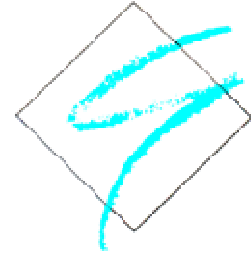


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**STRUCTURAL CALCULATIONS**

CLIENT: TRUE STEEL FRAMES

JOB ADDRESS: Dw. 4&5, 19-21 ALBION TERRACE, CAMPBELLTOWN

JOB NUMBER: 42559

DATE: FEB'21

ENGINEER: DJS

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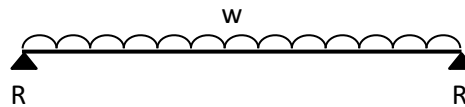
**Notes:**

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 B Porch.**

L = 2.5 m



**Loads**

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.10		
Wall (HB)	1.0 m	1.00 kPa	1.00		
Roof (S)	0.9 m	0.40 kPa	0.36	0.25 kPa	0.23
Floor	0.0 m	0.70 kPa	0.00	1.50 kPa	0.00

**Load combinations**

w = DL =	1.5 kN/m	-->	R =	1.8 kN
w = LL =	0.2 kN/m	-->	R =	0.3 kN
w* = 1.2DL + 1.5LL =	2.1 kN/m	-->	R* =	2.6 kN

TRY: TSF4510 (FLR)

**Check Strength**

M\* = 1.63 kNm  
M<sub>oa</sub> =  
α<sub>s</sub> =  
α<sub>m</sub> =  
φM<sub>sx</sub> = 22.25 kNm :: OK

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

**Check deflection**

I<sub>x</sub> = 10.7771 x 10<sup>6</sup> mm<sup>4</sup>  
Δ<sub>dl</sub> = 0.3 mm (~L / 7256)  
Δ<sub>total</sub> = 0.4 mm (~L / 6287)

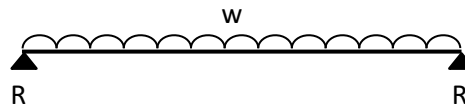
$$\Delta = \frac{5wL^4}{384EI}$$

USE: TSF4510



### BEAM B LIVING

L = 3.8 m



### Loads

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.10		
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	1.7 m	0.40 kPa	0.68	0.25 kPa	0.43
Floor	0.3 m	1.00 kPa	0.30	1.50 kPa	0.45

### Load combinations

w = DL =	4.1 kN/m	-->	R =	7.8 kN
w = LL =	0.9 kN/m	-->	R =	1.7 kN
w* = 1.2DL + 1.5LL =	6.2 kN/m	-->	R* =	11.8 kN

TRY: TSF4510 (FLR)

### Check Strength

M* =	11.21 kNm
M <sub>oa</sub> =	
α <sub>s</sub> =	
α <sub>m</sub> =	
φM <sub>sx</sub> =	22.25 kNm :: OK

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

### Check deflection

I <sub>x</sub> =	10.7771 x 10 <sup>6</sup> mm <sup>4</sup>
Δ <sub>dl</sub> =	5.1 mm (~L / 739)
Δ <sub>total</sub> =	6.2 mm (~L / 609)

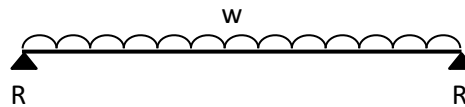
$$\Delta = \frac{5wL^4}{384EI}$$

USE: TSF4510



**BEAM B1**

L = 3.0 m



**Loads**

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.40		
Wall (HB)	0.0 m	1.00 kPa	0.00		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	3.6 m	1.00 kPa	3.56	1.50 kPa	5.34

**Load combinations**

w = DL =	4.0 kN/m	-->	R =	5.9 kN
w = LL =	5.3 kN/m	-->	R =	8.0 kN
w* = 1.2DL + 1.5LL =	12.8 kN/m	-->	R* =	19.1 kN

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

**Check Strength**

M\* = 14.36 kNm  
M<sub>oa</sub> =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi M_{sx}$  = 88.98 kNm :: OK

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

**Check deflection**

I<sub>x</sub> = 43.1083 x 10<sup>6</sup> mm<sup>4</sup>  
 $\Delta_{dl}$  = 0.5 mm (~L / 6193)  
 $\Delta_{total}$  = 1.1 mm (~L / 2637)

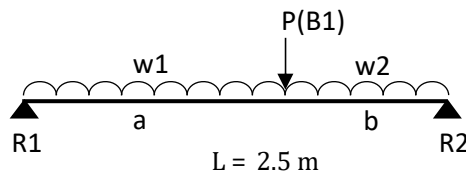
$$\Delta = \frac{5wL^4}{384EI}$$

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



**BEAM B1 (Cook)**

a = 0.4 m  
b = 2.1 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)	1.2 m	0.40 kPa	0.48	0.25 kPa	0.30
Floor	0.3 m	0.70 kPa	0.21	1.50 kPa	0.45

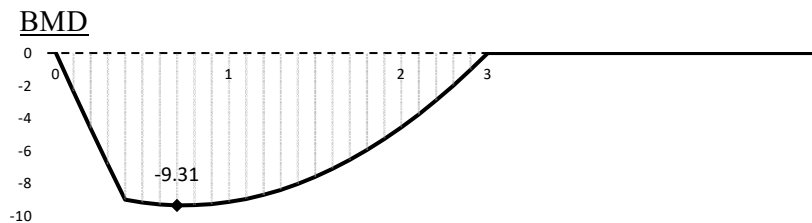
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	3.0 m	1.00 kPa	3.00		
Roof (S)	1.2 m	0.40 kPa	0.48	0.25 kPa	0.30
Floor	0.3 m	0.70 kPa	0.21	1.50 kPa	0.45

**Load combinations**

	w1	w2	P		R1	R2
(W) DL	4.09	4.09	5.9	-->	10.1	6.1
(W) LL	0.75	0.75	8.0	-->	7.7	2.2
(U) 1.2DL+1.5LL	6.03	6.03	19.1	-->	23.6	10.6

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

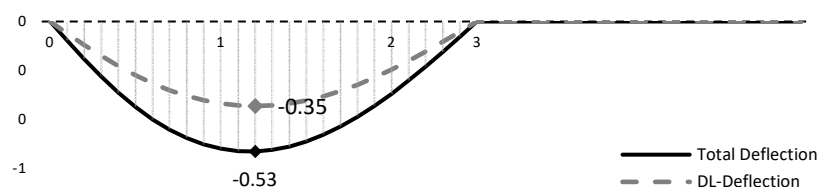
**Check Strength**



M\* = 9.31 kNm  
Moa =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi M_{sx}$  = 88.98 kNm :: OK

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

**Check Deflection**



(~L / 4717)  
(~L / 7143)

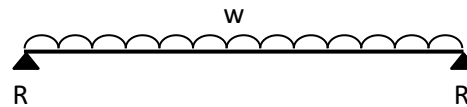
USE: 2/TSF4510 (2TC & 2BC)



**GARAGE OPTION 1**

**BEAM B2**

L = 5.8 m



**Loads**

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.40		
Wall (HB)	3.3 m	1.00 kPa	3.30		
Roof (S)	4.2 m	0.40 kPa	1.66	0.25 kPa	1.04
Floor	1.1 m	0.70 kPa	0.74	1.50 kPa	1.58

**Load combinations**

w = DL =	6.1 kN/m	-->	R =	17.7 kN
w = LL =	2.6 kN/m	-->	R =	7.6 kN
w* = 1.2DL + 1.5LL =	11.2 kN/m	-->	R* =	32.6 kN

TRY: 300PFC (FLR)

**Check Strength**

M\* = 47.23 kNm  
M<sub>oa</sub> =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi M_{sx}$  = 152.00 kNm :: OK

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

**Check deflection**

I<sub>x</sub> = 72.4 x 10<sup>6</sup> mm<sup>4</sup>  
 $\Delta_{dl}$  = 6.2 mm (~L / 935)  
 $\Delta_{total}$  = 8.9 mm (~L / 655)

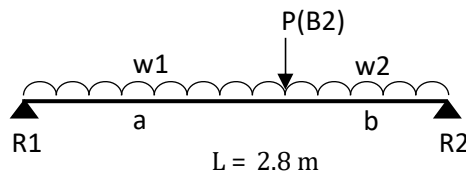
$$\Delta = \frac{5wL^4}{384EI}$$

USE: 300PFC



**OPTION 1**  
**BEAM PF1**

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

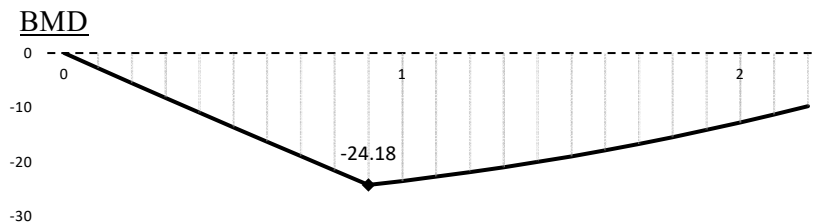
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	3.5 m	1.00 kPa	3.50		
Roof (S)	0.6 m	0.40 kPa	0.24	0.25 kPa	0.15
Floor	0.6 m	0.70 kPa	0.42	1.50 kPa	0.90

**Load combinations**

	w1	w2	P		R1	R2
(W) DL	1.49	4.41	17.7	-->	15.8	11.4
(W) LL	0.15	1.05	7.6	-->	5.9	3.8
(U) 1.2DL+1.5LL	2.01	6.87	32.6	-->	27.8	19.4

TRY: 230PFC Le = 2.8 m

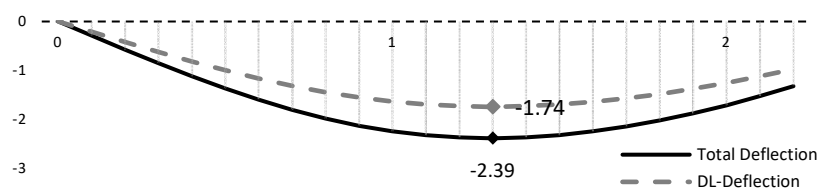
**Check Strength**



M\* = 24.18 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**



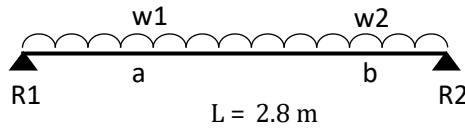
(~L / 1155)  
(~L / 1586)

USE: 230PFC



**OPTION 2**  
**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

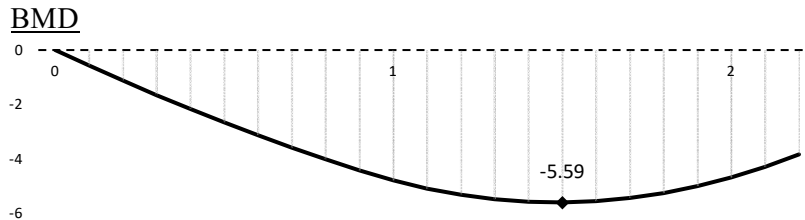
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	3.5 m	1.00 kPa	3.50		
Roof (S)	0.6 m	0.40 kPa	0.24	0.25 kPa	0.15
Floor	0.6 m	0.70 kPa	0.42	1.50 kPa	0.90

**Load combinations**

	w1	w2		R1	R2
(W) DL	1.49	4.41	-->	3.9	5.7
(W) LL	0.15	1.05	-->	0.8	1.3
(U) 1.2DL+1.5LL	2.01	6.87	-->	5.8	8.8

TRY: 230PFC Le = 2.8 m

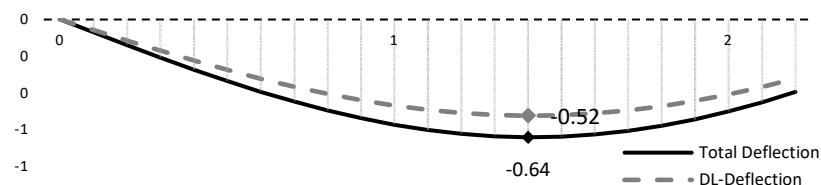
**Check Strength**



M\* = 5.59 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 / 4313)  
(~L / 5308)

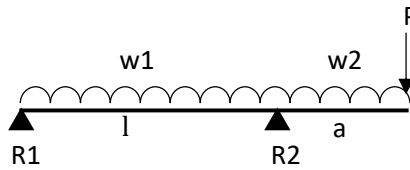
USE: 230PFC





### BEAM CB CANTI

l = 1.5 m  
a = 0.5 m  
L = 2.0 m



### Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.10		
Wall (HB)	0.0 m	1.00 kPa	0.00		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa	0.00

UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	0.5 m	1.00 kPa	0.50		
Roof (S)	1.2 m	0.40 kPa	0.48	0.25 kPa	0.30
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa	0.00

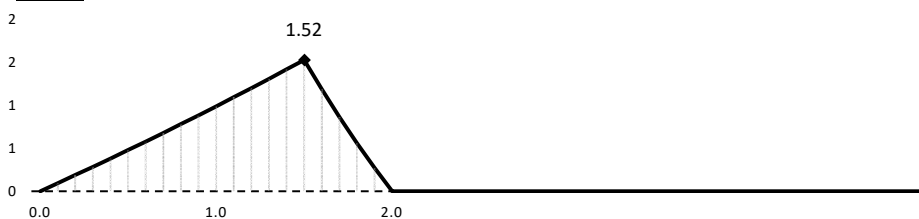
### Load Combinations

	w1 (kN/m)		w2 (kN/m)		P (kN)		R1 (kN)	R2 (kN)
Working	DL	0.10	DL+LL	1.38	2.1	-->	-0.7	3.7
Ultimate	1.2DL+1.5LL	0.12	1.2DL+1.5LL	1.75	2.6	-->	-0.9	4.6

TRY: 150x50x3.0 RHS (FLR)

### Check Strength

#### BMD



M\* = 0.00 kNm

-M\* = -1.52 kNm

Mo<sub>a</sub> =

α<sub>s</sub> =

α<sub>m</sub> =

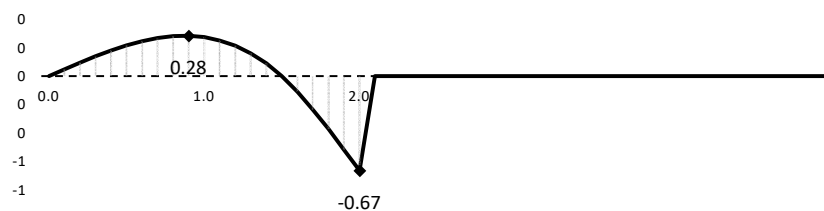
φM<sub>sx</sub> = 16.20 kNm :: OK

AS4100 - C5.6.1

AS4100 - C5.6.1

AS4100 - T5.6.1

### Check Deflection



(~l / 5357)

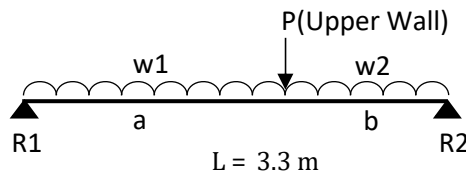
(~a / 746)

USE: 150x50x3.0 RHS



**GARAGE OPTION 2**  
**BEAM FJ1 @ 450 CRS**

a = 2.1 m  
b = 1.2 m



**Loads**

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.10		
Wall (HB)	0.0 m	1.00 kPa	0.00		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	0.5 m	0.70 kPa	0.32	1.50 kPa	0.68

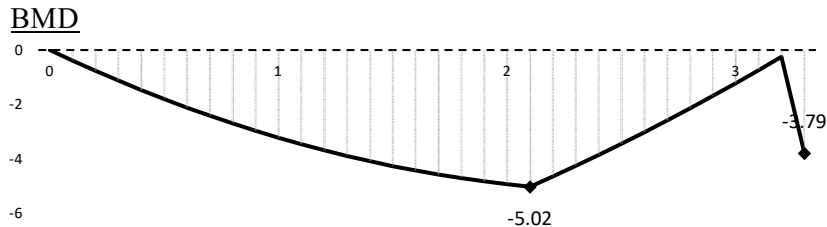
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	0.0 m	1.00 kPa	0.00		
Roof (S)	1.2 m	0.40 kPa	0.48	0.25 kPa	0.30
Floor	0.0 m	0.70 kPa	0.00	1.50 kPa	0.00

**Load combinations**

	w1	w2	P		R1	R2
(W) DL	0.42	0.58	3.0	-->	1.8	2.8
(W) LL	0.68	0.30	0.6	-->	1.2	1.1
(U) 1.2DL+1.5LL	1.51	1.15	4.5	-->	4.0	5.0

TRY: TSF4010 (FLR)

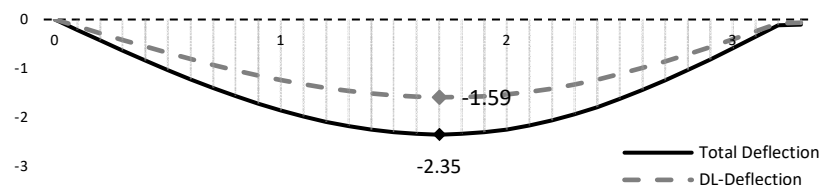
**Check Strength**



M\* = 5.02 kNm  
Moa =  
 $\alpha_s$  =  
 $\alpha_m$  =  
 $\phi M_{sx}$  = 18.73 kNm :: OK

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

**Check Deflection**



(~L / 1383)  
(~L / 2044)

USE: TSF4010

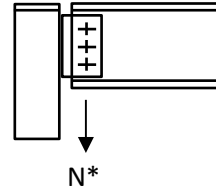


### COLUMN C1

Max height = 3.0 m

### Loads

$$\begin{aligned} N^* &= 35.00 \text{ kN} \\ N_e^* &= 35.00 \text{ kN} \\ M_e^* &= 5.69 \text{ kNm} \quad (e = 0.163 \text{ m}) \end{aligned}$$



TRY: 125x75x6.0 RHS

### Properties

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

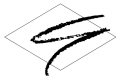
### Check section capacity

$$\frac{M_e^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.27 < 1.0, \text{ therefore OK}$$

### Check member capacity

$$\frac{M_e^*}{\phi M_b} + \frac{N^*}{\phi N_c} = 0.33 < 1.0, \text{ therefore OK}$$

USE: 125x75x6.0 RHS

**PORTAL FRAME PF1****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  
 $N^* (\text{DL}) = 19.0 \text{ kN}$   
 $\Rightarrow M^* (e) = 3.1 \text{ kN/m}$   
 $M^* (\text{total}) = 18.1 \text{ kN/m}$

**Section Capacity**

$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.71$$

**Check member capacity**

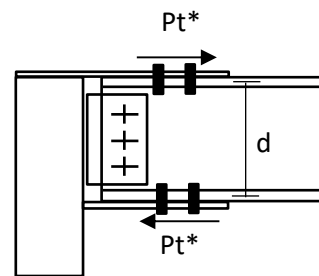
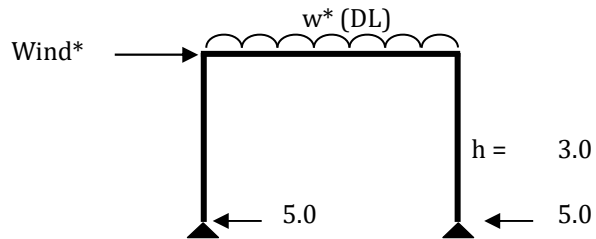
$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_c} = 0.74 \text{ (For } L_e = 3.0 \text{ m)}$$

USE: 125x75x6.0 RHS

**2. Connection**

Design top & bottom bolts for wind

$d = 0.3 \text{ m}$   
 $P_t^* = M^* / d = 60.27 \text{ kN}$



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

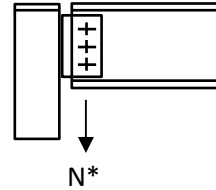


### COLUMN C2

Max height = 3.0 m

### Loads

$$\begin{aligned} N^* &= 32.00 \text{ kN} \\ N_e^* &= 32.00 \text{ kN} \\ M_e^* &= 4.62 \text{ kNm} \quad (e = 0.145 \text{ m}) \end{aligned}$$



TRY: 89x89x3.5 SHS

### Properties

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

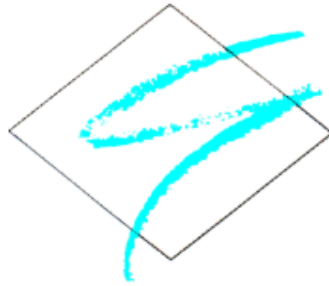
### Check section capacity

$$\frac{M_e^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.49 < 1.0, \text{ therefore OK}$$

### Check member capacity

$$\frac{M_e^*}{\phi M_b} + \frac{N^*}{\phi N_c} = 0.55 < 1.0, \text{ therefore OK}$$

USE: 89x89x3.5 SHS



Job Number: 42559  
 Design: DJS  
 Date: Feb-21  
 Page:

### WIND BEAM (WB)

Contributing Width (c/w) = 3 m

Beam Span (L) = 4.4 m

Le = 3.6 m

Wind Speed (Ws) = 32 m/s

q =  $[(Ws^2) \times 0.6] / 1000$   
 = 0.61 kPa

$F_R$  =  $(0.7 + 0.5) \times q \times c/w$   
 = 2.21 kN/m

$M_{(working)}$  =  $(F_R \times L^2) / 8$   
 = 3.58 kNm

$I_{req} = 1676929$

=  $1.7 \times 10^6 \text{ mm}^4$

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

**USE: 89x89x5.0 SHS (C350)**