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CHENG LTD

CONSULTING STRUCTURAL AND CIVIL ENGINEERS

15 High Street,
Spalding,
Lincs. PE11 1TW.

Project No. 36818

Sheet No. 1

Rev.

Date

MARCH '19

Designer

PROJECT:

PROPOSED EXTENSION.

G.T.R. LTD.

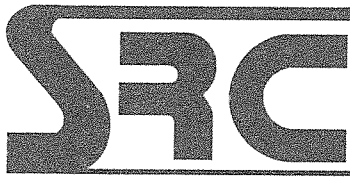
DENMAN'S LANE.

FONTWELL.

WEST SUSSEX.

BN18 0SH.

EAGLE STRUCTURAL LTD.



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Sheet No. 2.

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PROJECT:

LOADINGS

$$\begin{aligned} \text{INSULATED ROOF SHEETING} &= 0.12 \text{ kN/m}^2 \\ \text{PURLINS} &= 0.03 \text{ kN/m}^2 \\ &\underline{\underline{0.15 \text{ kN/m}^2}} \end{aligned}$$

$$\text{SERVICES} = \underline{\underline{0.10 \text{ kN/m}^2}}$$

$$\text{BASIC SNOW LOAD} = 0.45 \text{ kN/m}^2 \quad S_{\text{alt}} = 0.14$$

$$A_{\text{L}} = 35 \text{ m} \therefore S_0 = 0.45 + 0.14 ((35 - 100)/100) = 0.359$$

$$\alpha = 15^\circ \therefore \mu = 0.8$$

$$\therefore S_d = 0.8 \times 0.359 = 0.287 \text{ kN/m}^2$$

$$\text{BUT MINIMUM IMPOSED LOAD} = \underline{\underline{0.60 \text{ kN/m}^2}}$$

WIND LOADING

$$\text{BASIC WIND SPEED, } V = 38 \text{ m/s}$$

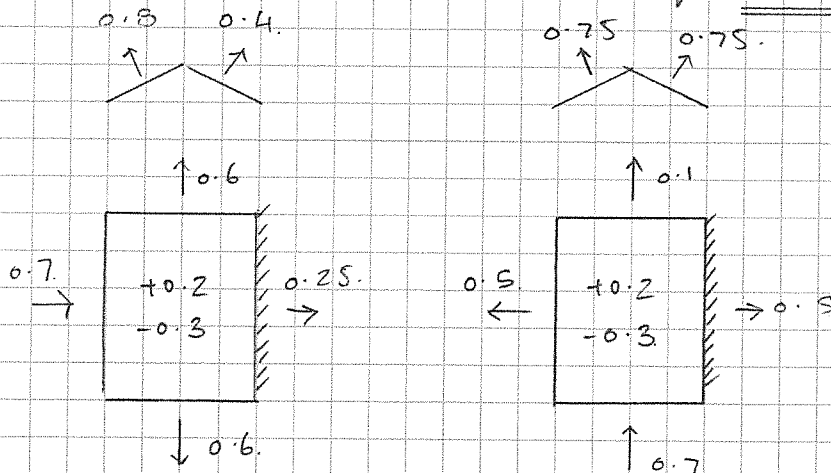
$$S_1 = 1.0$$

$$S_2 = 0.824 \text{ CAT 2, CLASS B}$$

$$S_3 = 1.0$$

$$V_s = 31.31 \text{ m/s}$$

$$q = \underline{\underline{0.601 \text{ kN/m}^2}}$$

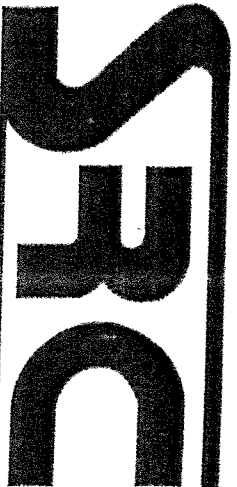


PROJECT:

MEZZANINE LOADS

IMPOSED = 5.00 kN/m²

SERVICES	=	0.10 kN/m ²
TIMBER DECKING	=	0.22 kN/m ²
JOISTS	=	0.19 kN/m ²
CEILING	=	0.25 kN/m ²
		<u>0.76 kN/m²</u>



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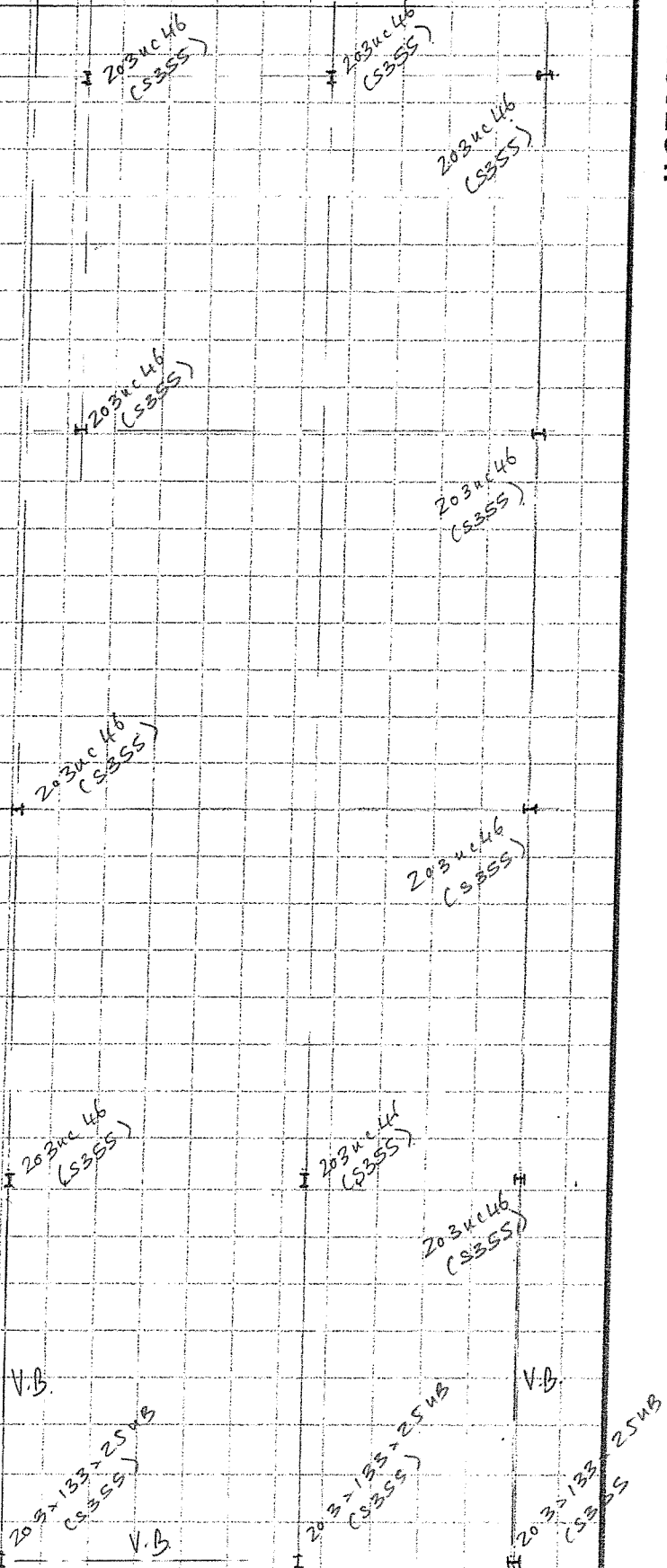
Sheet No. 4 Rev.

Date MARCH 19

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PROJECT:

COLUMN PLAN



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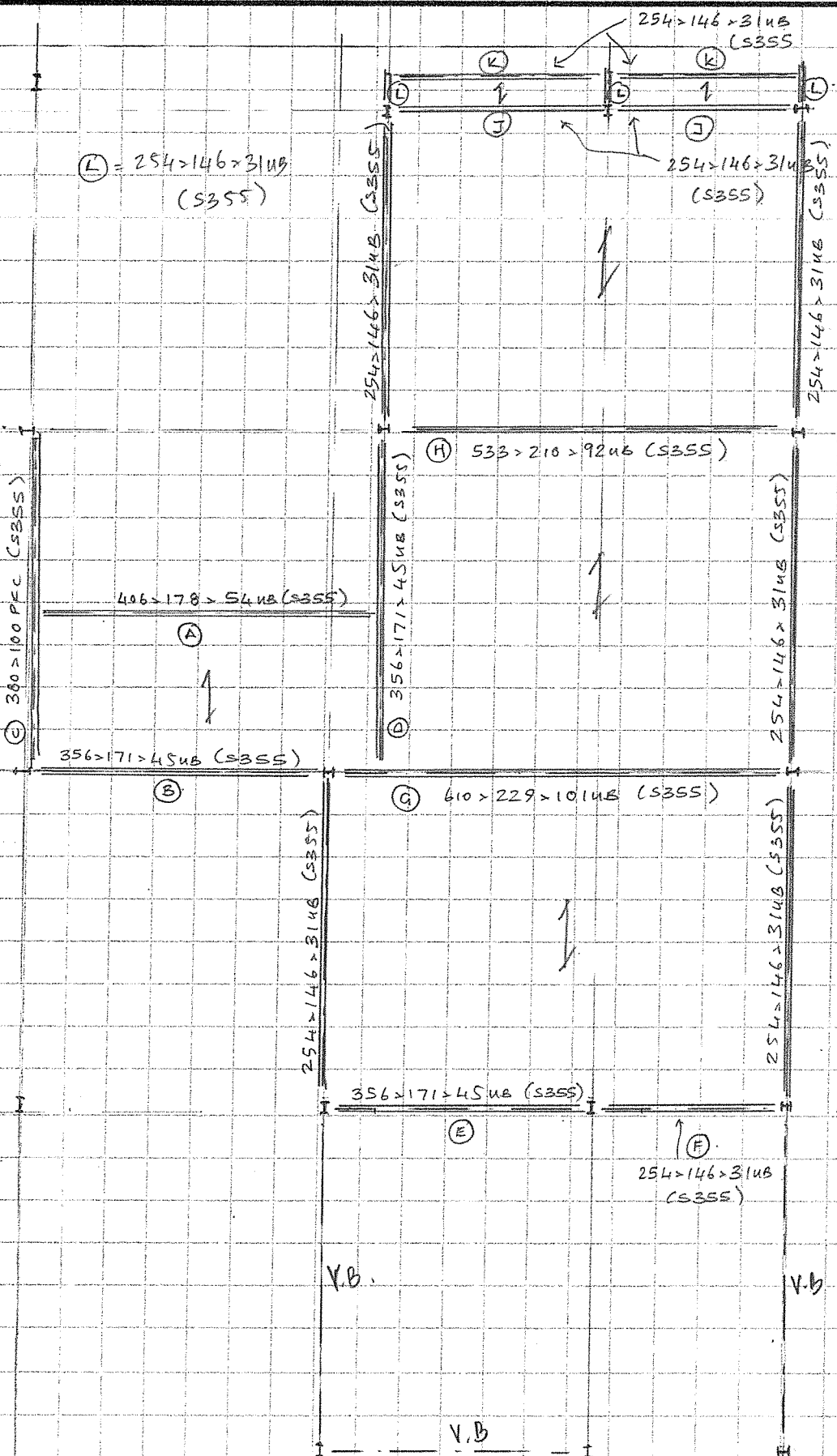
PROJECT:

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MEZZANINE PLAN



SFC

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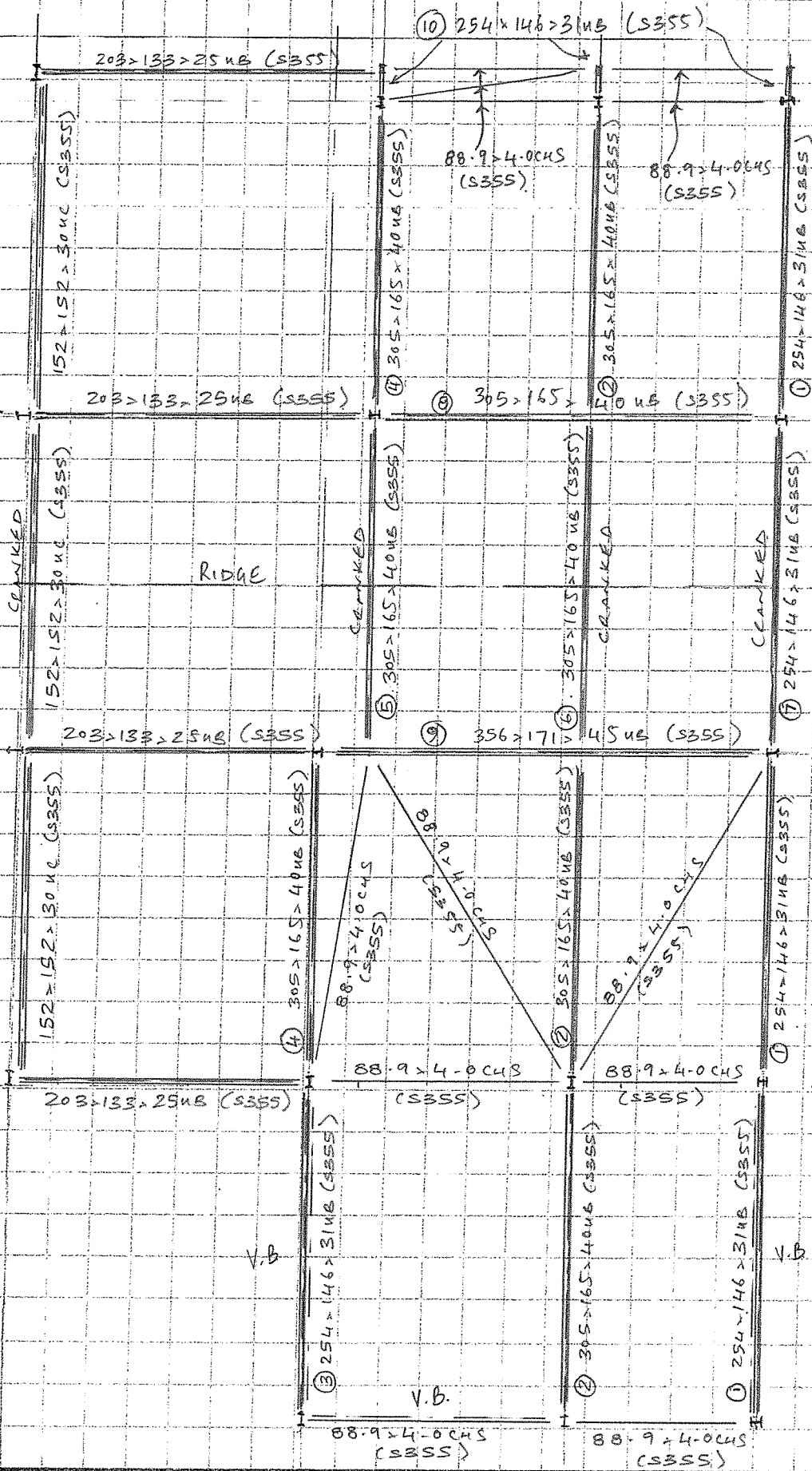
Sheet No. 6 Rev.

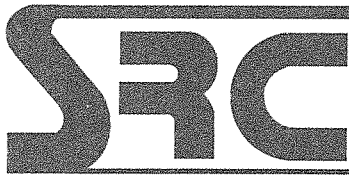
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PROJECT:

ROOF PLAN





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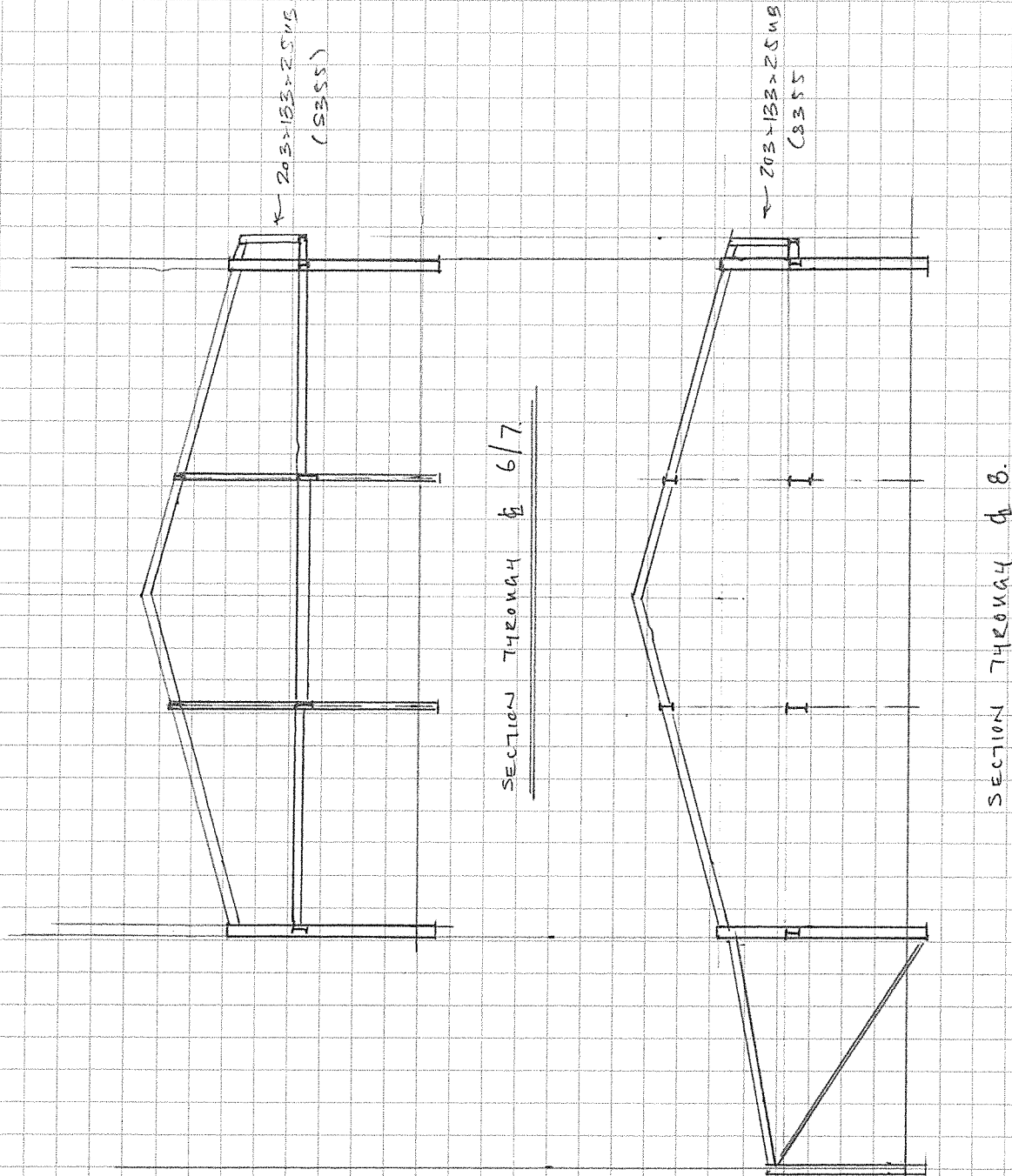
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Rev.

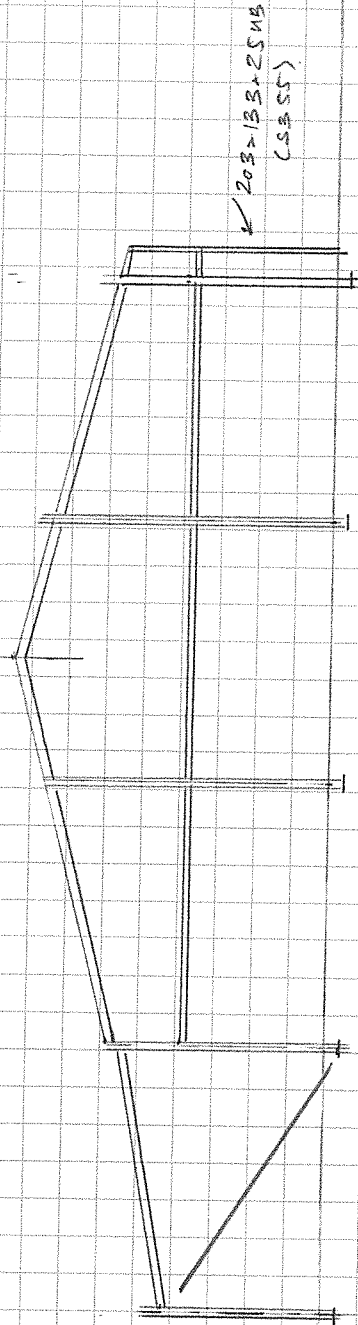
Date MARCH '19

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PROJECT:

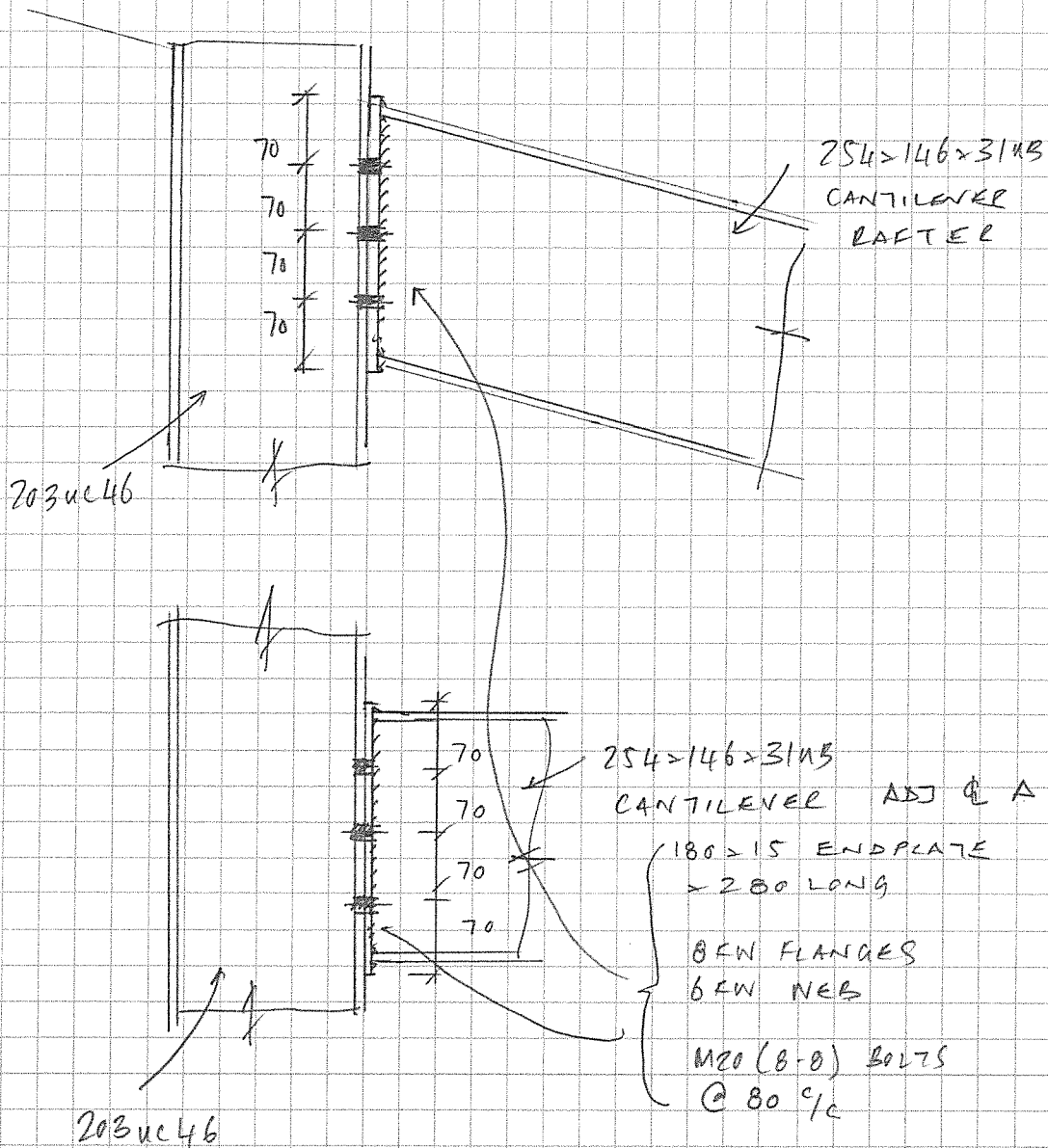


PROJECT:



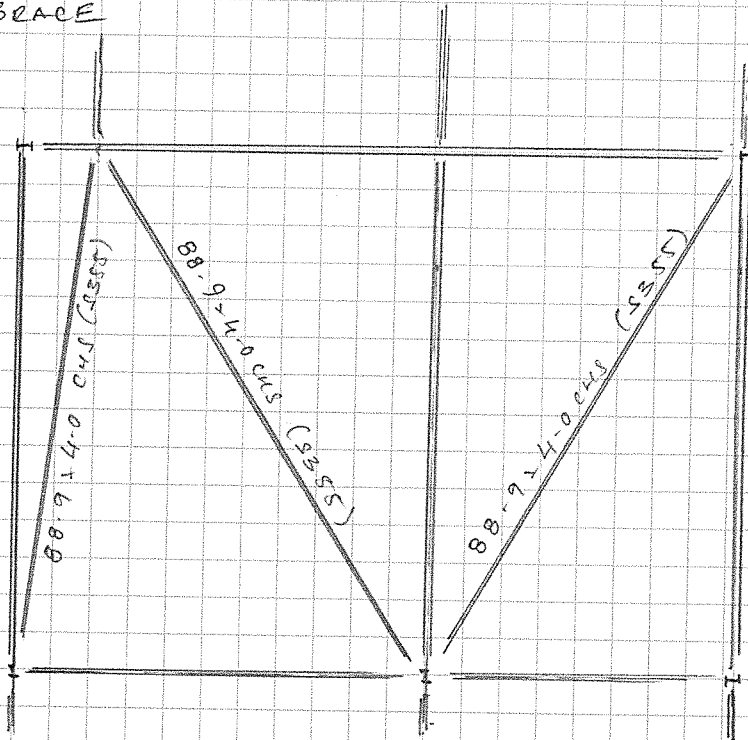
ELEVATION 9.

PROJECT:



PROJECT:

ROOF BRACE

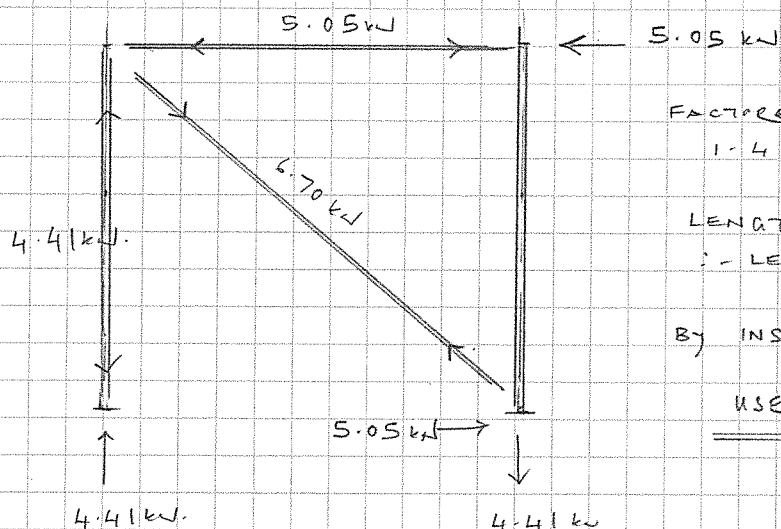


EAVES TIES

BY INSPECTION. USE 88.9 x 4.0 CHS (S355) TYPICAL

PROJECT:

VERTICAL BRACING @ E / 6 → 8



FACTORED AXIAL LOAD =

$$1.4 \times 6.7 = 9.38 \text{ kN}$$

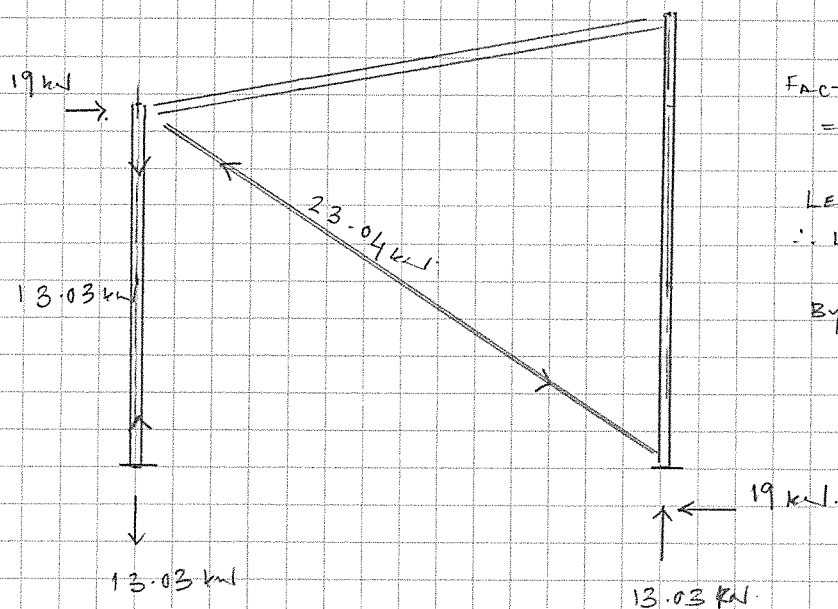
$$\text{LENGTH} = 7.3 \text{ m}$$

$$\therefore LE = 7.3 \times 0.85 = 6.205 \text{ m}$$

By INSPECTION,

USE 88.9 x 3.2 CHS (S355)

VERTICAL BRACING @ 6 & 9 / D → E



FACTORED AXIAL LOAD

$$= 1.4 \times 23.0 = 32.2 \text{ kN}$$

$$\text{LENGTH} = 8.49 \text{ m}$$

$$\therefore LE = 0.85 \times 8.49 = 7.21 \text{ m}$$

By INSPECTION,

USE 88.9 x 4.0 CHS (S355)

PROJECT:

INTERNAL ROOF / FLOOR SUPPORT POSTS Q D / 6 & 8

LENGTH = 6.5m

FACTORED AXIAL LOAD = $(25.62 \times 1.4) + (103.09 \times 1.6) = 200.81 \text{ kN}$

ECC MOMENT = $[(8.36 \times 1.4) + (48.13 \times 1.6)] \times 0.1 = 8.87 \text{ kNm (Y-Y)}$

LE = 6.5m $\therefore$ TRY 203 $\times$ 203 $\times$ 46 UC (S355)

CHECK COMBINED AXIAL LOAD & BENDING

$$\frac{200.81}{575.5} + \frac{8.87}{64.8} = 0.49 < 1.0$$

$\therefore$ 203 $\times$ 203 $\times$ 46 UC (S355) IS SATISFACTORY

PROJECT:

GABLE POST @ D/9

LENGTH = 6.5m.

FACTORED AXIAL LOAD = $(12.42 \times 1.4) + (43.40 \times 1.6) = 86.83 \text{ kN}$

ECC MOMENT = $[(6.12 \times 1.4) + (35.00 \times 1.6)] \times 0.2 = 12.91 \text{ kNm}$

WIND MOMENT = $7.0 \times 0.6 \times 1.4 \times 6.5^2 = 31.05 \text{ kNm}$
8

$\therefore$ TOTAL MOMENT = 43.96 kNm

LE = 6.5m $\therefore$ Try 203 x 205 x 46uc (S355)

$$\frac{86.83}{575.5} + \frac{43.96}{93.55} = 0.62 < 1.0.$$

$\therefore$ 203 x 205 x 46uc (S355) IS SATISFACTORY



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PROJECT:

CABLE POSTS @ 9 / B & C.

LENGTH = 8.0m

$$\text{FACTORED AXIAL LOAD} = (45.29 \times 1.4) + (187.21 \times 1.6) = 362.94 \text{ kN}$$

$$\text{ECC MOMENT} = [(30.41 \times 1.4) + (167.25 \times 1.6)] \times 0.2 = 62.03 \text{ kNm}$$

$$\text{WIND MOMENT} = \frac{7.0 \times 0.6 \times 1.4 \times 8.0^2}{8} = 47.04 \text{ kNm}$$

$$\therefore \text{TOTAL MOMENT} = 109.07 \text{ kNm}$$

LE = 4.2m $\therefore$ TRY 203 x 203 x 46uc CS355

CHECK COMBINED AXIAL LOAD & BENDING

$$\frac{362.94}{1083.2} + \frac{0.6 \times 109.07}{124} = 0.86 < 1.0$$

$$\text{DEFLECTION (WIND)} = \frac{5 \times 4.2 \times 8.0^4 \times 10^5}{384 \times 205 \times 4568} = 23.92 \text{ mm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{8000}{250} = 32.0 \text{ mm}$$

$\therefore$ 203 x 203 x 46uc CS355 IS SATISFACTORY

PROJECT:

INTERNAL ROOF & FLOOR SUPPORT BEAMS

LENGTH = 8.0m.

FACTORED AXIAL LOAD = $(53.61 \times 1.4) + (218.37 \times 1.6)$
= 424.45 kN

ECC MOMENT = $[(32.82 \times 1.4) + (169.79 \times 1.6)] \times 0.2 = 63.52 \text{ kNm}$

LE = 4.2m $\therefore$ try 203 x 203 x 46uc (S355)

CHECK COMBINED AXIAL LOAD & BENDING

$$\frac{424.45}{1083} + \frac{63.52}{124} = 0.90 < 1.0$$

$\therefore$ 203 x 203 x 46uc (S355) is SATISFACTORY



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PROJECT:

POST ADD @ A / 7, 8 & 9

LENGTH = 6.2m

FACTORED AXIAL LOAD = $(22.61 \times 1.4) + (92.22 \times 1.6) = 179.21 \text{ kN}$

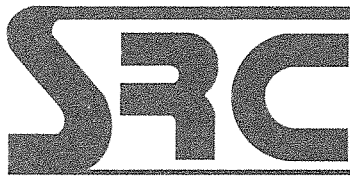
WIND MOMENT = $0.6 \times 6.0 \times \frac{1.4 \times 6.2^2}{8} = 24.22 \text{ kNm}$

LE = 6.2m $\therefore$ TRY 203 UC 46 (S355)

CHECK COMBINED AXIAL LOAD & BENDING

$$\frac{179.21}{619} + \frac{24.22}{96.76} = 0.54 < 1.0$$

$\therefore$ 203 UC 46 (S355) IS SATISFACTORY



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PROJECT:

RAFTER SUPPORT POSTS @ E / 6 → 9

$$LENGTH = 5.0m$$

$$FACTORED AXIAL LOAD = (5.57 \times 1.4) + (9.98 \times 1.6) = 23.77kN$$

$$ECC MOMENT = 0.2 \times 23.77 = 4.75kNm$$

$$WIND MOMENT = \frac{0.6 \times 6.0 \times 1.4 \times 5.0^2}{8} = 15.75kNm$$

TRY 203 x 133 x 25UB (S355)

CHECK COMBINED AXIAL LOAD & BENDING

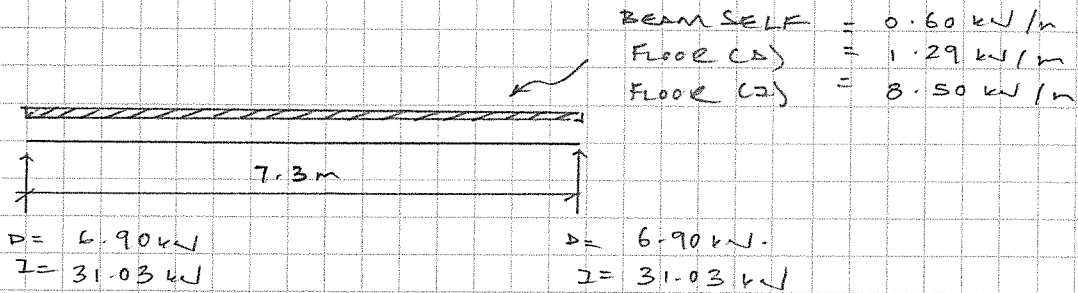
$$\frac{23.77}{219} + \frac{20.50}{32.00} = 0.75 < 1.0$$

$$DEFLECTION (WIND) = \frac{5 \times 3.6 \times 5.0^4 \times 10^5}{384 \times 205 \times 2340} = 6.11mm$$

∴ 203 x 133 x 25UB (S355) IS SATISFACTORY

PROJECT:

MEZZANINE BEAM A.



$$\text{FACTORED MOMENT} = \left[\frac{(1.89 \times 1.4) + (8.50 \times 1.6)}{8} \right] \times 7.3^2$$

$$= 108.22 \text{ kNm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{7300}{360} = 20.2 \text{ mm}$$

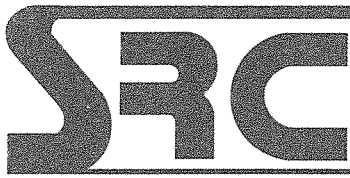
$$\therefore I_{\text{REQ'D}} = \frac{5 \times 8.50 \times 7.3^4 \times 10^5}{384 \times 205 \times 20.2} = 7590 \text{ cm}^4$$

$$\text{Tey. } 406 \times 178 \times 54 \text{ UB (S355) } L_E = 0.85 \times 7.3 = 6.205 \text{ m}$$

$$M_c = 375 \text{ kNm} \quad \frac{M_b}{M_c} = \frac{110.80}{0.925} = 119.78 \text{ kNm} \checkmark$$

$$I_{\text{xx}} = 18720 \text{ cm}^4 > 7590 \text{ cm}^4$$

$\therefore 406 \times 178 \times 54 \text{ UB (S355) IS SATISFACTORY}$



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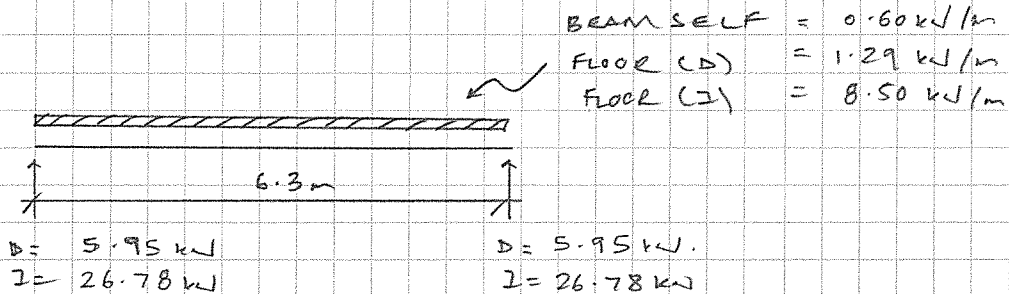
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PROJECT:

MEZZANINE BEAM B.



$$M_x (\text{FACTORED}) = \left[\frac{(1.89 \times 1.4) + (8.50 \times 1.6)}{8} \right] \times 6.3^2 = 80.60 \text{ kNm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{6300}{360} = 17.5 \text{ mm}$$

$$\therefore I \text{ REQ'D} = \frac{5 \times 8.50 \times 6.3^4 \times 10^5}{384 \times 205 \times 17.5} = 4860 \text{ cm}^4$$

$$\text{TRY } 356 \times 171 \times 45 \text{ UB (S355)} \quad L_E = 0.85 \times 6.3 = 5.36 \text{ m.}$$

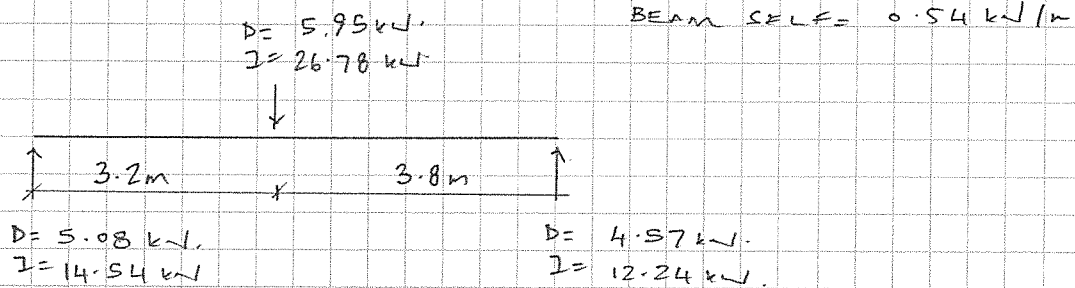
$$M_c = 275 \text{ kNm} \quad \frac{M_b}{M_L} = \frac{96.33}{0.925} = 104.14 \text{ kNm}$$

$$I_{yy} = 12070 \text{ cm}^4 > 4860 \text{ cm}^4$$

$\therefore 356 \times 171 \times 45 \text{ UB (S355) IS SATISFACTORY}$

PROJECT:

MEZZANINE BEAM C



FACTORED MOMENT = 93.40 kNm $L_E = 3.8m$

TRY 380 x 100 PFC (S355)

$M_c = 321 \text{ kNm}$ $\frac{M_b}{M_c} = \frac{148.92}{0.61} = 244.13 \text{ kNm}$

DEFLECTION (IMP) = 6.15 mm $< \frac{7000}{360} = 19.44 \text{ mm}$

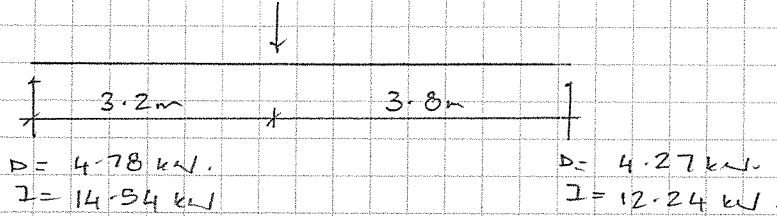
∴ 380 x 100 PFC (S355) IS SATISFACTORY

PROJECT:

MEZZANINE BEAM D.

BEAM SELF = 0.45 kN/m

$D = 5.95 \text{ kN}$
 $I = 26.78 \text{ kN}$



FACTORED MOMENT = 92.66 kNm $LE = 3.8 \text{ m}$

TRY $356 \times 171 \times 45 \text{ UB (S355)}$

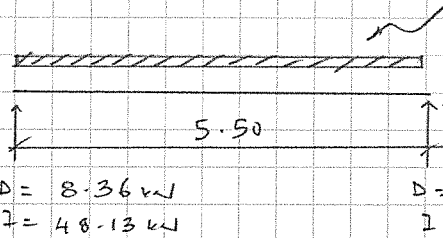
$M_C = 274 \text{ kNm}$ $M_B = 143.75 \text{ kNm}$

DEFLECTION (IMP) = 7.66 mm $< \frac{7000}{360} = 19.44 \text{ mm}$

$\therefore 356 \times 171 \times 45 \text{ UB (S355) IS SATISFACTORY}$

PROJECT:

MEZZANINE BEAM E



BEAM SELF = 0.40 kN/m
FLOOR (1) = 2.66 kN/m
FLOOR (2) = 17.50 kN/m

$$M_x (\text{FACTORED}) = \left[\frac{(3.04 \times 1.4) + (17.50 \times 1.6)}{8} \right] \times 5.5^2 = 121.97 \text{ kNm}$$

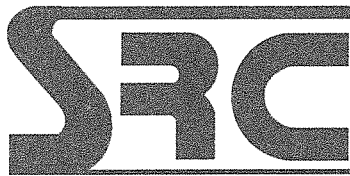
$$L_E = 0.85 \times 5.5 = 4.68 \text{ m} \quad \therefore \text{TRY } 356 \times 171 \times 45 \text{ UB (S355)}$$

$$M_C = 275 \text{ kNm} \quad \frac{M_B}{M_C} = \frac{113.92}{0.925} = 123.16 \text{ kNm}$$

$$\text{DEFLECTION (IMP)} = \frac{5 \times 17.5 \times 5.5^4 \times 10^5}{384 \times 205 \times 12070} = 8.43 \text{ mm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{5500}{360} = 15.28 \text{ mm}$$

$\therefore 356 \times 171 \times 45 \text{ UB (S355) IS SATISFACTORY}$



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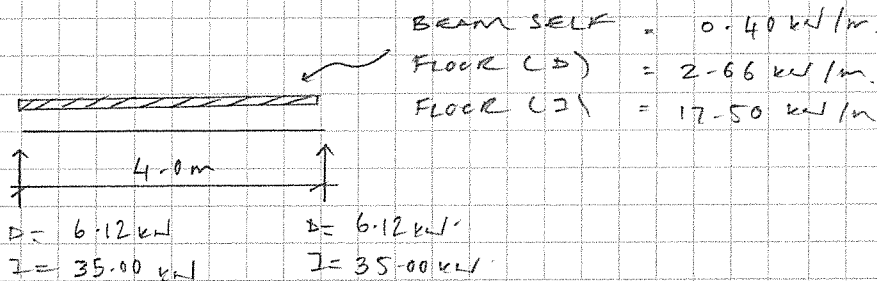
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PROJECT:

MEZZANINE BEAM F.



$$M_x (\text{FACTORED}) = \left[\frac{(3.06 \times 1.4) + (17.50 \times 1.6)}{8} \right] \times 4.0^2 = 64.51 \text{ kNm}$$

$$L_e = 0.85 \times 4.0 = 3.40 \text{ m} \therefore \text{TRY } 254 \times 146 \times 31 \text{ UB (S355)}$$

$$M_c = 140 \text{ kNm} \quad \frac{M_b}{M_c} = \frac{75.5}{0.925} = 81.62 \text{ kNm} \quad \checkmark$$

$$\text{DEFLECTION (IMP)} = \frac{5 \times 17.50 \times 4.0^4 \times 10^5}{384 \times 205 \times 4413} = 6.45 \text{ mm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{4000}{360} = 11.11 \text{ mm}$$

$\therefore 254 \times 146 \times 31 \text{ UB (S355) IS SATISFACTORY}$

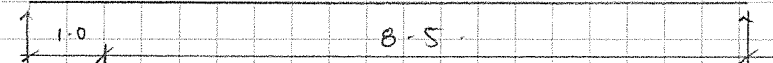
PROJECT:

MEZZANINE BEAM G

BEAM SELF = 0.80 kN/m

$P = 4.78 \text{ kN}$
 $J = 14.54 \text{ kN}$
FLOOR (D) = 3.80
FLOOR (Z) = 25.00

FLOOR (D) = 5.32 kN/m
FLOOR (Z) = 35.00 kN/m



$D = 32.82 \text{ kN}$
 $Z = 169.79 \text{ kN}$

$D = 30.41 \text{ kN}$
 $Z = 167.25 \text{ kN}$

$M_x (\text{FA COLUMNS}) = 741.90 \text{ kNm}$ FULLY RESTRAINED BY FLOOR

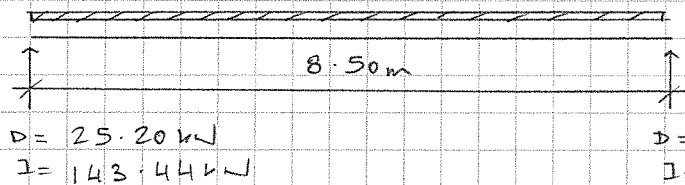
TRY $610 \times 229 \times 101 \text{ UB (S355)}$ $M_c = 1023 \text{ kNm}$ ✓

DEFLECTION (IMP) = $24.23 \text{ mm} < \frac{9500}{360} = 26.39 \text{ mm}$

$\therefore 610 \times 229 \times 101 \text{ UB (S355) IS SATISFACTORY}$

PROJECT:

MEZZANINE BEAM H



BEAM SELF = 0.80 kN/m
FLOOR (1) = 5.13 kN/m
FLOOR (2) = 33.75 kN/m

$$M_x (\text{FACTORED}) = \left[\frac{(5.93 \times 1.4) + (33.75 \times 1.6)}{8} \right] \times 8.5^2 = 559.77 \text{ kNm}$$

FULLY RESTRAINED BY FLOOR CONSTRUCTION

$$\text{ALLOWABLE DEFLECTION} = \frac{8500}{360} = 23.61 \text{ mm}$$

$$\therefore I_{REQD} = \frac{5 \times 33.75 \times 8.5^4 \times 10^5}{384 \times 205 \times 23.61} = 47396 \text{ cm}^4$$

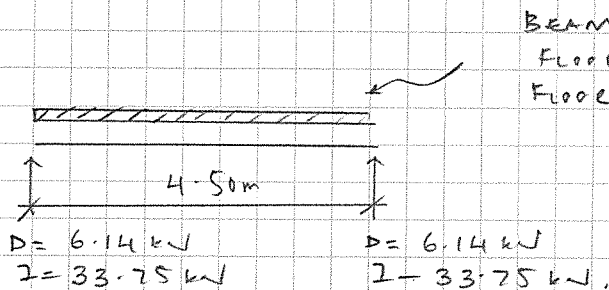
TRY 533 x 210 x 92 UB (S355)

$$I_{xx} = 55230 \text{ cm}^4 \quad \checkmark \quad M_c = 838 \text{ kNm} \quad \checkmark$$

$\therefore$ 533 x 210 x 92 UB (S355) IS SATISFACTORY

PROJECT:

MEZZANINE BEAM 3.



BEAM SELF = 0.45 kN/m
FLOOR (D) = 2.28 kN/m
FLOOR (2) = 15.00 kN/m

$$M_x (\text{FACTORED}) = \left[\frac{(2.73 \times 1.4) + (15.00 \times 1.6)}{8} \right] \times 4.5^2 = 70.42 \text{ kNm}$$

FULLY RESTRAINED BY FLOOR CONSTRUCTION

$$\therefore \text{TRY } 254 \times 146 \times 31 \text{ MB (S355)} \quad M_c = 140 \text{ kNm}$$

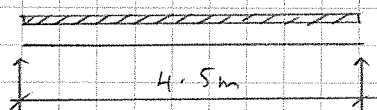
$$\text{DEFLECTION (IMP)} = \frac{5 \times 15.0 \times 4.5^4 \times 10^5}{384 \times 205 \times 4413} = 8.85 \text{ mm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{4500}{360} = 12.50 \text{ mm}$$

$\therefore 254 \times 146 \times 31 \text{ MB (S355) IS SATISFACTORY}$

PROJECT:

MEZZANINE BEAM K



$$D = 1.53 \text{ kN} \\ Z = 5.63 \text{ kN}$$

$$D = 1.53 \text{ kN} \\ Z = 5.63 \text{ kN}$$

$$\begin{aligned} \text{BEAM SELF} &= 0.30 \text{ kN/m} \\ \text{FLOOR (A)} &= 0.38 \text{ kN/m} \\ \text{FLOOR (Z)} &= 2.50 \text{ kN/m} \end{aligned}$$

$$M_x (\text{FACTORED}) = \frac{[(0.68 \times 1.4) + (2.50 \times 4.6)] \times 4.5^2}{8} = 12.53 \text{ kNm}$$

$$L_E = 0.85 \times 4.5 \text{ m} = 3.825 \text{ m}$$

$$\therefore \text{Try } 254 \times 146 \times 31 \text{ kg (S355)}$$

$$M_c = 140 \text{ kNm}$$

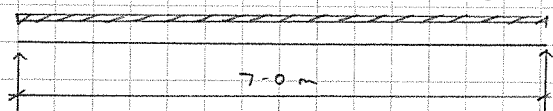
$$M_b = 66.73 \text{ kNm}$$

$$\text{DEFLECTION (IMP)} = \frac{5 \times 2.5 \times 4.5^4 \times 10^5}{384 \times 205 \times 4413} = 1.48 \text{ mm}$$

$$\therefore \underline{254 \times 146 \times 31 \text{ kg (S355) IS SATISFACTORY}}$$

PROJECT:

RAFTER 1



$$\begin{aligned} D &= 3.15 \text{ kN} \\ Z &= 4.20 \text{ kN} \\ W &= -4.20 \text{ kN} \end{aligned}$$

$$\begin{aligned} \text{BEAM SELF} &= 0.40 \text{ kN/m} \\ \text{ROOF (D)} &= 0.50 \text{ kN/m} \\ \text{ROOF (Z)} &= 1.20 \text{ kN/m} \\ \text{ROOF (W)} &= -1.20 \text{ kN/m} \end{aligned}$$

$$\begin{aligned} D &= 3.15 \text{ kN} \\ Z &= 4.20 \text{ kN} \\ W &= -4.20 \text{ kN} \end{aligned}$$

$$M_x (\text{FACTORED}) \text{ D+L} = \left[(0.90 \times 1.4) + (1.20 \times 1.6) \right] \times 7.0^2 / 8 = 19.48 \text{ kNm}$$

$$LE = 0.85 \times 7.0 = 5.95 \text{ m} \therefore 7 \text{ m} \quad 254 \times 146 \times 31 \text{ UB (S355)}$$

$$M_c = 140 \text{ kNm} \quad \frac{M_b}{M_c} = \frac{40.1}{0.925} = 43.35 \text{ kNm} \quad \checkmark$$

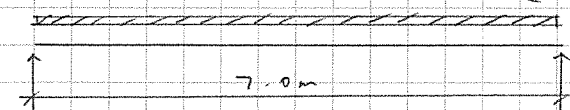
$$\text{DEFLECTION (IMP)} = \frac{5 \times 1.2 \times 7.0^4 \times 10^5}{384 \times 205 \times 4413} = 4.15 \text{ mm}$$

$\therefore 254 \times 146 \times 31 \text{ UB (S355) IS SATISFACTORY}$

PROJECT:

RAFTER 2

BEAM SELF = 0.40 kN/m
ROOF (D) = 1.19 kN/m
ROOF (J) = 2.85 kN/m
ROOF (W) = -2.85 kN/m



D = 5.57 kN
I = 9.98 kN
W = -9.98 kN

D = 5.57 kN
I = 9.98 kN
W = -9.98 kN

$$M_x (\text{FACTORED}) \text{ D+I} = \left[\frac{(1.59 \times 1.4) + (2.85 \times 1.6)}{8} \right] \times 7.0^2 = 41.56 \text{ kNm}$$

$$LE = 0.85 \times 7.0 = 5.95 \text{ m} \therefore \text{70y } 305 \times 165 \times 40 \text{ UB (S355)}$$

$$M_c = 22.1 \text{ kNm} \quad M_b = 71.7 \text{ kNm}$$

$$\text{DEFLECTION (IMP)} = \frac{5 \times 2.85 \times 7.0^4 \times 10^5}{384 \times 205 \times 8503} = 5.11 \text{ mm}$$

$\therefore 305 \times 165 \times 40 \text{ UB (S355) IS SATISFACTORY}$



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Project No. 56818

Sheet No. 30

Rev.

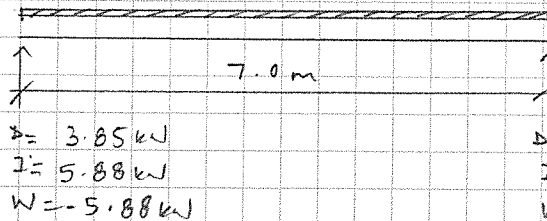
Date

MARCH '19

Designer

PROJECT:

RAFTER 3.



BEAM SELF = 0.40 kN/m
ROOF (D) = 0.70 kN/m
ROOF (J) = 1.68 kN/m
ROOF (W) = 1.68 kN/m

$$M_{\text{FACTORED}} \quad D+I = \left[\frac{(1.1 \times 1.4) + (1.68 \times 1.6)}{8} \right] \times 7.0^2 = 25.90 \text{ kNm}$$

$$L_E = 0.85 \times 7.0 = 5.95 \text{ m} \quad \therefore \text{TRY } 254 \times 146 \times 31 \text{ UB (S355)}$$

$$M_C = 140 \text{ kNm} \quad \frac{M_b}{M_{L2}} = \frac{40.1}{0.925} = 43.35 \text{ kNm}$$

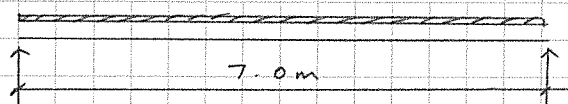
$$\text{DEFLECTION (IMP)} = \frac{5 \times 1.68 \times 7.0^4 \times 10^5}{384 \times 205 \times 4413} = 5.81 \text{ mm}$$

$\therefore 254 \times 146 \times 31 \text{ UB (S355) IS SATISFACTORY}$

PROJECT:

RAFTER 4.

BEAM SELF = 0.40 kN/m
ROOF (D) = 1.47 kN/m
ROOF (Z) = 3.53 kN/m
ROOF (W) = -3.53 kN/m



$D = 6.55 \text{ kN}$

$Z = 12.36 \text{ kN}$

$W = -12.36 \text{ kN}$

$D = 6.55 \text{ kN}$

$Z = 12.36 \text{ kN}$

$W = -12.36 \text{ kN}$

$$M_x (\text{factored}) \text{ D+I} = \left[\frac{(1.87 \times 1.4) + (3.53 \times 1.6)}{8} \right] \times 7.0^2 = 50.63 \text{ kNm}$$

$L_e = 0.85 \times 7.0 = 5.95 \text{ m} \quad \therefore \text{try } 305 \times 165 \times 40 \text{ UB (S355)}$

$M_c = 221 \text{ kNm}$

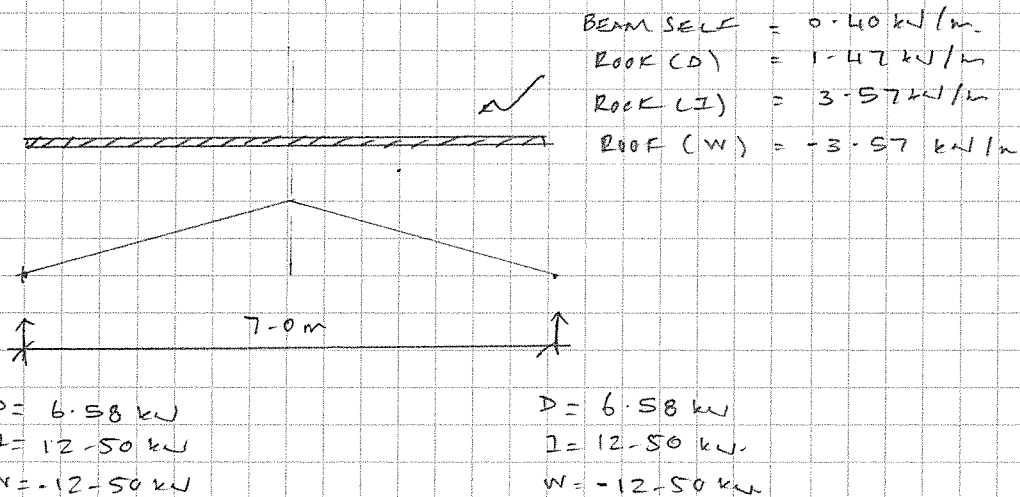
$M_b = 71.7 \text{ kNm}$

DEFLECTION (IMP) = $\frac{5 \times 3.53 \times 7.0^4 \times 10^5}{384 \times 205 \times 8503} = 6.33 \text{ mm}$

$\therefore 305 \times 165 \times 40 \text{ UB (S355)} \text{ IS SATISFACTORY}$

PROJECT:

CRANKED RAFTER 5



FACTORED MOMENT (D+L) = 51.10 kNm

L_E = 7.0m ∴ TRY 305 > 165 > 400B (S355)

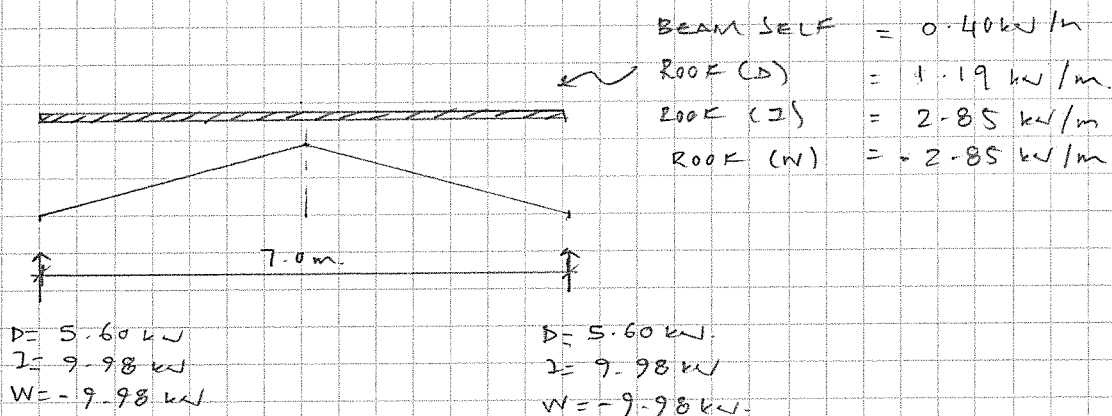
M_c = 221 kNm M_b = 60.0 kNm ✓

DEFLECTION @ RIDGE (IMP) = 6.63 mm

∴ 305 > 165 > 400B (S355) IS SATISFACTORY

PROJECT:

CRANKED RAFTER 6.



FACTORED MOMENT = 41.64 kNm

LE = 7.0m $\therefore$ 70Y 305 $\times$ 165 $\times$ 40 NB (S355)

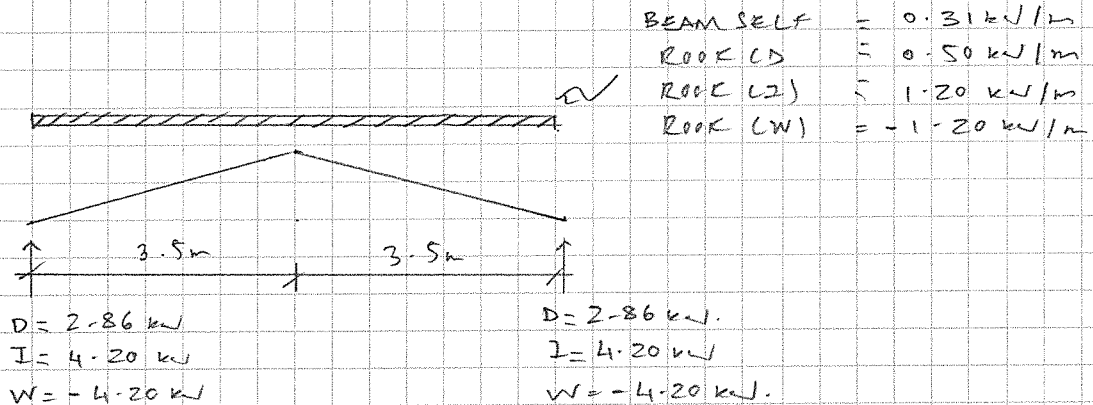
MC = 22.1 kNm MB = 60.0 kNm

DEFLECTION @ RIDGE (IMP) = 5.29 mm

$\therefore$ 305 $\times$ 165 $\times$ 40 NB (S355) IS SATISFACTORY

PROJECT:

CRANKED RAFTER 7



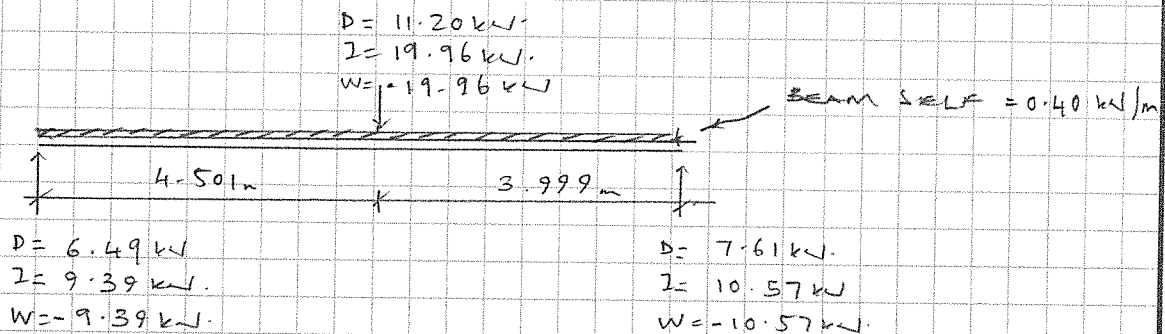
Factored Moment = 18.76 kNm

LE = 7.0m $\therefore$ TRY 254x146x31kg (S355)

MC = 140 kNm Mb = 33.8 kNm

DEFLECTION @ RIDGE (MP) = 4.29 mm

$\therefore$ 254x146x31kg (S355) IS SATISFACTORY

PROJECT:RAFTER SUPPORT BEAM 8

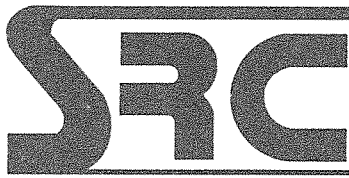
$$M_x (\text{FACTORED}) = 105.81 \text{ kNm} \quad L_e = 4.501 \text{ m}$$

$$\text{TRY } 305 \times 165 \times 40 \text{ UB (S355)}$$

$$M_c = 221 \text{ kNm} \quad M_b = 113 \text{ kNm} \quad \sqrt{0.4}$$

$$\text{DEFLECTION (IMP)} = 14.58 \text{ mm} < \frac{8500}{360} = 23.61 \text{ mm}$$

$$\therefore 305 \times 165 \times 40 \text{ UB (S355)} \text{ IS SATISFACTORY}$$



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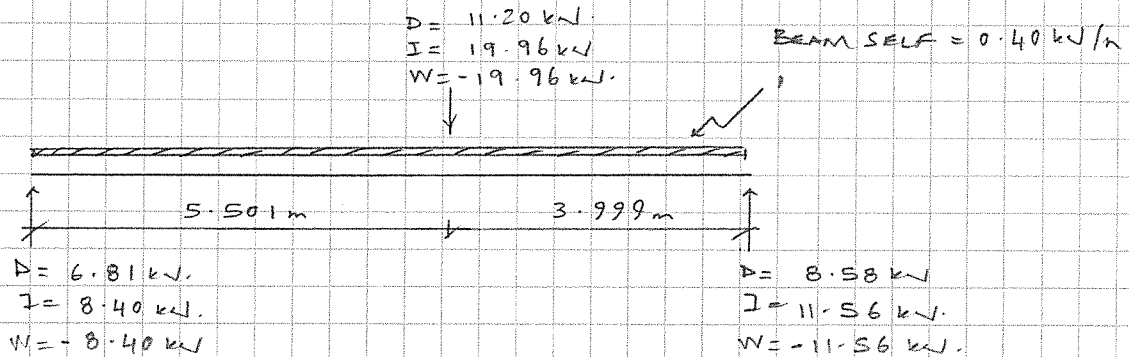
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Project No.	36818	
Sheet No.	36	Rev.
Date	March '19	
Designer		

PROJECT:

RAFTER SUPPORT BEAM 9.



$$M_x (\text{FACTORED}) = 116.34 \text{ kNm} \quad L_E = 5.501 \text{ m}$$

TRY $356 \times 171 \times 45 \text{ UB (S355)}$

$$M_C = 275 \text{ kNm}$$

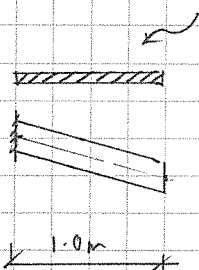
$$\frac{M_b}{M_{Cv}} = \frac{92.35}{0.614} = 150.41 \text{ kNm}$$

$$\text{DEFLECTION (IMP)} = 13.94 \text{ mm} < \frac{9500}{360} = 26.39 \text{ mm}$$

$\therefore 356 \times 171 \times 45 \text{ UB (S355)} \text{ IS SATISFACTORY}$

PROJECT:

RAFTER 10.

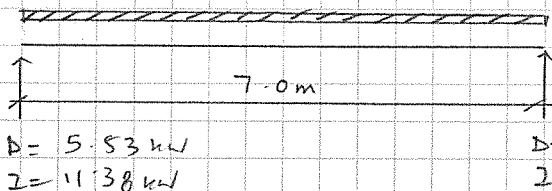


RAFTER SELF = 0.25 kJ/m.
ROOF (D) = 1.45 kJ/m
ROOF (Z) = 3.48 kJ/m
ROOF (W) = -3.48 kJ/m

BY INSPECTION, USE 254 x 146 x 31 kg (SSSS)

PROJECT:

CHECK EXISTING GABLE RAFTERS



BEAM SELF = 0.23 kN/m
ROOF (CD) = 1.35 kN/m
ROOF (CJ) = 3.24 kN/m

$M_x (\text{FACTORED}) = \frac{[(1.58 \times 1.4) + (3.24 \times 1.6)] \times 7.0^2}{8} = 45.30 \text{ kNm}$

$L_E = 0.7 \times 7.0 = 4.90 \text{ m}$

CHECK 182x152x23 UC (S355)

$M_c = 60.5 \text{ kNm}$

$\frac{M_b}{M_{L1}} = \frac{38.11}{0.925} = 41.20 \text{ kNm} < 45.30 \text{ kNm}$

$\text{DEFLECTION (IMP)} = \frac{5 \times 3.24 \times 7.0^4 \times 10^5}{384 \times 205 \times 1250} = 39.53 \text{ mm}$

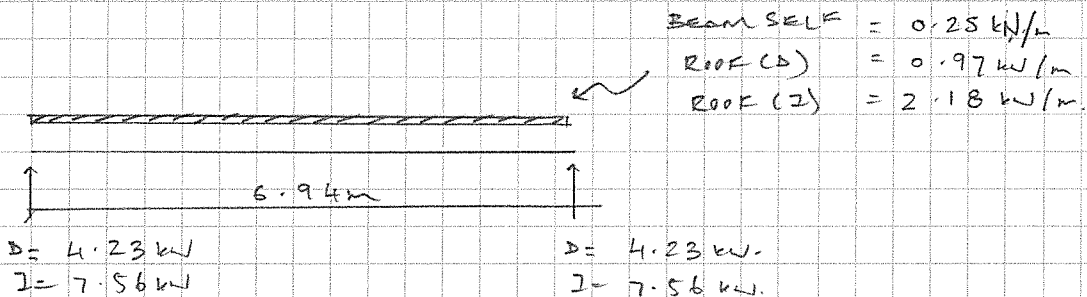
$\text{ALLOWABLE DEFLECTION} = \frac{7000}{250} = 28.0 \text{ mm} < 39.53 \text{ mm}$

∴ EXISTING RAFTER IS NOT SUITABLE FOR EXTRA LOAD

PROVIDE NEW PURLIN SUPPORT MEMBER

PROJECT:

NEW PURLIN SUPPORT MEMBER @ EXISTING GABLE END



$$M_u (\text{factored}) = \left[(1.22 \times 1.4) + (2.18 \times 1.6) \right] \times 6.94^2 = 31.28 \text{ kNm}$$

$$L_E = 0.85 \times 6.94 = 5.90 \text{ m} \quad \therefore \text{try } 152 \times 152 \times 30 \text{ uc (S355)}$$

$$M_C = 88.0 \text{ kNm}$$

$$M_B = 43.64 \text{ kNm}$$

$$\text{DEFLECTION (IMP)} = \frac{5 \times 2.18 \times 6.94^4 \times 10^5}{384 \times 205 \times 1748} = 18.37 \text{ mm}$$

$$\text{ALLOWABLE DEFLECTION} = \frac{6940}{250} = 27.76 \text{ mm}$$

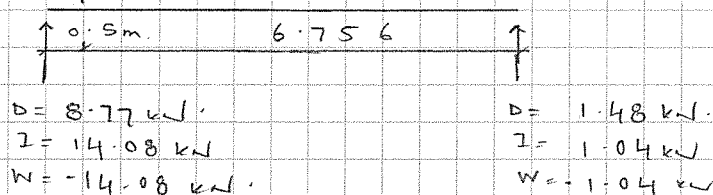
$\therefore 152 \times 152 \times 30 \text{ uc (S355) is SATISFACTORY}$

PROJECT:

RAFTER SUPPORT BEAM [NEW TO EXISTING]

$$\begin{aligned} D &= 8.46 \text{ kN} \\ Z &= 15.12 \text{ kN} \\ W &= -15.12 \text{ kN} \end{aligned}$$

BEAM SELF = 0.30 kN/m



$$\text{FACTORED MOMENT} = 17.36 \text{ kNm} \quad L_E = 7.256 \text{ m}$$

TRY. 203 x 133 x 25 UB (S355)

$$M_c = 91.48 \text{ kNm} \quad M_b = 21.83 \text{ kNm}$$

$$\text{DEFLECTION (IMP)} = 5.28 \text{ mm}$$

$\therefore$ 203 x 133 x 25 UB (S355) IS SATISFACTORY

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Job No.: 36818

Designer: M.A.S

Date: 14/03/2019

Registered Details:-

Tel:

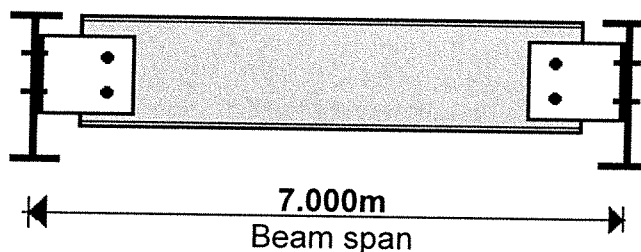
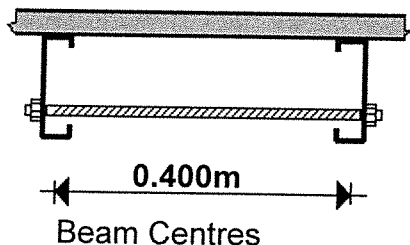
Fax:

Email:

Site:

Comment:

Mezzanine Floor-Inset Design



Dead load: 0.220 kN/m²

Service load: 0.350 kN/m²

Imposed load: 5.000 kN/m²

Deflection Limit: span/ 250 (28mm)

Section	Weight (kg/m)	Unfactored Load (def)	Ultimate Load	Cleat Thickness	Pass/ Fail
		Required Loads (kN/m²)			
		5.000	8.798		
		Load Capacities (kN/m²)			
302.M.20	7.86	5.393	13.357	4.0	Pass

Notes:-

1. Load capacities have been derived in accordance with the following documents:

1.1 BS 5950 - 5:1998 "Code of Practice for design of cold formed thin gauge sections".

1.2 Steel Construction Institute publication "Building design using cold formed steel sections - Worked Examples".

2. Load capacities are valid only when fixed in accordance with details shown in the current Technical Handbook.

3. Adequate torsional restraint is provided by 38mm minimum thickness flooring grade particle board fixed to the top flange of the C-Sections using appropriate self drilling, self tapping screws at a spacing not greater than 1150mm along the span.

Tie bars must be provided at mid span position as illustrated in the Technical Handbook.

4. All fixing bolts must be M16 dia., grade 8.8 complete with washer under head and nut.

5. Allowance for self weight of C-Sections is included.

MEZZANINE FLOOR JOISTS

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Job No.: 36818

Designer: MAS

Date: 14/03/2019

Registered Details:-

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15 High Street, Spalding,
Lincs, PE11 1TW

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Fax: 01775712635

Email: mark.shields@src ltd.com

Site:

Comment:

SIDE RAIL ENTERED DATA

SYSTEM TYPE :

Z Butt System

Dimensions & Limits

Span : 6.256 m

Centres : 1.800 m

Deflection Limit : Span / 150(42mm)

No. of Supports: 2

Cladding : Restraining

Design Loads in kN/m²

Cladding Weight: 0.125

Wind Pressure: 0.601

Wind Suction 0.481

SELECTED SIDE RAILS

Span No.	Reference	Weight (kg/m)	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	202.Z.14	3.82	0.841	0.673	1.225	1.225	0.601	0.755	Pass

SIDE RAILS [BUTTED]

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

Site:

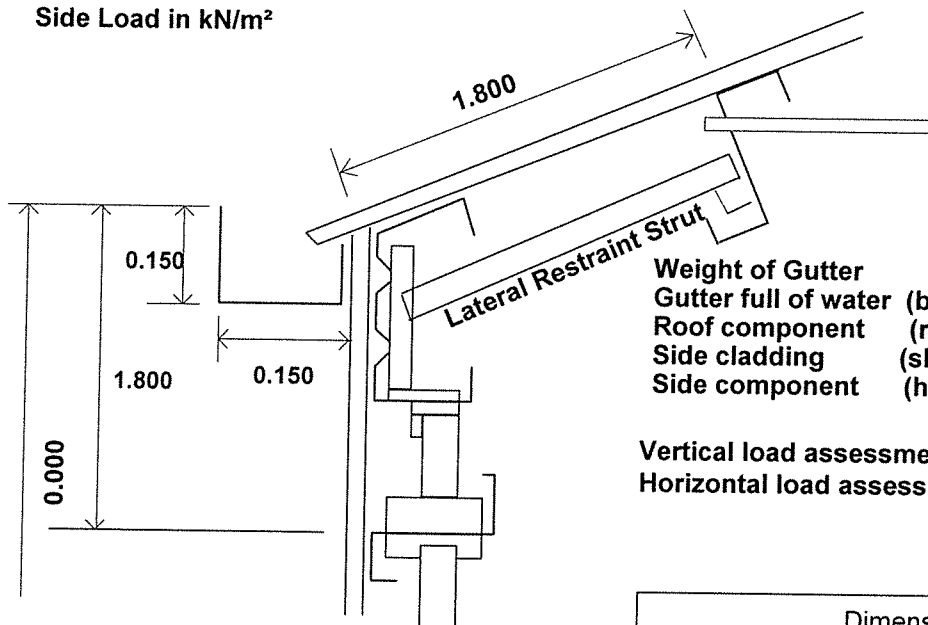
Comment:

EAVES BEAM SELECTION

NB: Dimensions in metres

Roof Load in kN/m²

Side Load in kN/m²



Working Loads
(kN/m)

Weight of Gutter	0.200
Gutter full of water (b x d x 10)	0.225
Roof component (roof load x 0.5 z)	0.738
Side cladding (sheet weight x height)	0.000
Side component (horz. wind load x 0.5 y)	0.540

Vertical load assessment (A + B + C + D) = 1.163

Horizontal load assessment (H) = 0.540

Dimensions & limits

Design loads in kN/m

Vertical load : 1.163

Horizontal load : 0.540

Span : 7.256 m

No. lateral struts : 2

Deflection limit : Span / 200 (36mm)

Eaves Section reference	Weight (kg/m)	No. of lateral struts	Load to capacity ratios			
			Ultimate Bi-Axial Bending	Vertical deflection check	Vertical shear check	Pass or Fail
			Combined			
230.E.20	6.83	2	0.559	0.813	0.204	Pass

EAVES BEAM

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Job No.: 36818

Designer: MAS

Date: 14/03/2019

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SIDE RAIL ENTERED DATA

SYSTEM TYPE :

Z Sleeved System

Dimensions & Limits

Design Loads in kN/m²

Span : 7.000 m

Cladding Weight: 0.125

Centres : 1.800 m

Wind Pressure: 0.601

Deflection Limit : Span / 150(47mm)

Wind Suction 0.481

No. of Supports: 2

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight (kg/m)	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	172.Z.14	3.49	0.841	0.673	1.086	1.086	0.601	0.781	Pass

GABLE RAILS. (SLEEVED)

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

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Site:

Comment:

SIDE RAIL ENTERED DATA

SYSTEM TYPE :

Z Butt System

Dimensions & Limits

Design Loads in kN/m²

Span : 7.000 m

Cladding Weight: 0.125

Centres : 1.800 m

Wind Pressure: 0.601

Deflection Limit : Span / 150(47mm)

Wind Suction 0.481

No. of Supports: 2

Cladding : Restraining

SELECTED SIDE RAILS

Span No.	Reference	Weight (kg/m)	Factored Loads (kN/m ²)		Capacities (kN/m ²)		Unfactored Load (defln)	Deflection Capacity (kN/m ²)	Pass / Fail
			Pressure	Suction	Pressure	Suction			
1	202.Z.16	4.35	0.841	0.673	1.216	1.216	0.601	0.613	Pass

GABLE RAILS (BUTTED)

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

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Job No.: 36818

Designer: MAS

Date: 14/03/2019

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Fax: 01775712635

Email: mark.shields@src Ltd.com

Site:

Comment:

PURLIN SELECTION

Z PURLIN SYSTEM TYPE: SLEEVED

METAL CLADDING

Dimensions & Limits

Span: 7.256 m

Centres: 1.800 m

Deflection Limit: Span/ 180

Roof Slope: 15.0 deg.

Design Loads in kN/m²

Dead Load : 0.120

Service Load : 0.100

Super Load : 0.600

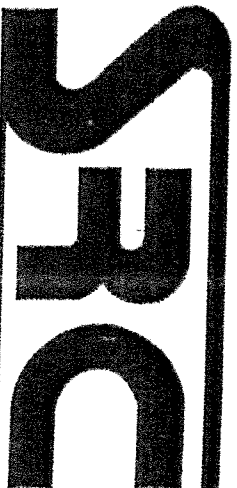
Wind Uplift Load : 0.601

SELECTED PURLINS

Section		Pass			Unfactored load for deflection	Ultimate download	Ultimate wind uplift
Required Loads in kN/m² :					0.820	1.268	0.721
Capacity Loads in kN/m² :							
Section Reference	Weight in kg/m	Restraint					
202.Z.15	4.09	1 Sags			0.875	1.360	1.413

The above values assume that the cladding panel or liner tray is screw fixed to the section(s) at a maximum spacing of 600mm.

Roof PURLINS



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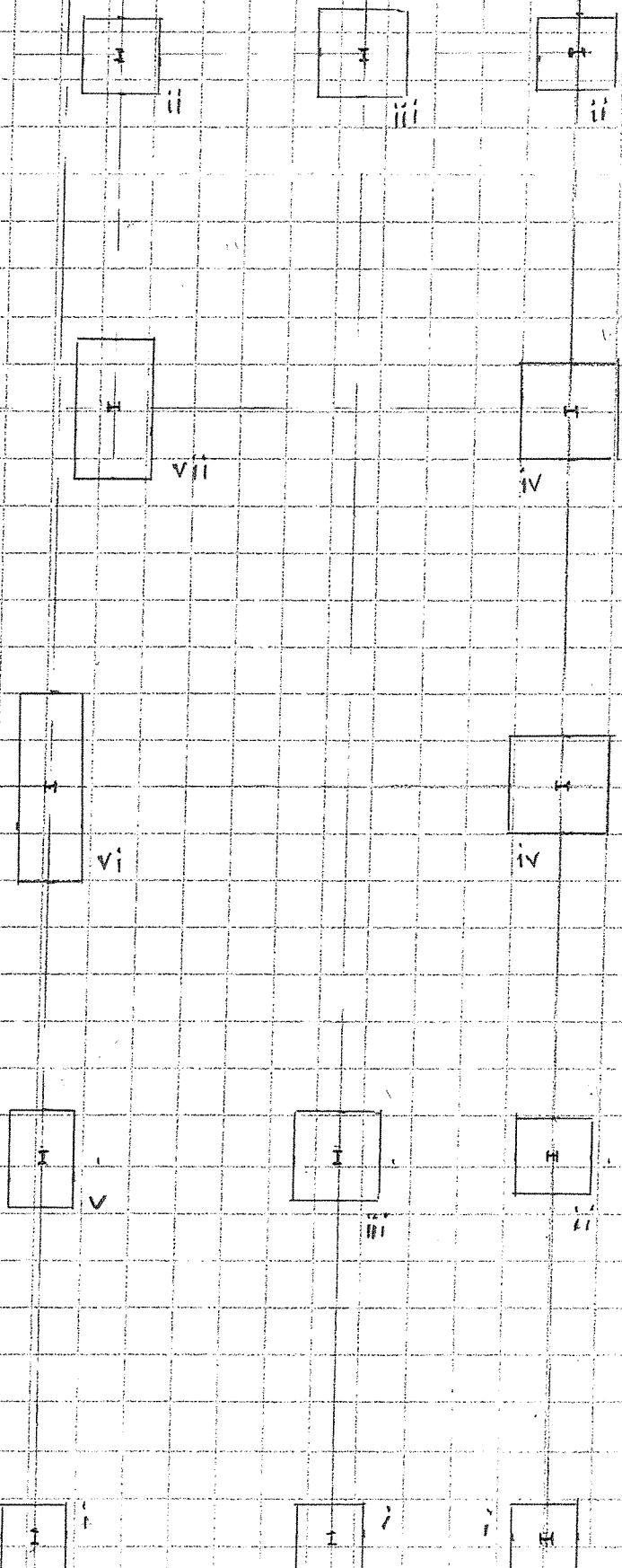
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Rev.

Date March '19

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i	1.2 x 1.2 x 0.5
ii	1.4 x 1.4 x 0.5
iii	1.6 x 1.6 x 0.5
iv	1.8 x 1.8 x 0.5
v	1.8 x 1.2 x 0.5
vi	3.5 x 1.2 x 0.5
vii	2.5 x 1.4 x 0.5

2 LAYERS OF B39S MESH IN BOTTOM
75mm COVER
C28/35 CONCRETE IN BOTTOM

PROJECT:

PAD FOUNDATION @ 7 / ADD A.

SUMMARY OF UNFACTORED FOUNDATION LOADS

D + I = $\downarrow 74 \text{ kN}$.

TRY BASE SIZE. $1.4 \times 1.4 \times 0.5$.

SELF WT OF BASE = $1.4 \times 1.4 \times 0.5 \times 25 = 24.50 \text{ kN}$.

WT OF BACKFILL = $1.4 \times 1.4 \times 0.6 \times 18 = 21.17 \text{ kN}$
45.67 kN

TOTAL VERTICAL LOAD = $74 + 45.67 = 119.67 \text{ kN}$.

$\therefore P = \frac{119.67}{1.4 \times 1.4} = 61.06 \text{ kN/m}^2 \quad \checkmark$

$\therefore$ PROVIDE A $1.4 \times 1.4 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C28/35 CONCRETE

PROJECT:

PAD FOUNDATION Q 8 / ADJ A

SUMMARY OF UNFACTORED FOUNDATION LOADS

$$D+I = 114.83 \text{ kN.}$$

TRY BASE SIZE $1.6 \times 1.6 \times 0.5$.

$$\text{SELF WT OF BASE} = 1.6 \times 1.6 \times 0.5 \times 25 = 32.00 \text{ kN.}$$

$$\text{WT OF BACKFILL} = 1.6 \times 1.6 \times 0.6 \times 18 = 27.65 \text{ kN.}$$
$$\underline{59.65 \text{ kN.}}$$

$$\text{TOTAL VERTICAL LOAD} = 114.83 + 59.65 = 174.48 \text{ kN.}$$

$$P = \frac{174.48}{1.6 \times 1.6} = 68.16 \text{ kN/m}^2 \checkmark$$

PROVIDE A $1.6 \times 1.6 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C28/35 CONCRETE

PROJECT:

PAD FOUNDATION 9 / ADJ A

SUMMARY OF UNFACTORED FOUNDATION LOADS

$$D+I = \downarrow 59.58 \text{ kN} \quad \rightarrow = 8 \text{ kN}$$

$$\text{TRY BASE SIZE } 1.4 \times 1.4 \times 0.5$$

$$\text{SELF WT OF BASE} = 1.4 \times 1.4 \times 0.5 \times 25 = 24.50 \text{ kN}$$

$$\text{WT OF BACKFILL} = 1.4 \times 1.4 \times 0.6 \times 18 = 21.17 \text{ kN}$$

$$\underline{45.67 \text{ kN}}$$

$$\text{TOTAL VERTICAL LOAD} = 59.58 + 45.67 = 105.25 \text{ kN}$$

$$\text{MOMENT DUE TO HORIZONTAL THRUST} = 0.5 \times 8 = 4 \text{ kNm}$$

$$e = \frac{4}{105.25} = 0.04 \text{ m} < \frac{L}{6}$$

$$P = \frac{105.25}{1.4 \times 1.4} \times 1.16 > 0.04 = 62.90 \text{ kN/m}^2$$

\therefore PROVIDE A 1.4 x 1.4 x 0.5 PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C28/35 CONCRETE

PROJECT:

PAD FOUNDATION @ 3/7

SUMMARY OF UNFACTORED FOUNDATION LOADS

DEAD + IMP = 241.54 kN. ↓

TRY BASE SIZE 2.5 x 1.4 x 0.5.

SELF WT OF BASE = 2.5 x 1.4 x 0.5 x 25 = 43.75 kN.

WT OF BACKFILL = 2.5 x 1.4 x 0.6 x 18 = 37.80 kN.
81.55 kN.

TOTAL VERTICAL LOAD = 241.54 + 81.55 = 323.09 kN.

$P = \frac{323.09}{2.5 \times 1.4} = 92.31 \text{ kN/m}^2$ ✓

∴ PROVIDE A 2.5 x 1.4 x 0.5 PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C28/35 CONCRETE



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Project No. 36818

Sheet No. 52

Rev.

Date

MARCH '19

Designer

PROJECT:

PAD FOUNDATION A/B/9 & C/9

SUMMARY OF UNFACTORED FOUNDATION LOADS

DEAD + IMP $\downarrow = 201.53 \text{ kN} \rightarrow 18 \text{ kN}$

TRY BASE SIZE $1.8 \times 1.8 \times 0.6$

SELF WT OF BASE $= 1.8 \times 1.8 \times 0.5 \times 25 = 40.50 \text{ kN}$

WT OF BACKFILL $= 1.8 \times 1.8 \times 0.6 \times 18 = 34.99 \text{ kN}$
75.49 kN

TOTAL VERTICAL LOAD $= 201.53 + 75.49 = 277.02 \text{ kN}$

MOMENT DUE TO HORIZONTAL THRUST $= 0.5 \times 18 = 9 \text{ kNm}$

$e = \frac{9}{277.02} = 0.03 \text{ m}$

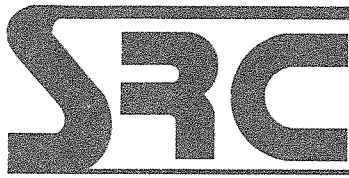
$P = \frac{277.02}{1.8 \times 1.8} \times \frac{1 \pm 0.03}{1.8} = 86.93 \text{ kN/m}^2 \checkmark$

$\therefore$ PROVIDE A $1.8 \times 1.8 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C28/35 CONCRETE



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Project No. 36818

Sheet No. 53

Rev.

Date MARCH '19

Designer

PROJECT:

PAD FOUNDATION @ C / 6.

SUMMARY OF UNFACTORED FOUNDATION LOADS

DEAD + IMP $\downarrow = 271.98 \text{ kN}$

TRY BASE SIZE $3.5 \times 1.2 \times 0.5$

SELF WT OF BASE $= 3.5 \times 1.2 \times 0.5 \times 25 = 52.50 \text{ kN}$

WT OF BACKFILL $= 3.5 \times 1.2 \times 0.6 \times 18 = 45.36 \text{ kN}$
 97.86 kN

TOTAL VERTICAL LOAD $= 271.98 + 97.86 = 369.84 \text{ kN}$

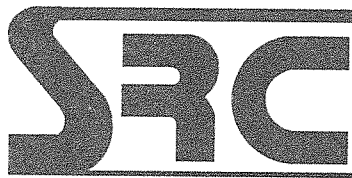
$P = \frac{369.84}{3.5 \times 1.2} = 88.06 \text{ kN/m}^2$

$\therefore$ PROVIDE A $3.5 \times 1.2 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER C28/35 CONCRETE



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Project No. 36818

Sheet No. 54

Rev.

Date

MARCH '19

Designer

PROJECT:

PAD FOUNDATION @ D/6.

SUMMARY OF UNFACTORED FOUNDATION LOADS

DEAD + IMP $\downarrow = 88 \text{ kN}$ $\rightarrow = 9 \text{ kN}$.

TRY BASE SIZE $1.8 \times 1.2 \times 0.5$

SELF WT OF BASE $= 1.8 \times 1.2 \times 0.5 \times 25 = 27.00 \text{ kN}$.

WT OF BACKFILL $= 1.8 \times 1.2 \times 0.6 \times 18 = 23.33 \text{ kN}$.
50.33 kN.

TOTAL VERTICAL LOAD $= 88 + 50.33 = 138.33 \text{ kN}$.

MOMENT DUE TO HORIZONTAL THRUST $= 0.5 \times 9 = 4.5 \text{ kNm}$

$e = \frac{4.5}{138.33} = 0.03 \text{ m} < \frac{L}{6}$

$P = \frac{138.33}{1.8 \times 1.2} \times \frac{1 \pm 6 \times 0.03}{1.2} = 73.65 \text{ kN/m}^2$

∴ PROVIDE A $1.8 \times 1.2 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS

OF A393 MESH IN THE BOTTOM

75mm COVER, C20/35 CONCRETE

PROJECT:

PAD FOUNDATION @ D/8.

SUMMARY OF UNFACTORED FOUNDATION LOADS

DEAD + IMP $\downarrow = 128.71 \text{ kN}$

TRY BASE SIZE $1.6 \times 1.6 \times 0.5$.

SELF WT OF BASE $= 1.6 \times 1.6 \times 0.5 \times 25 = 32.00 \text{ kN}$
WT OF BACKFILL $= 1.6 \times 1.6 \times 0.6 \times 18 = 27.65 \text{ kN}$
59.65 kN

TOTAL VERTICAL LOAD $= 128.71 + 59.65 = 188.36 \text{ kN}$.

$P = \frac{188.36}{1.6 \times 1.6} = 73.58 \text{ kN/m}^2$

$\therefore$ PROVIDE A $1.6 \times 1.6 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C28/35 CONCRETE

PROJECT:

PAD FOUNDATION @ D/9.

SUMMARY OF UNFACTORED FOUNDATION LOADS.

DEAD + IMP $\downarrow = 56 \text{ kN} \rightarrow 18 \text{ kN}$

TRY BASE SIZE $1.4 \times 1.4 \times 0.5$.

SELF WT OF BASE $= 1.4 \times 1.4 \times 0.5 \times 25 = 24.50 \text{ kN}$.

WT OF BACKFILL $= 1.4 \times 1.4 \times 0.6 \times 18 = 21.17 \text{ kN}$
 45.67 kN

TOTAL VERTICAL LOAD $= 56 + 45.67 = 101.67 \text{ kN}$.

MOMENT DUE TO HORIZONTAL THRUST $= 0.5 \times 18 = 9 \text{ kNm}$

$e = \frac{9}{101.67} = 0.09 \text{ m} = \frac{1}{6}$

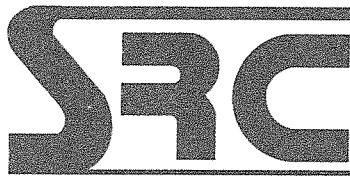
$P = \frac{101.67}{1.4 \times 1.4} \pm \frac{6 \times 0.09}{1.4} = 71.88 \text{ kN/m}^2$

$\therefore$ PROVIDE A $1.4 \times 1.4 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IN THE BOTTOM

75mm COVER, C20/35 CONCRETE



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PROJECT:

PAD FOUNDATION @ E/ 6, 8 & 9

SUMMARY OF UNFACTORED FOUNDATION LOADS

DEAD + IMP = 16 kN. $\rightarrow$ = 10 kN

TRY BASE SIZE $1.2 \times 1.2 \times 0.5$

SELF WT OF BASE = $1.2 \times 1.2 \times 0.5 \times 25 = 18.00 \text{ kN}$.

WT OF BACKFILL = $1.2 \times 1.2 \times 0.6 \times 18 = 15.55 \text{ kN}$.
33.55 kN.

TOTAL VERTICAL LOAD = $16 + 33.55 = 49.55 \text{ kN}$.

MOMENT DUE TO HORIZONTAL THRUST = $10 \times 0.5 = 5 \text{ kNm}$

$e = \frac{5}{49.55} = 0.10 \text{ m} < \frac{1}{6}$

$P = \frac{49.55}{1.2 \times 1.2} \times \frac{1 \pm 6 \times 0.10}{1.2} = 51.61 \text{ kN/m}^2$

$\therefore$ PROVIDE A $1.2 \times 1.2 \times 0.5$ PAD FOUNDATION

REINFORCED WITH 2 LAYERS OF

A393 MESH IS SATISFACTORY

25mm COVER, C20/35 CONCRETE

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JOB NO 36818
SHEET NO. 58
DATE MARCH '19
PREPARED. MAS

STRUCTURAL STEELWORK SPECIFICATION

Structural steel shall be to BS 4 and BS EN 10034 for hot rolled sections and to BS EN10210 and BS EN 10056 for hot rolled hollow sections and angles respectively.

Hot rolled sections shall normally be Grade S275 to BS EN 10025 except hollow sections which shall be Grade S275J2H or S355J2H to BS EN 10210 and shall be free from loose rust, scale and pitting and be truly straight and of uniform section throughout.

Mild steel bolts, nuts and lock nuts shall conform to BS EN 15048 (Black hexagon bolts) and BS 3692 (Precision hexagon bolts) or BS 4933 (Black cup and countersunk head bolts) as appropriate. Washers shall be in accordance with BS 4320.

Washers shall be provided to all bolted connections.

The threaded portion of each bolt shall project through the nut for at least one and a half thread.

Connections made with single bolts shall not be allowed except where specifically approved. Bracing connections shall be min. 2 bolts in line.

Welding shall be by Metal-Arc welding in accordance with BS EN 1011. All appropriate clauses of that standard shall be taken as incorporated therein.

Electrodes for Manual Metal-Arc welding shall be in accordance with BS EN 14341 and the shielding of gas is to comply with BS EN ISO 439.

Fabrication shall generally be in accordance with BS EN 1090-1, Execution Class 2, except buildings with overhead cranes which shall be class 3.

Fabrication & erection shall be in accordance with the National Structural Steelwork Specification (current edition).

When hot rolled sections are cut to length during fabrication, the cut length shall be inspected for evidence of weakness caused by internal laminations. Any pieces containing such laminations shall be discarded and shall not be used on the structure.

The erection of structural steelwork shall be in accordance with BS EN 1090.

During erection, the work shall be securely restrained by temporary bracings, strutting or fixings necessary to resist all erection forces, wind sway and temporary construction loads.

At no stage during transport, storage or erection shall any member be bent, deformed or subject to undue stress.

All steelwork permanently encapsulated in a cavity shall have either 2 coats of RIW primer or be hot dip galvsnised (min 85 μm , 610g/m²) to BS EN ISO 1461.

All steelwork permanently exposed to the environment shall have either a suitable 2 part epoxy paint or be grit blasted and hot dip galvsnised (min 140 μm , 1000g/m²) to BS EN ISO 1461.

FOUNDATION SPECIFICATION.

1. All strip / base foundations are to be placed within undisturbed natural strata at a depth to be agreed with the Building Inspector.
2. All topsoil and vegetation is to be stripped and removed from full building footprint.
3. It is the contractors responsibility to report any condition found on site during excavation which, in any way, may affect the present design (such as dubious ground, existing foundations , drains , trees, pits and shafts , etc.)
4. It is the contractors responsibility to determine the presence of sulphates or other deleterious material on site and to use an appropriately resistant cement.
5. A 50mm blinding layer of lean mix concrete should be placed into the bottom of foundation excavations as soon as is practical. Should surface / ground water enter the excavations prior to blinding with concrete, then the bottoms are to be reformed to the satisfaction of the engineer.
6. Reinforced concrete foundations to be minimum Grade C28/35 with a minimum O.P.C content of 300 Kg/m³ and a water cement ratio of 0.6
7. Mass concrete foundations to be Grade C25/30 with a minimum O.P.C. content of 275 Kg/m³, a maximum water cement ratio of 0.65 and 20mm nominal size aggregate.
8. Reinforcing bars (grade 460B), and Mesh Fabric to be High Yield Bar with a minimum yield strength of 460N/mm² in accordance with BS 4449, BS 4483 and BS 8666 respectively.
9. Minimum lap to reinforcing bars to be 40 times bar dia.
10. Minimum lap to mesh fabric to be 350mm.
11. All concrete to be compacted using an immersion vibrator to expell trapped air and form a consistent dense material.
12. No concrete to be poured if the ambient temperature is less than 5 degrees centigrade.