH (2)

APPENDIX D
Structural Calculations

BEAM FAILURE.

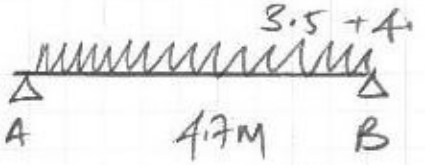
Existing original Oak beam has failed.

∴ To design replacement.

in Steelwork:

UDL (OUTER)

			(kN/m) Gk	Qk
1st floor Office	@	0.5 x 2.6m/2	= 0.7	
		2.5 x 2.6/2	=	3.3
Stud wall	@	0.5 x 2.1m	= 1.1	
ROOF	@	1.2 x 2.6m/2	= 1.7	
SNOW	@	0.6 x 2.6m/2	=	0.8
			3.5	4.1



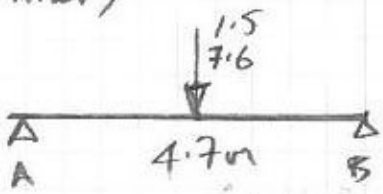
M_x = 21 kNm

M_v = 31.6 kNm

PL @ MID SPAN (inner)

1ST FLOOR @ 0.5 x 4.7M/2 x 2.6m/2 = 1.5kN

OFFICE @ 2.5 x 4.7M/2 x 2.6M/2 = 7.6kN



M_x = 10.7kNm

M_v = 16.8kNm

THE SHIP INN, CLACTON

Designed	Checked	Date	Job No.
SD		27/4/22	6422/43

JP Chick & Partners Ltd
Consulting Civil & Structural Engineers

CALCULATION SHEET

8 Atlantic Square Station Road Witham Essex CM8 2TL
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SHEET NO. C1

CONSIDER OAK BEAM - GRADE D50 - MIN 250 x 280mm

$M_x = 21 + 10.7 = 31.7\ kNm$

$\sigma_{ap} = \frac{31.7 \times 10^6}{(250 \times 280^2/6)} = 9.7\ N/mm^2 < 16\ N/mm^2$

∴ BENDING OK.

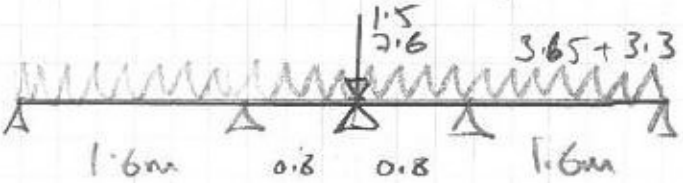
- REFER TEDDS SHEETS FOR DEFLECTION CALC.

$\delta = 12.5mm < 14mm$ ∴ ok.

CONSIDER GROUND FLOOR JOISTS UNDER PROPS.

UDL THRO' PROPS = 3.5 kN/m qk
(LESS SNOW LOAD) = 4.1 - 0.8 = 3.3 kN/m qk
=
PL (MID-SPAN) = 1.5 kN qk
7.6 kN qk

GF DL = 0.5 x 0.3 = 0.15 kN/m + 3.5 = 3.65 kN/m qk



$M_x = 1.7\ kNm$

50 x 180 C16 joist

$\sigma_{ap} = \frac{1.7 \times 10^6}{(50 \times 180^2/6)} = 6.3 > 5.3\ N/mm^2$

Allowable = $5.3 \times 1.06 \times 1.5$ (k7 k3)
= $8.4\ N/mm^2$
> 6.3 ∴ OK

THE SHIP INN, CLACTON

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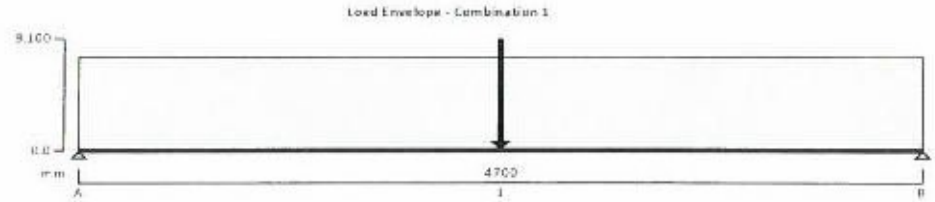
Designed	Checked	Date	Job No.
SD		27/4/22	cl22/043

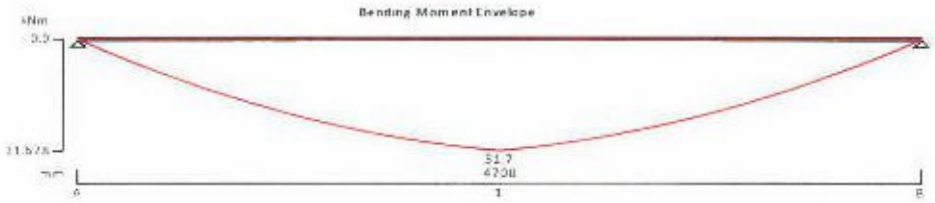
CALCULATION SHEET

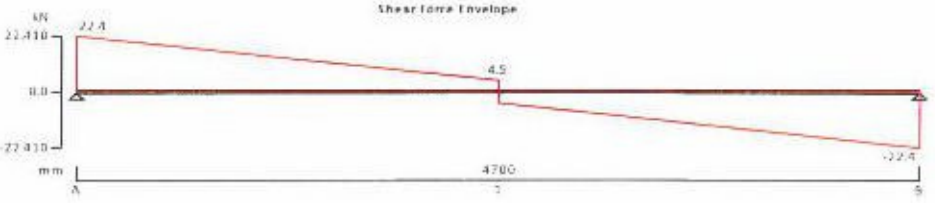
Tekla Tedds	Project				Job no.	
JP Chick & Partners Ltd 8 Atlantic Square Wilham CM8 2TL	The Ship Inn, Clacton				CG22/043	
	Calcs for				Start page no./Revision	
	Repalcement Oak Beam				4 C 3	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	SD	26/04/2022				

TIMBER BEAM ANALYSIS & DESIGN TO BS5268-2:2002

TEDDS calculation version 1.7.02







Applied loading

Beam loads

Dead full UDL 3.500 kN/m
Imposed full UDL 4.100 kN/m
Dead point load 1.500 kN at 2350 mm
Imposed point load 7.600 kN at 2350 mm

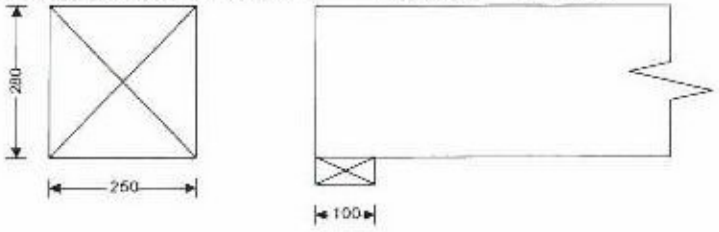
Load combinations

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

Analysis results

Maximum moment	M_{max} = **31.678** kNm	M_{min} = **0.000** kNm
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **31.678** kNm	
Maximum shear	F_{max} = **22.410** kN	F_{min} = **-22.410** kN
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **22.410** kN	

Total load on beam	W_{tot} = **44.820** kN	
Reactions at support A	R_{A_max} = **22.410** kN	R_{A_min} = **22.410** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **8.975** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **13.435** kN	
Reactions at support B	R_{B_max} = **22.410** kN	R_{B_min} = **22.410** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **8.975** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **13.435** kN	



Timber section details

Breadth of sections	b = **250** mm
Depth of sections	h = **280** mm
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **250** mm
Timber strength class	**D50**

Member details

Service class of timber	**1**
Load duration	**Long term**
Length of span	L_{s1} = **4700** mm
Length of bearing	L_b = **100** mm

Section properties

Cross sectional area of member	A = N × b × h = **70000** mm^2
Section modulus	Z_x = N × b × h^2 / 6 = **3266667** mm^3
	Z_y = h × (N × b)^2 / 6 = **2916667** mm^3
Second moment of area	I_x = N × b × h^3 / 12 = **457333333** mm^4
	I_y = h × (N × b)^3 / 12 = **364583333** mm^4
Radius of gyration	i_x = √(I_x / A) = **80.8** mm
	i_y = √(I_y / A) = **72.2** mm

Modification factors

Duration of loading - Table 17	K_3 = **1.00**
Bearing stress - Table 18	K_4 = **1.00**
Total depth of member - cl.2.10.6	K_7 = (300 mm / h)$^{0.11}$ = **1.01**
Load sharing - cl.2.9	K_8 = **1.00**

Lateral support - cl.2.10.8

Ends held in position and members held in line, as by direct connection of sheathing, deck or joists

Permissible depth-to-breadth ratio - Table 19	**5.00**
Actual depth-to-breadth ratio	h / (N × b) = **1.12**

PASS - Lateral support is adequate

Compression perpendicular to grain

Permissible bearing stress (no wane) $\sigma_{c\_adm} = \sigma_{cp1} \times K_3 \times K_4 \times K_8 =$ **4.500** N/mm²

Applied bearing stress $\sigma_{c\_a} = R_{A\_max} / (N \times b \times L_b) =$ **0.896** N/mm²

$\sigma_{c\_a} / \sigma_{c\_adm} =$ **0.199**

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

Bending parallel to grain

Permissible bending stress $\sigma_{m\_adm} = \sigma_m \times K_3 \times K_7 \times K_8 =$ **16.122** N/mm²

Applied bending stress $\sigma_{m\_a} = M / Z_x =$ **9.697** N/mm²

$\sigma_{m\_a} / \sigma_{m\_adm} =$ **0.602**

PASS - Applied bending stress is less than permissible bending stress

Shear parallel to grain

Permissible shear stress $\tau_{adm} = \tau \times K_3 \times K_8 =$ **2.200** N/mm²

Applied shear stress $\tau_a = 3 \times F / (2 \times A) =$ **0.480** N/mm²

$\tau_a / \tau_{adm} =$ **0.218**

PASS - Applied shear stress is less than permissible shear stress

Deflection

Modulus of elasticity for deflection $E = E_{min} =$ **12600** N/mm²

Permissible deflection $\delta_{adm} = \min(0.551 \text{ in}, 0.003 \times L_{s1}) =$ **13.995** mm

Bending deflection $\delta_{b\_s1} =$ **11.796** mm

Shear deflection $\delta_{v\_s1} =$ **0.690** mm

Total deflection $\delta_a = \delta_{b\_s1} + \delta_{v\_s1} =$ **12.485** mm

$\delta_a / \delta_{adm} =$ **0.892**

PASS - Total deflection is less than permissible deflection