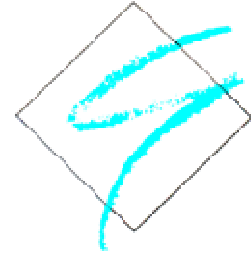


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**STRUCTURAL CALCULATIONS**

CLIENT: TRUE STEEL FRAMES

JOB ADDRESS: Dw. 1-2, 19-21 ALBION TERRACE, CAMPBELLTOWN

JOB NUMBER: 42559

DATE: FEB'21

ENGINEER: DJS

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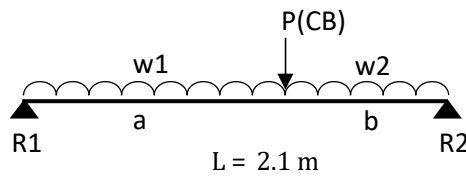
**Notes:**

1. Dead and live loads and load combinations to AS1170.0 and AS1170.1
2. Wind Loads to AS/NZS1170.2 & AS4055
3. Steelwork to AS4100



### BEAM B1

a = 1.7 m  
b = 0.4 m



### Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.20		
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	0.6 m	0.40 kPa	0.24	0.25 kPa	0.15
Floor	0.3 m	0.70 kPa	0.21	1.50 kPa	0.45

UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	0.6 m	0.40 kPa	0.24	0.25 kPa	0.15
Floor	0.3 m	0.70 kPa	0.21	1.50 kPa	0.45

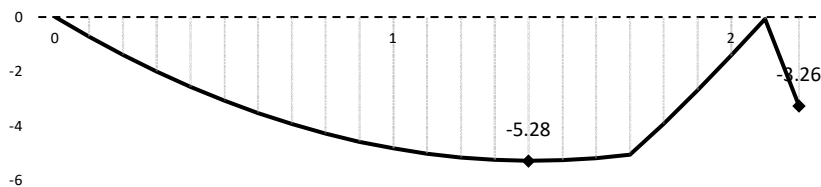
### Load combinations

	w1	w2	P		R1	R2
(W) DL	3.65	3.65	2.1	-->	4.3	5.6
(W) LL	0.60	0.60	5.6	-->	1.7	5.2
(U) 1.2DL+1.5LL	5.28	5.28	9.9	-->	7.5	13.6

TRY: TSF4510 (2TC & 2BC) (FLR)

### Check Strength

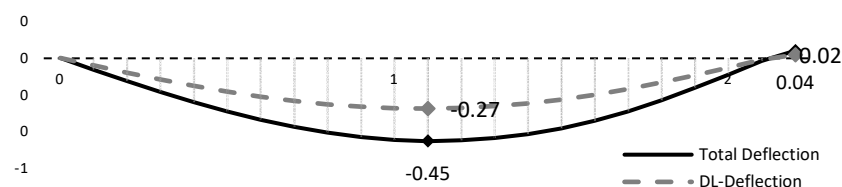
#### BMD



M\* = 5.28 kNm  
Moa =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi M_{sx}$  = 44.49 kNm :: OK

AS4100 - C5.6.1  
AS4100 - C5.6.1  
AS4100 - T5.6.1

### Check Deflection



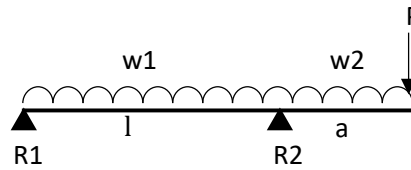
(~L / 4711)  
(~L / 7852)

USE: TSF4510 (2TC & 2BC)



### BEAM B2 - Option 1

l = 5.8 m  
a = 1.7 m  
L = 7.5 m



### Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.35		
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	2.9 m	0.40 kPa	1.16	0.25 kPa	0.73
Floor	1.1 m	1.00 kPa	1.05	1.50 kPa	1.58

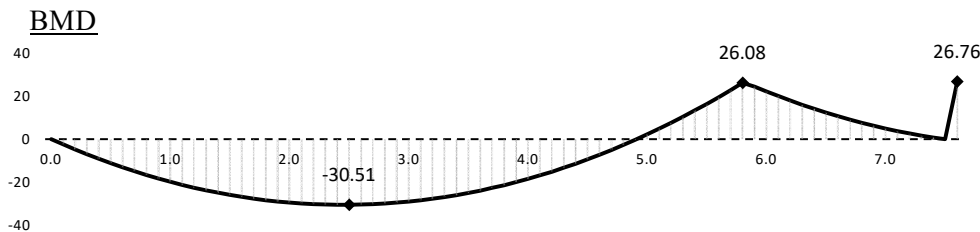
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	2.5 m	0.40 kPa	0.98	0.25 kPa	0.61
Floor	1.1 m	1.00 kPa	1.05	1.50 kPa	1.58

### Load Combinations

	w1 (kN/m)		w2 (kN/m)		P (kN)		R1 (kN)	R2 (kN)
Working LC1	DL	5.56	DL+LL	7.57	6.0	-->	12.6	38.6
Working LC2	DL+LL	7.86	DL	5.38	4.3	-->	20.3	38.9
Ultimate	1.2DL+1.5LL	10.12	1.2DL+1.5LL	9.74	7.5	-->	24.9	58.1

TRY: 250PFC (FLR)

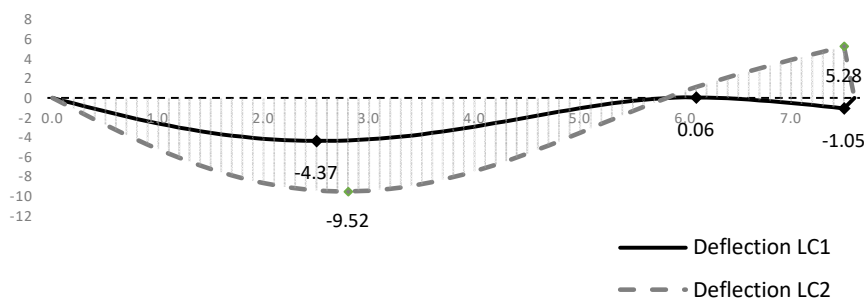
### Check Strength



M\* = 30.51 kNm  
-M\* = -26.08 kNm  
Moa =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi_{Msx}$  = 114.00 kNm :: OK

AS4100 - C5.6.1  
AS4100 - C5.6.1  
AS4100 - T5.6.1

### Check Deflection



LC1  
(~l / 1332)  
(~a / 1619)

LC2  
(~l / 611)  
(~a / 322)

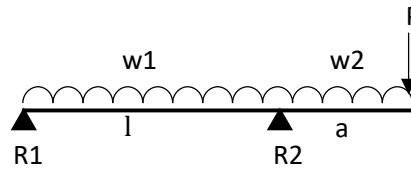
USE: 250PFC



### BEAM B2 - Option 2

SK9

l = 5.8 m  
a = 1.7 m  
L = 7.5 m



### Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.40		
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	2.9 m	0.40 kPa	1.16	0.25 kPa	0.73
Floor	1.1 m	1.00 kPa	1.05	1.50 kPa	1.58

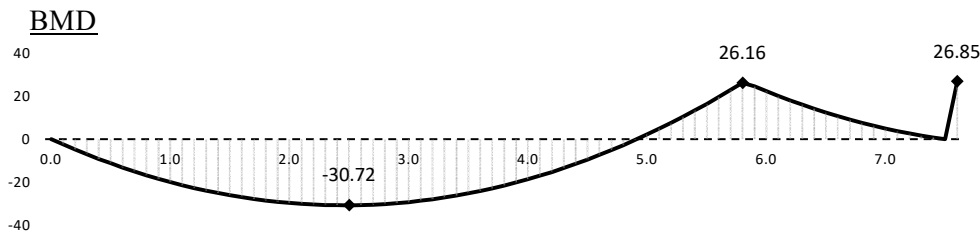
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	2.5 m	0.40 kPa	0.98	0.25 kPa	0.61
Floor	1.1 m	1.00 kPa	1.05	1.50 kPa	1.58

### Load Combinations

	w1 (kN/m)		w2 (kN/m)		P (kN)		R1 (kN)	R2 (kN)
Working LC1	DL	5.61	DL+LL	7.62	6.0	-->	12.7	38.9
Working LC2	DL+LL	7.91	DL	5.43	4.3	-->	20.4	39.1
Ultimate	1.2DL+1.5LL	10.18	1.2DL+1.5LL	9.80	7.5	-->	25.0	58.4

TRY: 2/TSF4510 (2TC & 2BC) (FLR)

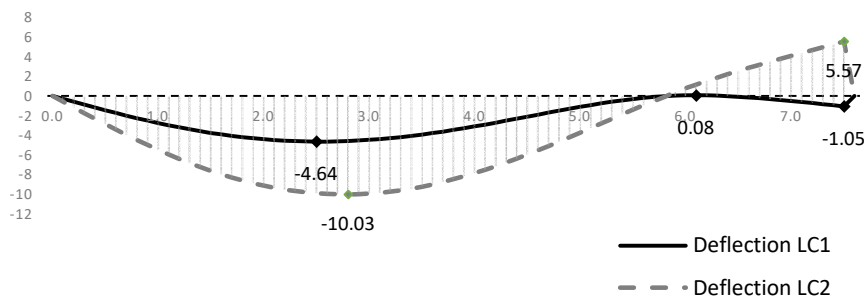
### Check Strength



M\* = 30.72 kNm  
-M\* = -26.16 kNm  
Moa =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi_{Msx}$  = 88.98 kNm :: OK

AS4100 - C5.6.1  
AS4100 - C5.6.1  
AS4100 - T5.6.1

### Check Deflection



LC1  
(~l / 1254)  
(~a / 1619)

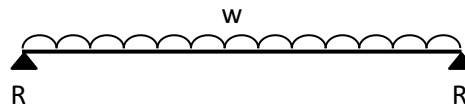
LC2  
(~l / 580)  
(~a / 305)

USE: 2/TSF4510 (2TC & 2BC)



### BEAM PF1

L = 3.7 m



### Loads

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.25		
Wall (HB)	3.3 m	1.00 kPa	3.25		
Roof (S)	2.1 m	0.40 kPa	0.84	0.25 kPa	0.53
Floor	0.3 m	1.00 kPa	0.30	1.50 kPa	0.45

### Load combinations

w = DL =	4.6 kN/m	-->	R =	8.6 kN
w = LL =	1.0 kN/m	-->	R =	1.8 kN
w* = 1.2DL + 1.5LL =	7.0 kN/m	-->	R* =	13.0 kN

TRY: 230PFC Le = 3.7 m

### Check Strength

M* =	12.03 kNm
M <sub>oa</sub> =	52.36 kNm
α <sub>s</sub> =	0.46
α <sub>m</sub> =	1.00
φM <sub>bx</sub> =	33.97 kNm :: OK

$M = 0.125wL^2$   
AS4100 - C5.6.1  
AS4100 - C5.6.1  
AS4100 - T5.6.1

### Check deflection

I <sub>x</sub> =	26.8 x 10 <sup>6</sup> mm <sup>4</sup>
Δ <sub>dl</sub> =	2.1 mm (~L / 1751)
Δ <sub>total</sub> =	2.6 mm (~L / 1447)

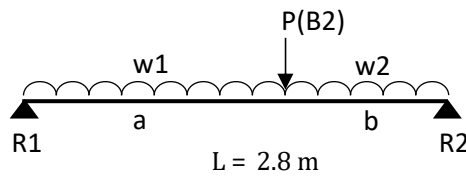
$$\Delta = \frac{5wL^4}{384EI}$$

USE: 230PFC



### BEAM PF2

a = 0.9 m  
b = 1.9 m



### Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.25		
Wall (HB)	1.0 m	1.00 kPa	1.00		
Roof (S)	0.6 m	0.40 kPa	0.24	0.25 kPa	0.15
Floor	0.0 m	0.70 kPa	0.00	1.50 kPa	0.00

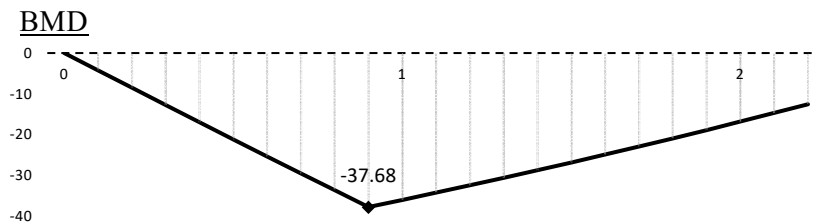
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	1.0 m	1.00 kPa	1.00		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	0.6 m	0.70 kPa	0.42	1.50 kPa	0.90

### Load combinations

	w1	w2	P		R1	R2
(W) DL	1.49	1.67	32.2	-->	23.9	12.8
(W) LL	0.15	0.90	13.2	-->	9.6	5.4
(U) 1.2DL+1.5LL	2.01	3.35	58.1	-->	42.8	23.4

TRY: 230PFC Le = 2.8 m

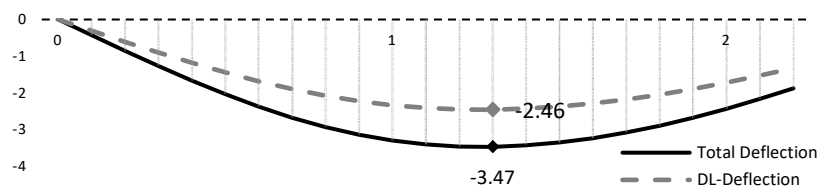
### Check Strength



M\* = 37.68 kNm  
Moa = 74.18 kNm  
 $\alpha_s$  = 0.57  
 $\alpha_m$  = 1.00  
 $\phi M_{bx}$  = 41.90 kNm :: OK

AS4100 - C5.6.1  
AS4100 - C5.6.1  
AS4100 - T5.6.1

### Check Deflection



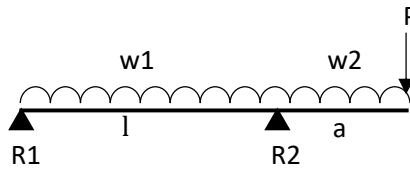
(~L / 795)  
(~L / 1122)

USE: 230PFC



### BEAM CB

l = 0.6 m  
a = 1.5 m  
L = 2.1 m



### Loads

UDL - w1			DL (kN/m)	LL (kN/m)
S/W	-	-	0.10	
Wall (Br.Vr)	0.0 m	2.40 kPa	0.00	
Roof (T)	0.0 m	1.00 kPa	0.00	0.25 kPa
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa

UDL - w2			DL (kN/m)	LL (kN/m)
Wall (LW)	0.4 m	0.40 kPa	0.16	
Roof (S)	0.9 m	0.40 kPa	0.35	0.25 kPa
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa

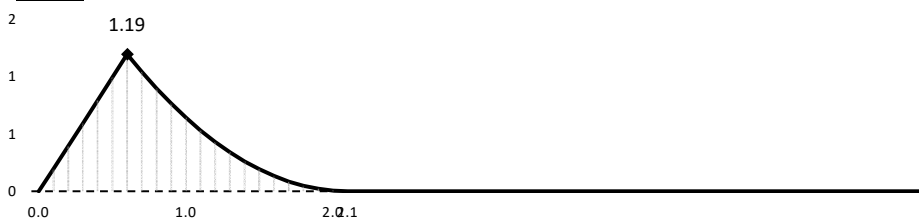
### Load Combinations

	w1 (kN/m)	w2 (kN/m)	P (kN)	R1 (kN)	R2 (kN)
Working	DL 0.10	DL 0.61	1.4	-4.6	7.0
Ultimate	1.2DL+1.5LL 0.12	1.2DL+1.5LL 1.06	0.0	-2.0	3.6

TRY: 150x50x3.0 RHS Le = 2.0 m

### Check Strength

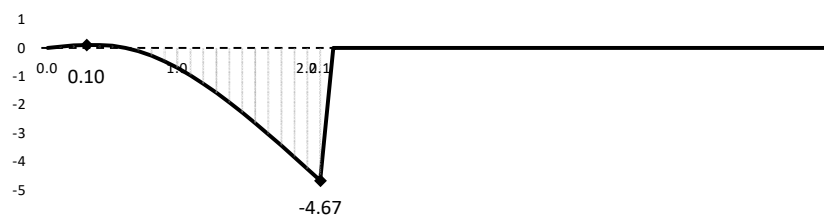
#### BMD



M\* = 0.00 kNm  
-M\* = -1.19 kNm  
Moa = 176.49 kNm  
 $\alpha_s$  = 0.98  
 $\alpha_m$  = 1.00  
 $\phi M_{bx}$  = 15.87 kNm :: OK

AS4100 - C5.6.1  
AS4100 - C5.6.1  
AS4100 - T5.6.1

### Check Deflection



(~l / 6000)  
(~a / 321)

USE: 150x50x3.0 RHS

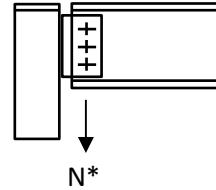


### COLUMN C1

Max height = 3.0 m

### Loads

$$\begin{aligned} N^* &= 44.00 \text{ kN} \\ N_e^* &= 44.00 \text{ kN} \\ M_e^* &= 7.15 \text{ kNm} \quad (e = 0.163 \text{ m}) \end{aligned}$$



TRY: 125x75x6.0 RHS

### Properties

$$\begin{aligned} \phi N_s &= 672.0 \text{ kN} \quad (\text{for } l_e = 3.0 \text{ m}) \\ \phi N_{cy} &= 312.0 \text{ kN} \\ \phi M_{sx} &= 26.5 \text{ kNm} \\ \phi M_{bx} &= 26.5 \text{ kNm} \end{aligned}$$

### Check section capacity

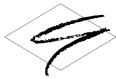
$$\frac{M_e^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.34 < 1.0, \text{ therefore OK}$$

### Check member capacity

$$\frac{M_e^*}{\phi M_b} + \frac{N^*}{\phi N_c} = 0.41 < 1.0, \text{ therefore OK}$$

USE: 125x75x6.0 RHS



**PORTAL FRAME PF1****1. Column C1**

Max height = 3.0 m  
 Nominate  $W_L^*$  = 10.0 kN  
 $\Rightarrow M^*$  (wind) = 15.0 kNm

Try 125x75x6.0 RHS

Eccentricity = 0.163 m  
 $N^*$  (DL) = 10.3 kN  
 $\Rightarrow M^*$  (e) = 1.7 kNm

$M^*$  (total) = 16.7 kNm

**Section Capacity**

$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.64$$

**Check member capacity**

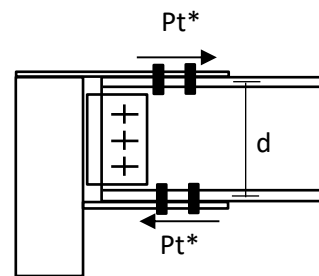
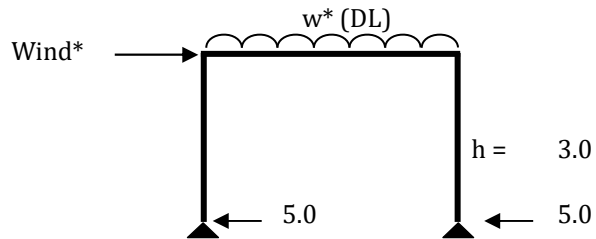
$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_c} = 0.66 \text{ (For } L_e = 3.0 \text{ m)}$$

USE: 125x75x6.0 RHS

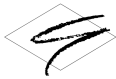
**2. Connection**

Design top & bottom bolts for wind

$d = 0.3 \text{ m}$   
 $P_t^* = M^* / d = 55.59 \text{ kN}$



$\Rightarrow$  USE 2M16 8.8/S

**PORTAL FRAME PF2****1. Column C1**

Max height = 3.0 m  
 Nominate WL\* = 10.0 kN  
 $\Rightarrow M^* (\text{wind}) = 15.0 \text{ kNm}$

Try 125x75x6.0 RHS

Eccentricity = 0.163 m  
 $N^* (\text{DL}) = 23.9 \text{ kN}$   
 $\Rightarrow M^* (e) = 3.9 \text{ kN/m}$   
 $M^* (\text{total}) = 18.9 \text{ kN/m}$

**Section Capacity**

$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.75$$

**Check member capacity**

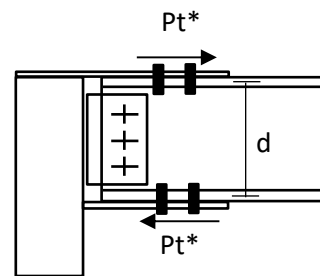
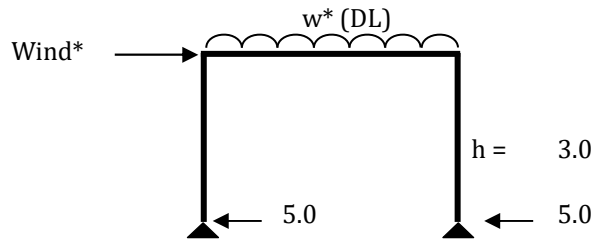
$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_c} = 0.79 \text{ (For } L_e = 3.0 \text{ m)}$$

USE: 125x75x6.0 RHS

**2. Connection**

Design top & bottom bolts for wind

$d = 0.3 \text{ m}$   
 $P_t^* = M^* / d = 62.95 \text{ kN}$



$\Rightarrow \text{USE } 2\text{M}16 \text{ 8.8/S}$

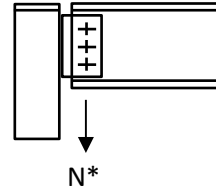


### COLUMN C2

Max height = 3.0 m

### Loads

$$\begin{aligned} N^* &= 25.00 \text{ kN} \\ N_e^* &= 25.00 \text{ kN} \\ M_e^* &= 3.61 \text{ kNm} \quad (e = 0.145 \text{ m}) \end{aligned}$$



TRY: 89x89x3.5 SHS

### Properties

$$\begin{aligned} \phi N_s &= 364.0 \text{ kN} \quad (\text{for } l_e = 3.0 \text{ m}) \\ \phi N_c &= 211.0 \text{ kN} \\ \phi M_{sx} &= 11.5 \text{ kNm} \\ \phi M_{bx} &= 11.5 \text{ kNm} \end{aligned}$$

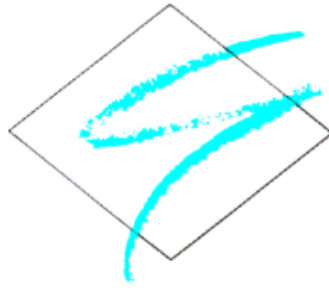
### Check section capacity

$$\frac{M_e^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.38 < 1.0, \text{ therefore OK}$$

### Check member capacity

$$\frac{M_e^*}{\phi M_b} + \frac{N^*}{\phi N_c} = 0.43 < 1.0, \text{ therefore OK}$$

USE: 89x89x3.5 SHS



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 Design: DJS  
 Date: Feb-21  
 Page:

### WIND BEAM (WB)

$$\text{Contributing Width (c/w)} = 3 \text{ m}$$

$$\text{Beam Span (L)} = 3.4 \text{ m}$$

$$L_e = 3.4 \text{ m}$$

$$\text{Wind Speed (Ws)} = 32 \text{ m/s}$$

$$q = [(Ws^2) \times 0.6] / 1000$$

$$= 0.61 \text{ kPa}$$

$$F_R = (0.7 + 0.5) \times q \times c/w$$

$$= 2.21 \text{ kN/m}$$

$$M_{(\text{working})} = (F_R \times L^2) / 8$$

$$= 3.20 \text{ kNm}$$

$$I_{\text{req}} = 1412680$$

$$= 1.4 \times 10^6 \text{ mm}^4$$

$$\text{Deflection Limit} = \frac{L}{250}$$

**USE: 89x89x4.0 SHS (C350)**