

STRUCTURAL ENGINEER'S
CALCULATIONS
FOR

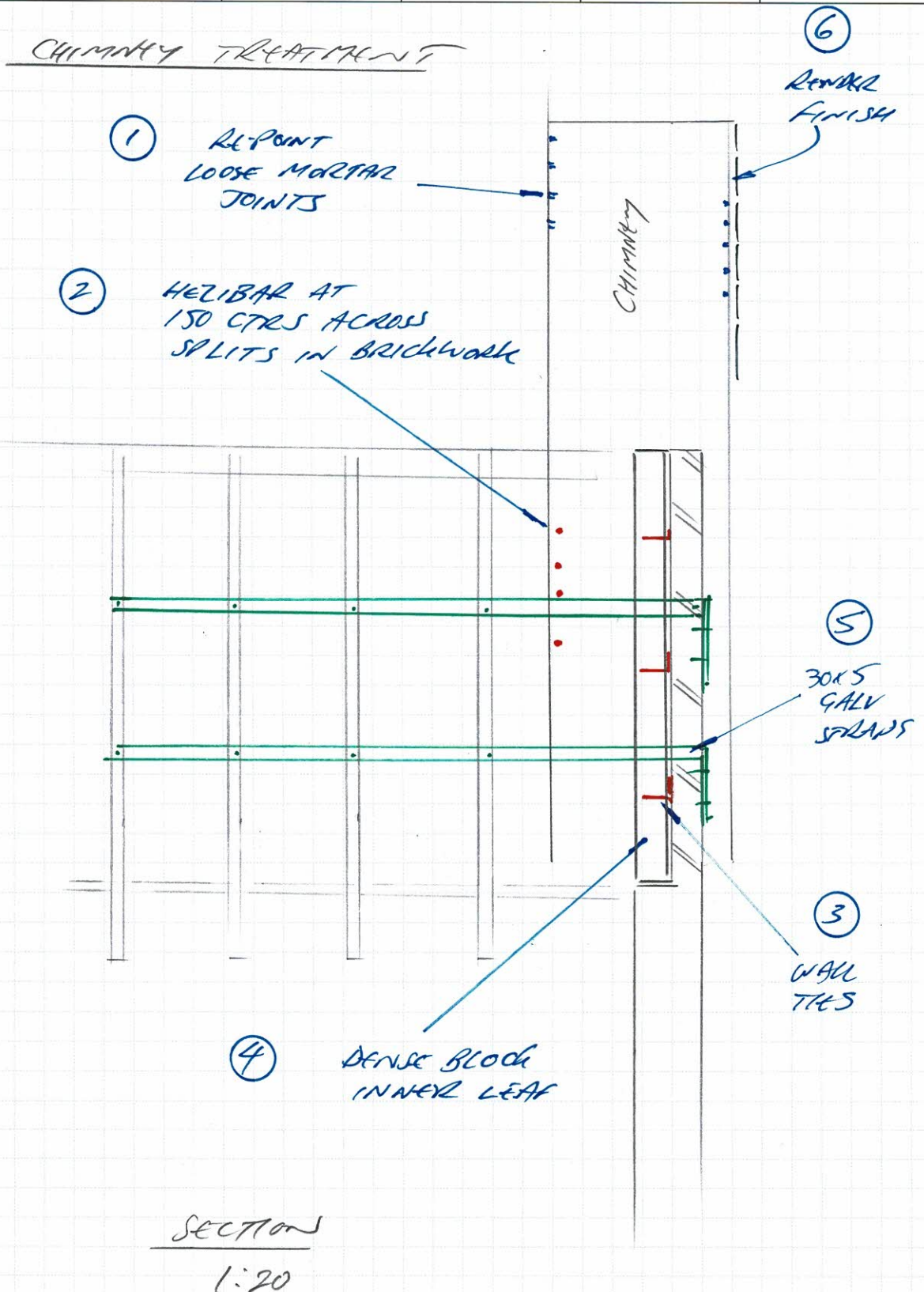
INTERNAL STRENGTHENING

The Castle Inn
London Road
Hickstead

Our Ref: GM/24283

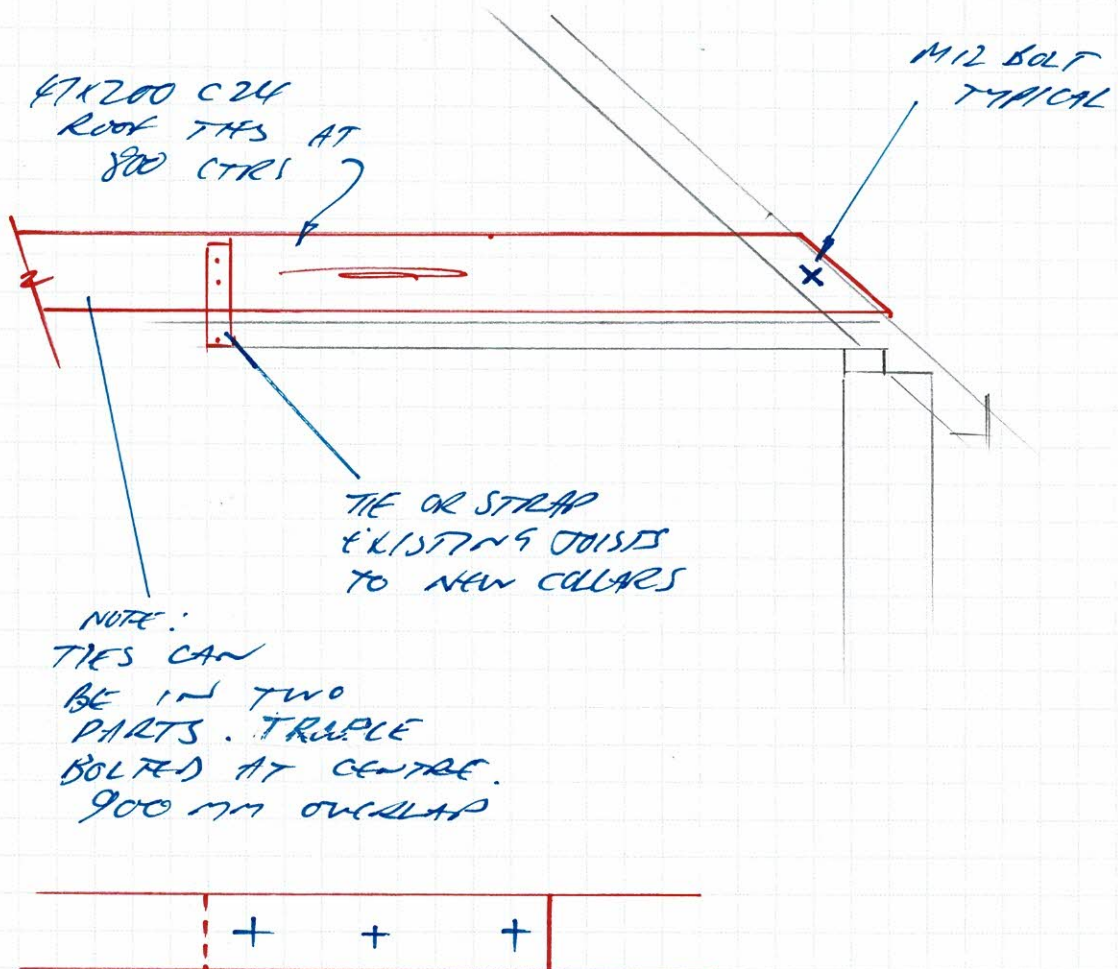
August 2025

JOB TITLE Castle Inn, Hickstead			ITEM Structural calculations		
DESIGNED BY GM	DATE Mar 25	CHECKED BY	JOB NO. 24283	SHEET 1	REV



JOB TITLE Castle Inn, Hickstead			ITEM Structural calculations		
DESIGNED BY GM	DATE Mar 25	CHECKED BY	JOB NO. 24283	SHEET 02	REV

ROOF TIES



SECTION
1:20

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KITCHEN SUPPORT

ADDITIONAL TRIMMER

$$SPAN = 3.2m$$

$$ROOF LOAD = \frac{4.6 \times 1.6}{2} = 3.7 kN/m$$

$$BM = \frac{3.7 \times 3.2^2}{8} = 4.7 kNm$$

$$f = \frac{M}{I} = \frac{4.7 \times 10^6 \times 6}{2 \times 50 \times 200^2} = 7.1 N/mm^2 \text{ or}$$

$$d = \frac{5 \times 3.7 \times 3200^4 \times 12}{384 \times 7200 \times 1.14 \times 100 \times 200^3} = 9.2mm$$

$$d_{all} = 320 \times 0.03 = 9.6mm$$

INCREASE TO 3N° 47 X 200 OR 4.

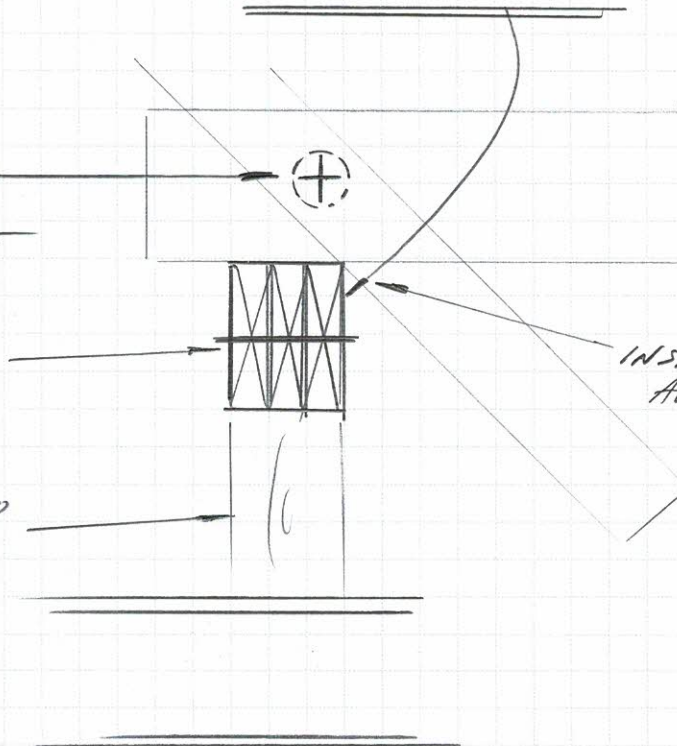
ADD
M12 BOLT
& WASHER
PLATE
EVERY JOIST

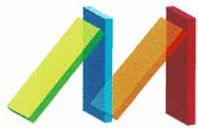
M12 BOLDS
AT 600
CENTS

STRUT ON TO
EXISTING
STEEL
BEAM

EXISTING
VALLEY JOISTS

INSTALL TIGHT
AGAINST
RAFTERS





JOB TITLE Castle Inn, Hickstead			ITEM Structural calculations		
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Roof THS

47x200
C24
AT 800
CTRS.

M12
BOLTS

EXISTING
RAFTERS

L1 DOOR LINTEL
900mm span

Roof Load -- $\frac{3.5 \times 1.55}{2} = 2.7 \text{ kN}$

WALL -- $0.5 \times 2 = 1 \text{ kN}$ total 3.7 kN

BM = $\frac{3.7 \times 0.9^2}{8} = 0.4 \text{ kNm}$

∴ 100 x 70 PLANK LINTEL $M_s = 1.04 \text{ kNm}$

L2 EXTERNAL DOOR
0.9m span

INNER Roof Load -- $\frac{3.2 \times 1.55}{2} = 2.5 \text{ kN}$

WALL -- $1.7 \times 2 = 3.4 \text{ kN}$ } 5.9 kN

BM = $\frac{5.9 \times 0.9^2}{8} = 0.6 \text{ kNm}$

OUTER 2x 100 x 70 PLANK LINTERS.
SIMILAR

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NARROW PER
 STAY 330mm.

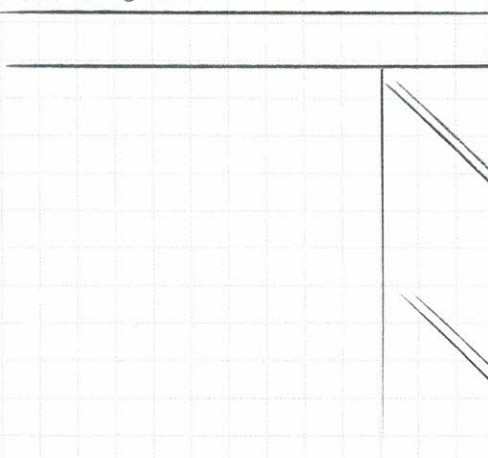
$R_{td} = \frac{2.2 \times 5.9}{2} = 6.5kN$

INNER APPLIED STRESS = $\frac{6.5 \times 10^3 \times 1.45}{330 \times 100} = 0.29 N/mm^2$

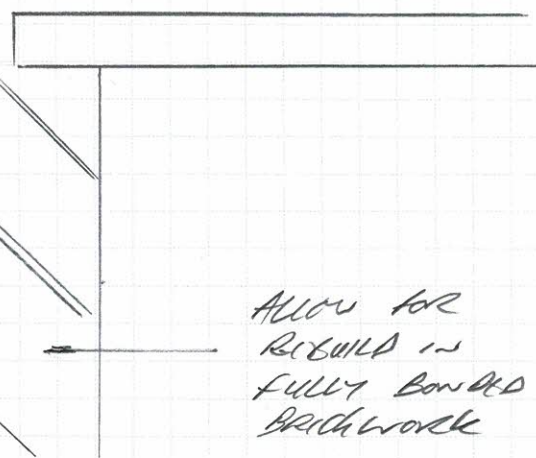
$f_h' = \frac{3.5}{3.5} \times 0.8 \times 0.7 = 0.56 N/mm^2 > 0.29$

ALLOW FOR REBUILDING PER IN SOLID BRICK
 INNER & OUTER LEAF.

NEW
LINTEL



EXISTING
LINTEL



ALLOW FOR
 REBUILD IN
 FULLY BONDED
 BRICKWORK

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BS
6399

GROUND FLOOR - STRUCTURAL CHECK

BAR LOADING - 5 kN/m^2

AREA 1 - JOIST SIZE = $50 \times 175 \text{ mm}$ AT 350 CTRS.

3.6m CLEAR SPAN

DEAD LOAD = 0.5 kN/m^2

+ UNDER FLOOR HEATING = 0.2 kN/m^2

TOTAL $5.7 \text{ kN/m}^2 \times 0.35 \text{ m} = 2 \text{ kN/m}$

$\text{BM} = 2 \times \frac{3.7^2}{8} = 3.4 \text{ kNm}$

$f = \frac{M}{Z} = \frac{3.4 \times 10^6 \times 6}{50 \times 175^2} = 13.3 \text{ N/mm}^2$ NOT ok

DOUBLE ALL JOISTS.

$d = \frac{5 \times 2 \times 3700^4 \times 12}{384 \times 10800 \times 100 \times 175^3} = 10 \text{ mm}$

d all: $3700 \times 0.003 = 11.1 \text{ mm}$ ok.

2N° 47x175 C24 JOISTS.

AREA 2 - JOIST SIZE = 50×125 AT 350 CTRS

2.3m CLEAR SPAN

$\text{BM} = 2 \times \frac{2.4^2}{8} = 1.44 \text{ kNm}$

$f = \frac{M}{Z} = \frac{1.44 \times 10^6 \times 6}{50 \times 125^2} = 11 \text{ N/mm}^2$ NOT ok

INCREASE TO 150mm
OR DOUBLE UP.

$d = \frac{5 \times 2 \times 2400^4 \times 12}{384 \times 10800 \times 100 \times 125^3} = 5 \text{ mm}$ ok.

2N° 47x125 C24 JOISTS

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STAIR BEAMS

BEAM 1 SIDE OF LANDING DESIGN SPAN = 4.2m

FLOOR/STAIR LOAD = $\frac{4}{2} \times 4.5 = 9 \text{ kN/m}$

WALL = $2.5 \times 0.5 = 1.25 \text{ kN/m}$

SW = 0.35 kN/m

TOTAL = 10.6 kN/m . s.s

BM = $\frac{10.6 \times 4.2^2}{8} = 23 \text{ kNm}$. x/f = 36 kNm - max.

Req: $\frac{5 \times 10.6 \times 4200^3 \times 360}{384 \times 205 \times 10^3} = 1796 \times 10^4 \text{ mm}^4$

b: 5- PROVIDE 203 x 133 x 30 UB . MB: 39 kNm

BEAM 2 2.4m DESIGN SPAN

$R_i = 10.6 \times 4.2 / 2 = 22 \text{ kN}$

FLOOR LOAD = $\frac{1.5}{2} \times 6.5 = 3.4 \text{ kN/m}$ } 3.75 kN/m

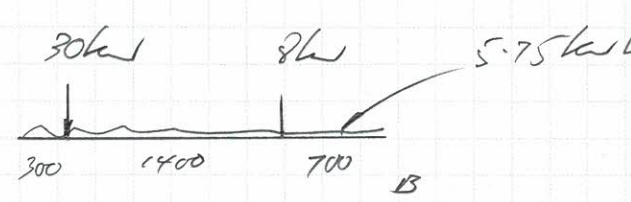
SW = 0.35 kN/m }

PER ABOVE

SW = $0.4 \times 2.5 \times 4 = 4 \text{ kN}$ } 8 kN

ROOF = $\frac{5.3}{2} \times 1.6 \times 1.9 = 4 \text{ kN}$ }

+ BRICK = $0.5 \times 4 = 2 \text{ kN}$



30kN 8kN 5.75kN

300 1400 700

A B

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$$R_A = \frac{1}{2.4} \left(30 \times 2.1 + 8 \times 0.7 + \frac{5.75 \times 2.4^2}{2} \right) = 35 \text{ kN}$$

$$R_B = 17 \text{ kN}$$

$$x = \frac{35 - 30}{5.75} = 0.9 \text{ m}$$

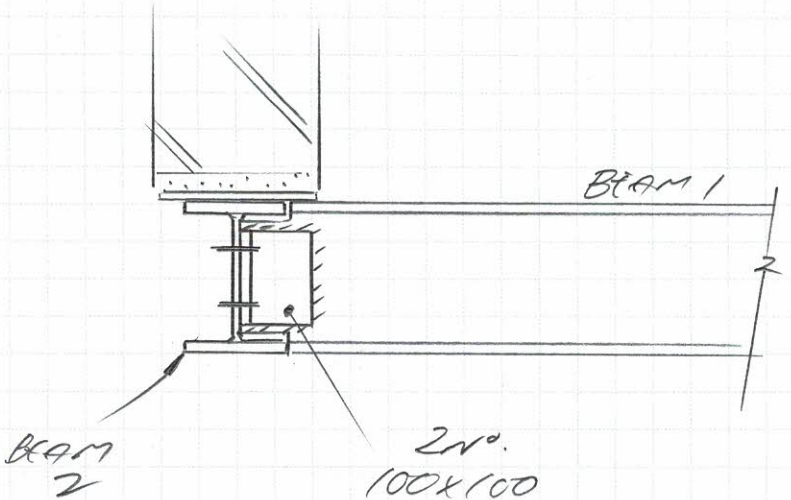
$$B.M. = 35 \times 0.9 - \frac{5.75 \times 0.9^2}{2} - 30 \times 0.6 = 11.2 \text{ kNm}$$

$$\text{wequiv} = \frac{11.2 \times 8}{2.4^2} = 15.5 \text{ kNm}$$

$$I_{eq} = 492 \times 10^4 \text{ mm}^4$$

 $l = 3 \text{ m}$

PROVIDE 203 x 133 x 30 UB



PADSTONE

$$AREA = \frac{35 \times 10^3 \times 1.58 \times 3.5}{4.1 \times 1.58}$$

$$= 29878 \text{ mm}^2$$

$\therefore$ MIN. 330mm LONG CONCRETE PADSTONE.

JOB TITLE Castle Inn, Hickstead		ITEM Structural calculations		
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REV				

CELLAR STRENGTHENING.

BEAM
1-5

DESIGN SPAN = 4m

FLOOR LOAD: 4.7 kN/m²

UDL = $4.7 \times 2.6 = 6.1 \text{ kN/m}$

SW = 0.3 kN/m } 6.4 kN/m

BM: $\frac{6.4 \times 4^2}{8} = 12.8 \text{ kNm}$ x 8 = 20 kNm

$I_{req} = \frac{5 \times 6.4 \times 4000^3 \times 360}{384 \times 205 \times 10^3} = 937 \times 10^4 \text{ mm}^4$

6-5-2 PROVIDE 203 x 133 x 25 UBS MB - 28kN

$I_{UBS} = 2340 \times 10^4 \text{ mm}^4$

EXISTING BEAMS

9" x 4" RST

13 FOOT SPAN SWL = 7.4 T

$W = 6.4 \times 4 = 25 \text{ kN} = 2.56 \text{ tonnes} < 7.4$

$I_{RST} = 81.3 \text{ in}^4 \rightarrow 3377 \times 10^4 \text{ mm}^4 >> 937$

EXISTING BEAMS = SAFE.

JOISTS

50 x 125 1.3m SPAN

UDL = $4.7 \times 0.4 = 1.9 \text{ kN/m}$

BM = $1.9 \times 1.3^2 / 8 = 0.4 \text{ kNm}$

$f = \frac{M}{I} = \frac{0.4 \times 10^6 \times 6}{50 \times 125^2} = 3 \text{ N/mm}^2$ SAFE

$d = \frac{5 \times 1.9 \times 1300^4 \times 12}{384 \times 10800 \times 50 \times 125^3} = 0.8 \text{ mm}$ SAFE

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REV				

BEAM 6 4.2m DESIGN SPAN

FLOOR LOAD - $3.2 \frac{1}{2} \times 4.7 = 7.5 \text{ kN/m}$
 SW - 0.3 kN/m } 7.8 kN/m

BM - $7.8 \times \frac{4.2^2}{8} = 17 \text{ kNm}$ x $\gamma_f = 27 \text{ kNm}$

$I_{req} = 1321 \times 10^4 \text{ mm}^4$

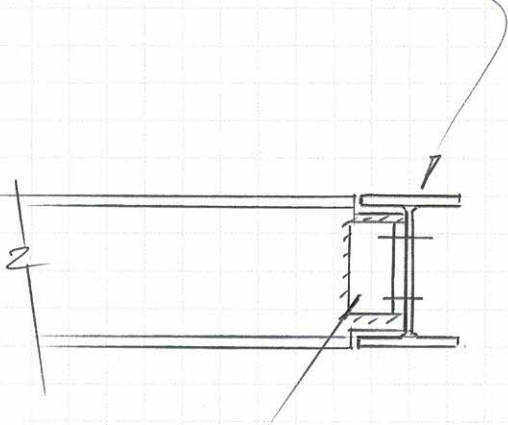
6-55- PROVIDE 203 X 133 X 30 UB . $M_f = 43 \text{ kNm}$

BEAM 7 2.5m DESIGN SPAN SW - 0.3 kN/m

FLOOR LOAD - $8.2 \times 4.7 = 19.3 \text{ kN/m}$ } 19.6

BM - $19.6 \times \frac{2.5^2}{8} = 15.3$ x $\gamma_f = 24 \text{ kNm}$. u.s.

6-3 PROVIDE 203 X 133 X 25 UB



ANGLE CLIP
OR 12mm
END PLATE

+ 4x M12/M16
BOLTS

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BEAM
8

1.2m DESIGN SPAN $SW = 0.36k$

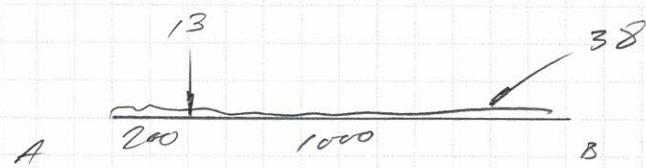
ROOF LOAD $= \frac{4.6}{2} \times 1.6 =$

WALL $= 6m \times 5 = 30k$

FLOOR $= \frac{4.6}{2} \times 2.5 = 5.8k$

TOTAL $= 38k$

POINT LOAD $R_4 = 6.4 \times 4/2 = 13k$



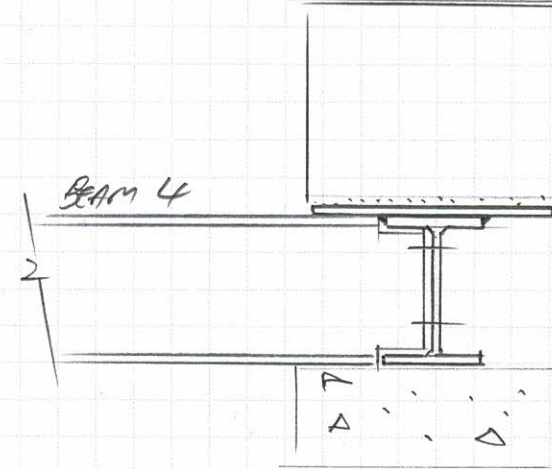
$R_A = \frac{1}{1.2} \left(\frac{38 \times 1.2^2}{2} + 13 \times 1 \right) = 33.6k$
 $R_B = 25k$

$x = 25/38 = 0.66m$

$BM = 25 \times 0.66 - \frac{38 \times 0.66^2}{2} = 8.2k$

$\times 4 = 12k$ - max.

Provide 203x133x25 UB



PADSTONE $A = \frac{33.6 \times 10^3 \times 1.457 \times 3.5}{3.5 \times 1.5}$

$= 32480 mm^2$

FULL WIDTH IN SITU CONCRETE PADSTONE.

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OTHER PADSTONES

ALL 330mm CONG
CONC. PADS

