ANDREW WARING
ASSOCIATES

STRUCTURAL CALCULATIONS

FOR KITCHEN BEAM STRENGTHENING AT

CHARMANS, BIGNOR, WEST SUSSEX, RH20 1PQ

Scanned to File	
Job No.	

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Date: April 2022

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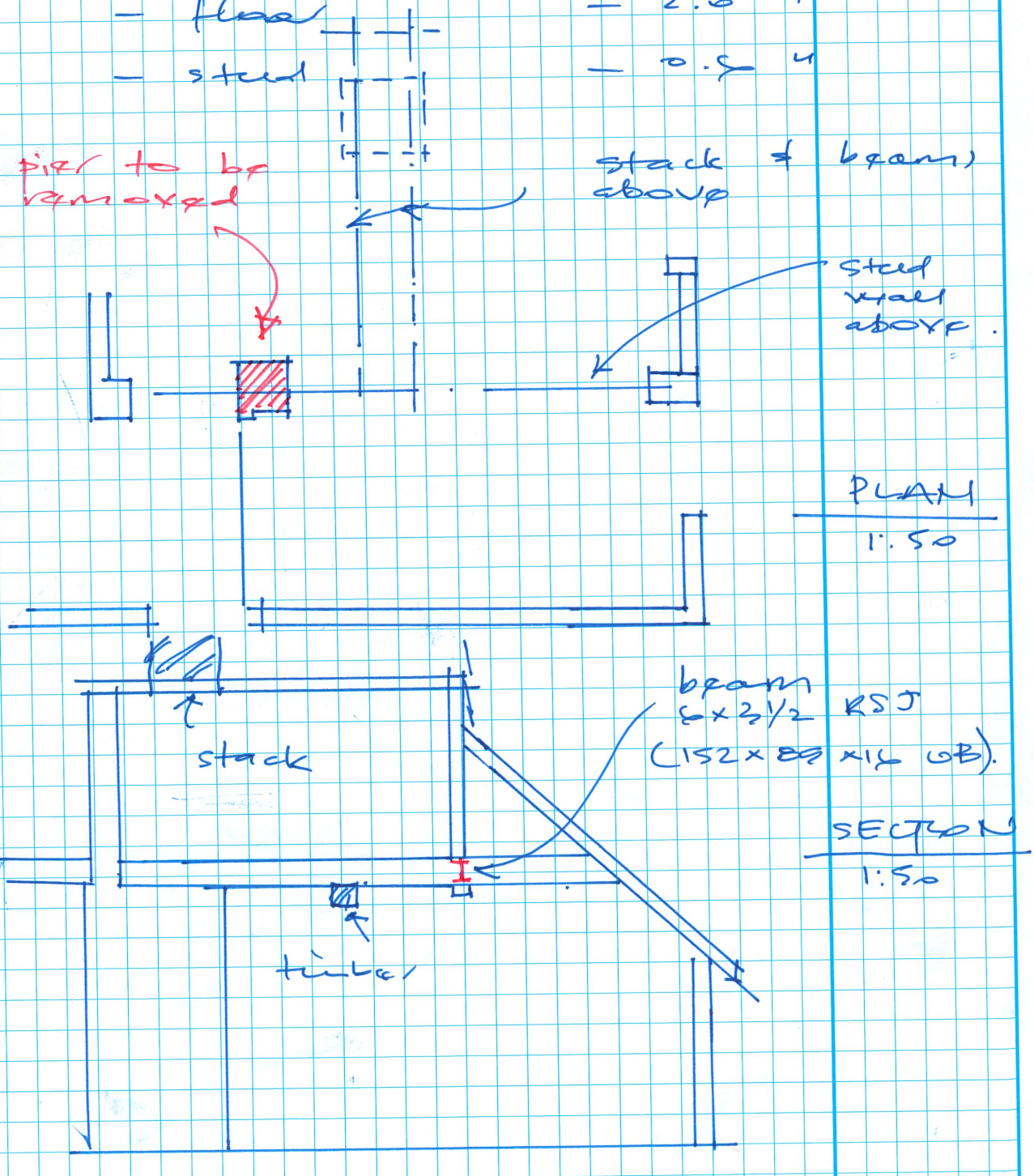
Project	Job Nº	Sheet Nº	Rev.
Chairman's		01	

Element	Date	By	Checked
Beams	04.24	ME	ME

Loadings:

Roof - plain clay + plaster lining — 1.8 kN/m

- floor — 2.0 "
- steel — 0.5 "



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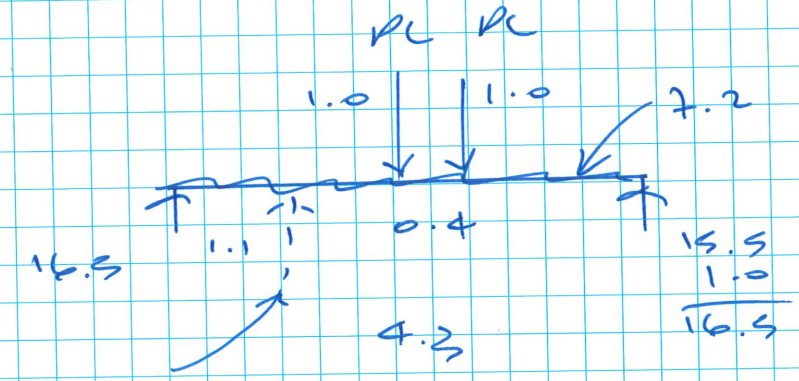
Project	Job Nº	Sheet Nº	Rev.
Garman.		02	
Element	**Date**	**By**	**Checked**
	04.22	ME	MK

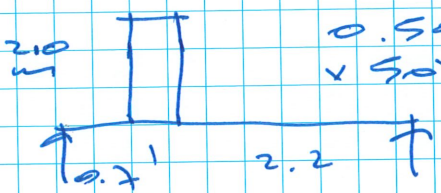
Loading on beam



pier to be removed.

UDL – roof	1.8 x 2.8/2	– 2.3
ptn	2.3/2 x 1.6	– 1.8
lgtn – HD	1.7/2 x 1.8	– 1.5
cly	1.7/2 x 0.5	– 0.4
floor	1.0/2 x 2.0	– 1.0
s/wt		– 0.2
		7.2

PL from stack



0.55 x 0.55 x 20 x 5ol. x 2.0 = 8 kN/2 = 4 kN.

∴ 1.0 kN each

+ Mmt = 0.2 x 1.0 + 7.2 x 2.15²/2 – 16.5 x 2.15

= 20.8 kNm

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Project	Job Nº	Sheet Nº	Rev.
Charnwood		03	
Element	**Date**	**By**	**Checked**
Beam	04.22	IW	MW

for 152 x 89 x 16 UB. (actually KSJ)

restrained by floor joists

$f_{bc} = 20 \times 10^6 / 110 \times 10^3 = 181$

∴ overstressed

$e/y = 4300/21 = 204$ D/T = 17

$P_{bx} = 90$ N/mm²

add 15mm plate.
x 100 of (20mm plate)

$I = 838 \times 10^4 + 15 \times 100^3/12$

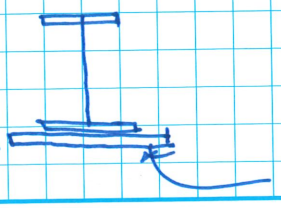
125×10^4 (144)

$= 963 \times 10^4$. = (1004)

$Z = 128.4 \times 10^3$ = (133)

$f_{bc} = 155$ N/mm² < (150).

try adding bottom plate.



A — 200 x 15

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Project	Job №	Sheet №	Rev.
Chalmers.		04.	
Element	**Date**	**By**	**Checked**
Beams	04.22	KC	

NA – from A – A

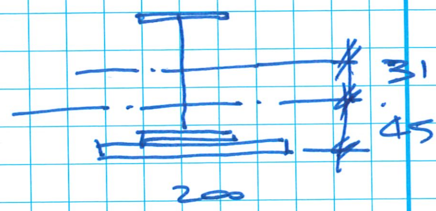
$6 \times 3\frac{1}{2}$ RSJ.
$A = 3.38\ in^2$
$Z = 7.07\ in^3$
$I = 21.22\ in^4$
$r_y = 2.51\ in.$

$200 \times 15^2/2 = 22500$

$+ \quad 3.38 \times 0.645 \times 10^3 \times 91 = 198389$

~~total~~ $= 220889\ mm^3$

$\therefore$ NA $= 42$ mm



$I = 21.22 \times 0.4162 \times 10^6 + 3.38 \times 0.645 \times 10^3 \times 31^2$

$= 883.17 \times 10^4\ mm^4$

$+ \quad 200 \times 15^3/12 + 3000 \times 37.5^2$

$= 427.5 \times 10^4\ mm^4$

~~total~~ $= 1310.6 \times 10^4\ mm^4$

$Z_b = 1310 \times 10^4 / 122 = 107.37 \times 10^3\ mm^3$

$Z_t = 1310 \times 10^4 / 45 = 291.1 \times 10^3\ mm^3$

$r_{yy} = \sqrt{427.5 \times 10^4 / 5180} = 28.7$ mm

$\frac{l_e}{r_y} = 4300/28 = 153 \qquad D/T = 17$

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Project	Job Nº	Sheet Nº	Rev.
Chatsworth.		05	
Element	**Date**	**By**	**Checked**
Beams	04.22		

P_{bc} 108 F_{bc} 193 NS 1.1.

t_{ry}  102 x 51 KSC

$I = 883 \times 10^4\ mm^4 + 207.7 \times 10^4\ mm^4$

$= 1090.7 \times 10^4\ mm^4.$

$A = 2180 + 851 = 3031\ mm^2$

$r_y = \sqrt{1090 \times 10^4 / 3031} = 59$

e_{lz} $4300/59 = 73$ mm $P/T = 17.$

P_c 162

$Z = 1090 \times 10^4 / 76 = 143\ cm^3$

$F_{bc} = 20.8 \times 10^6 / 143 \times 10^3 = 145 < 162$

$\Delta = UDL = 13$

$VL = \frac{1.4}{14.4}$ span/300. D+L -

Use Ex. 152 x 89 x 16 KSJ +

mem 102 x 51 PFC

awa
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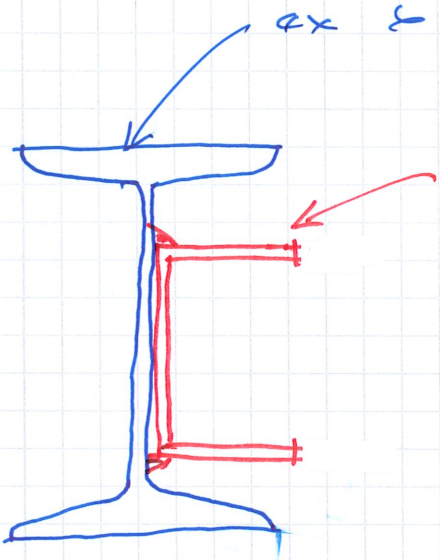
PROJECT	Charman	JOB N°	SHEET N° SK1	REV
ELEMENT	Beam	DATE 04.22	BY KW	CHECKED KW



PLUS MAKE GOOD PIPE HOLE IN RSJ.

PLUS CHECK BEARING(S) OF RSJ