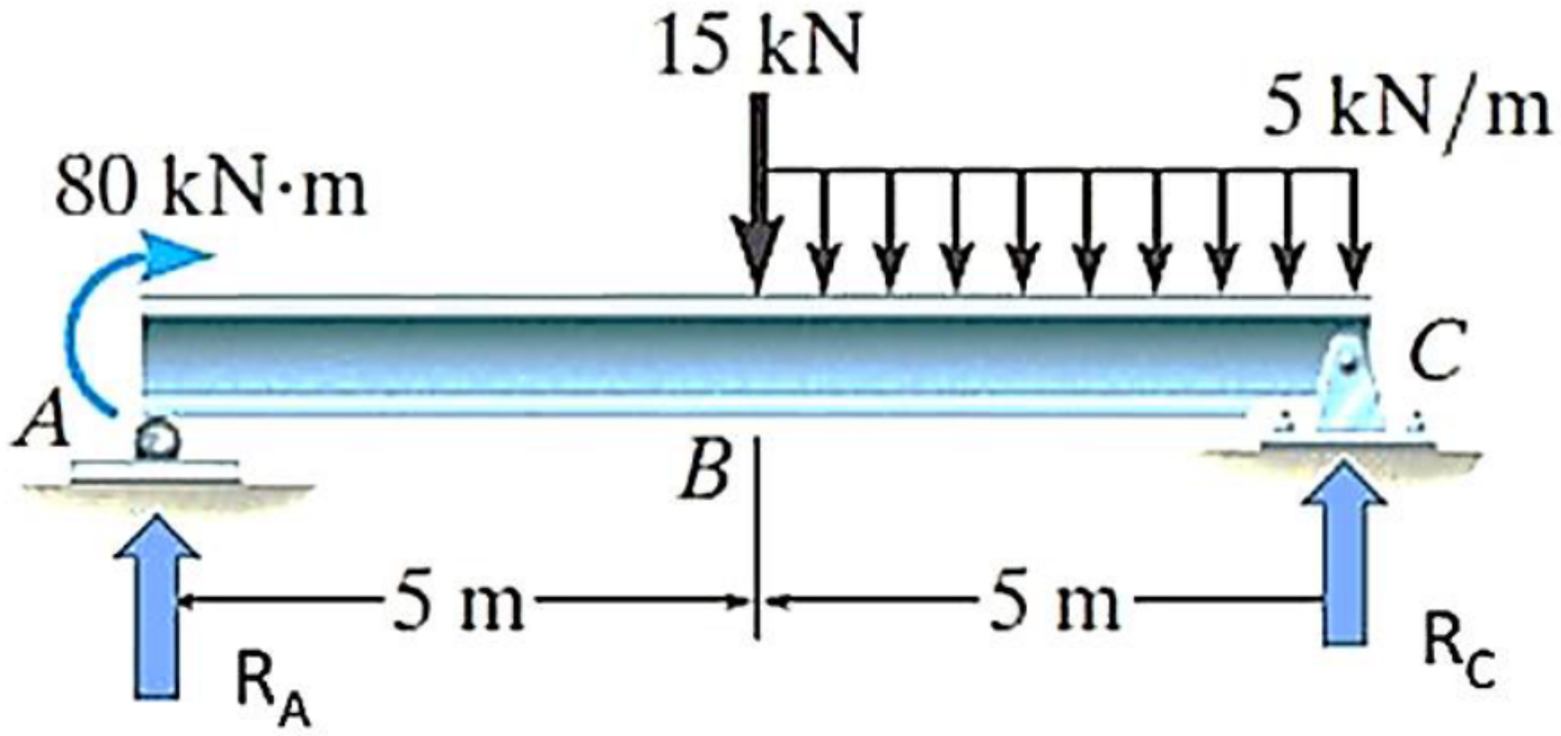
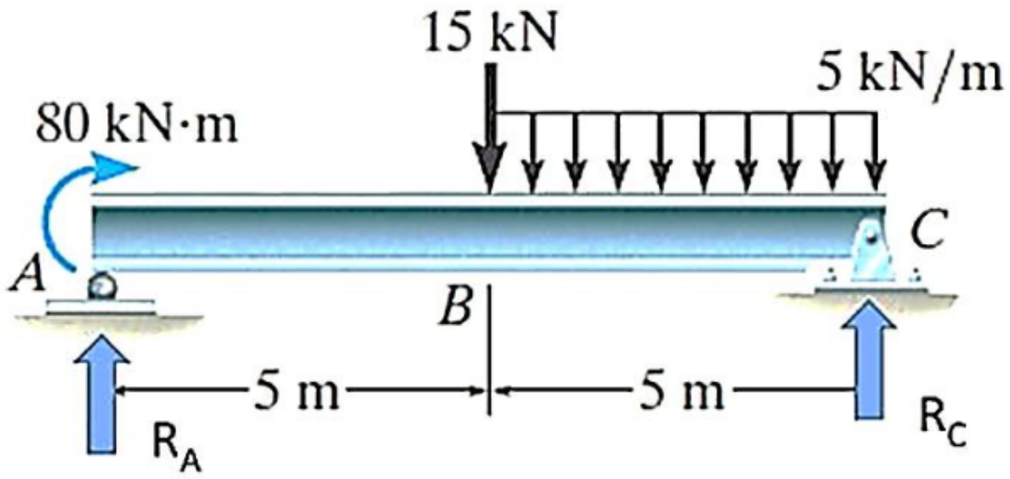
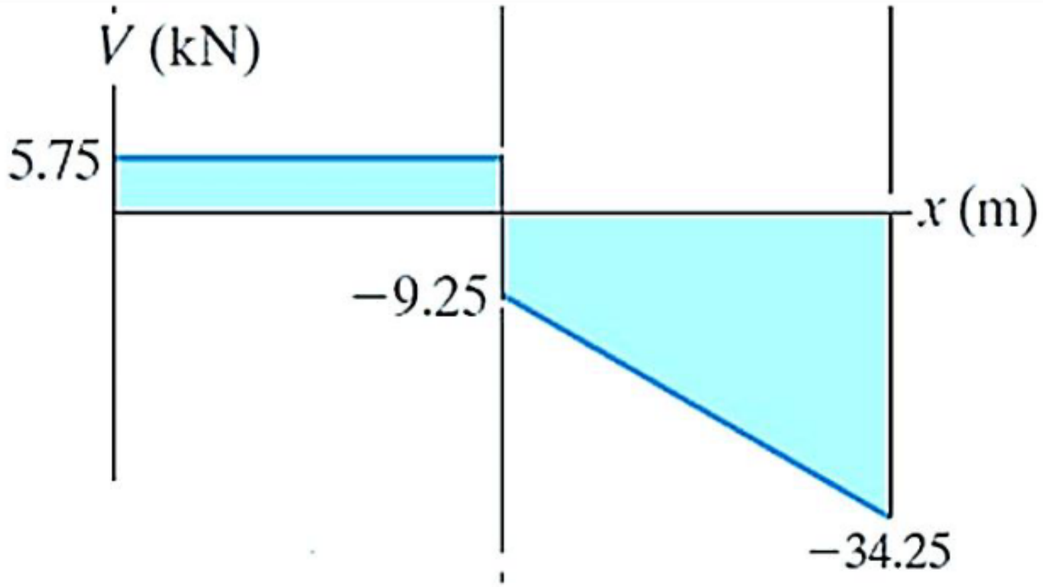
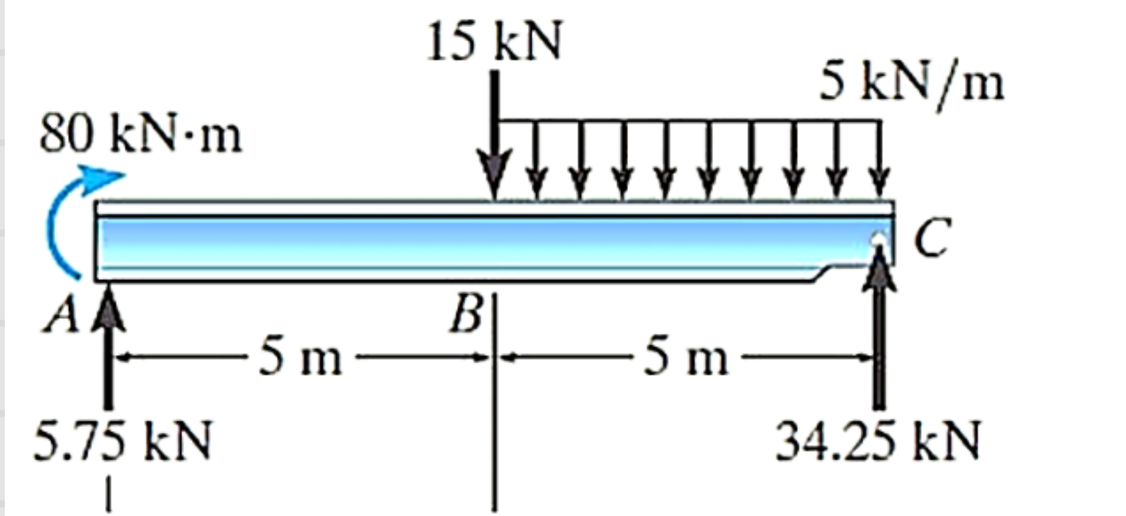
SFD and BMD of Beam – SAP

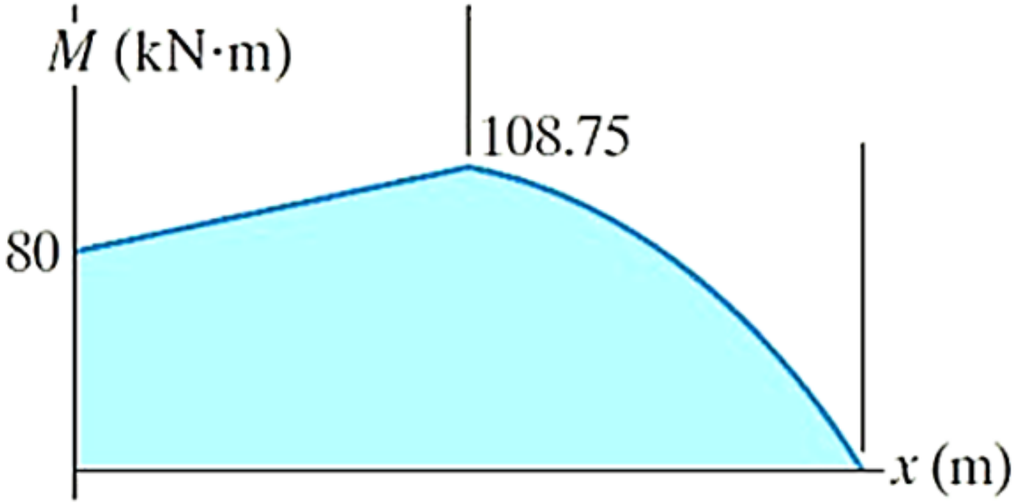
- Model the following beam in SAP2000 and analyze for the loading shown.

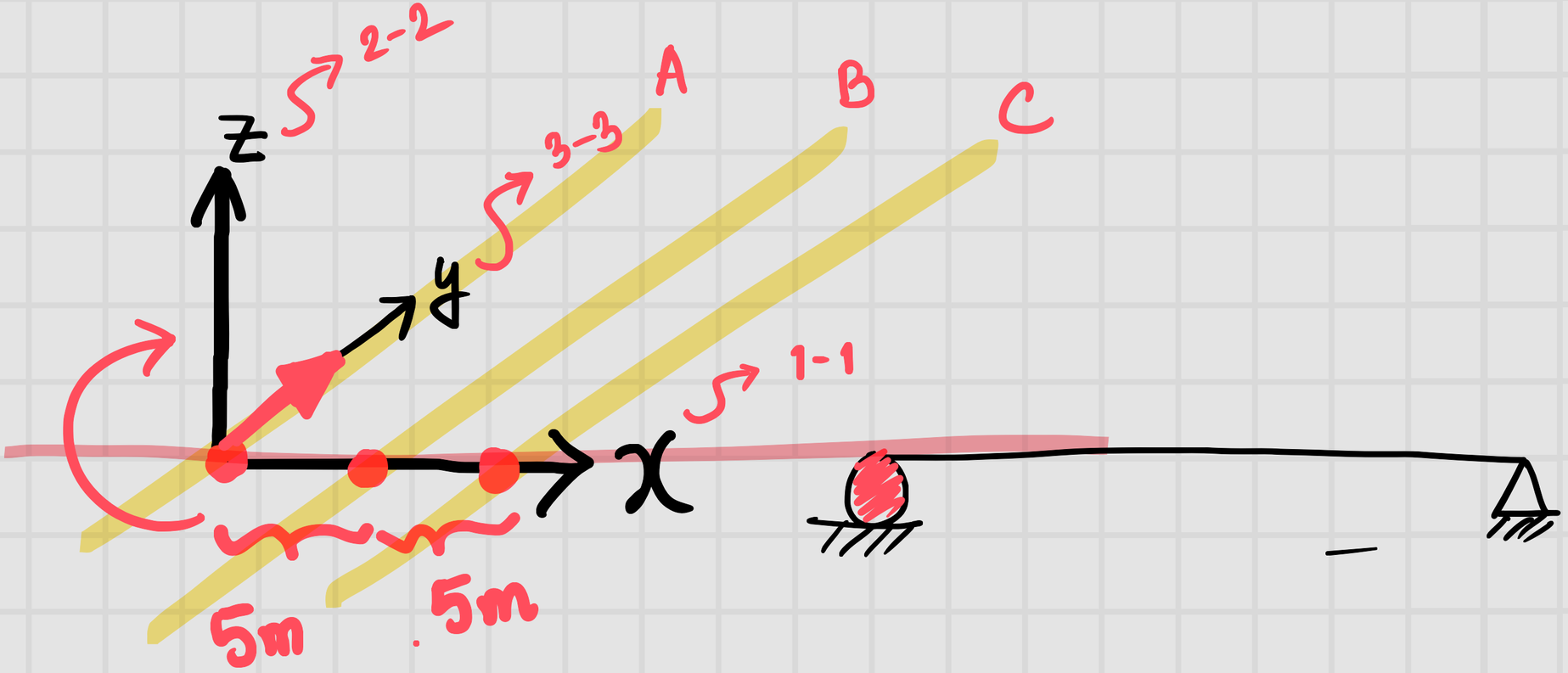


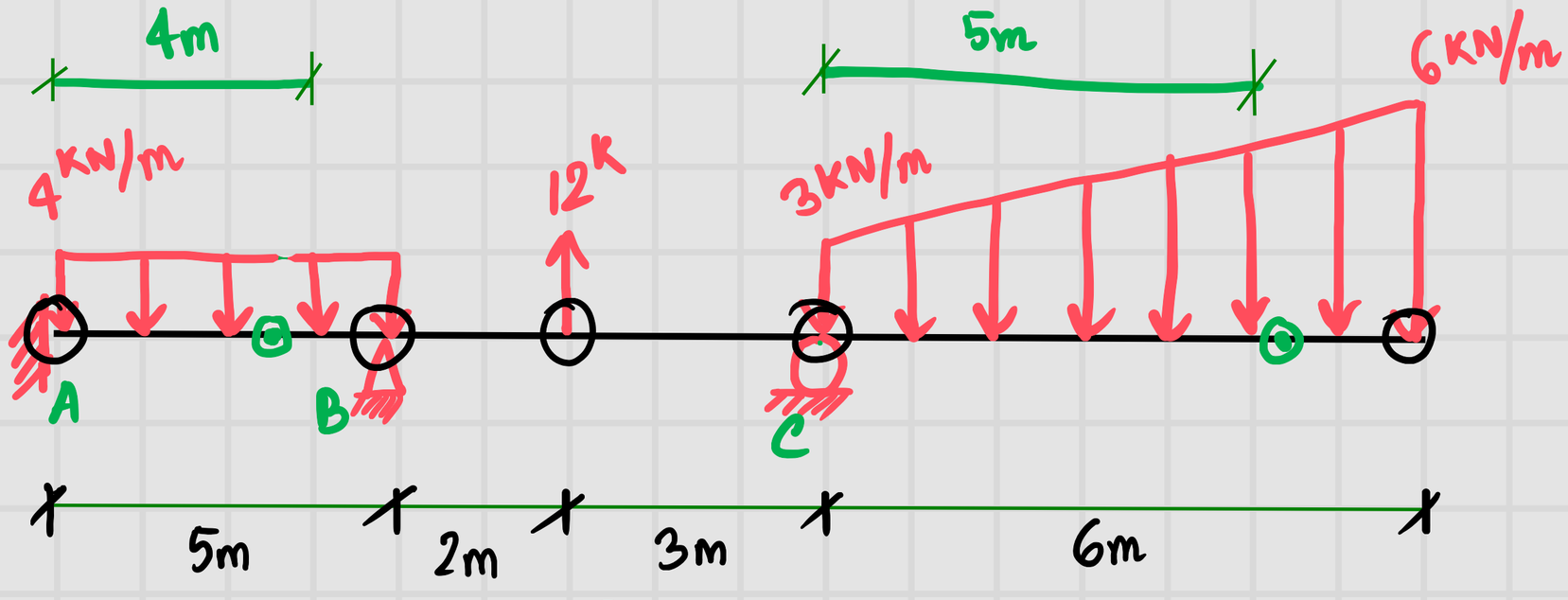


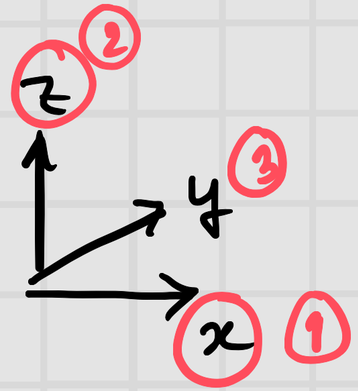


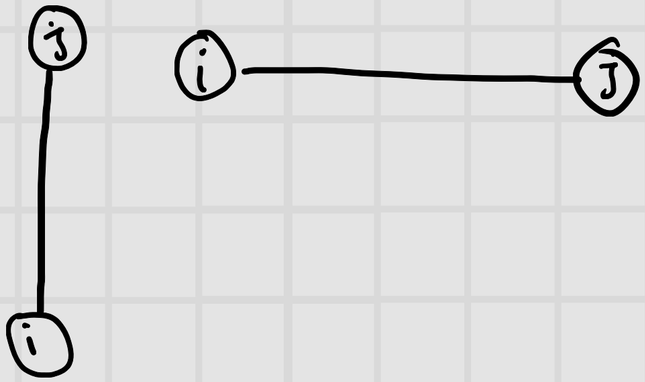


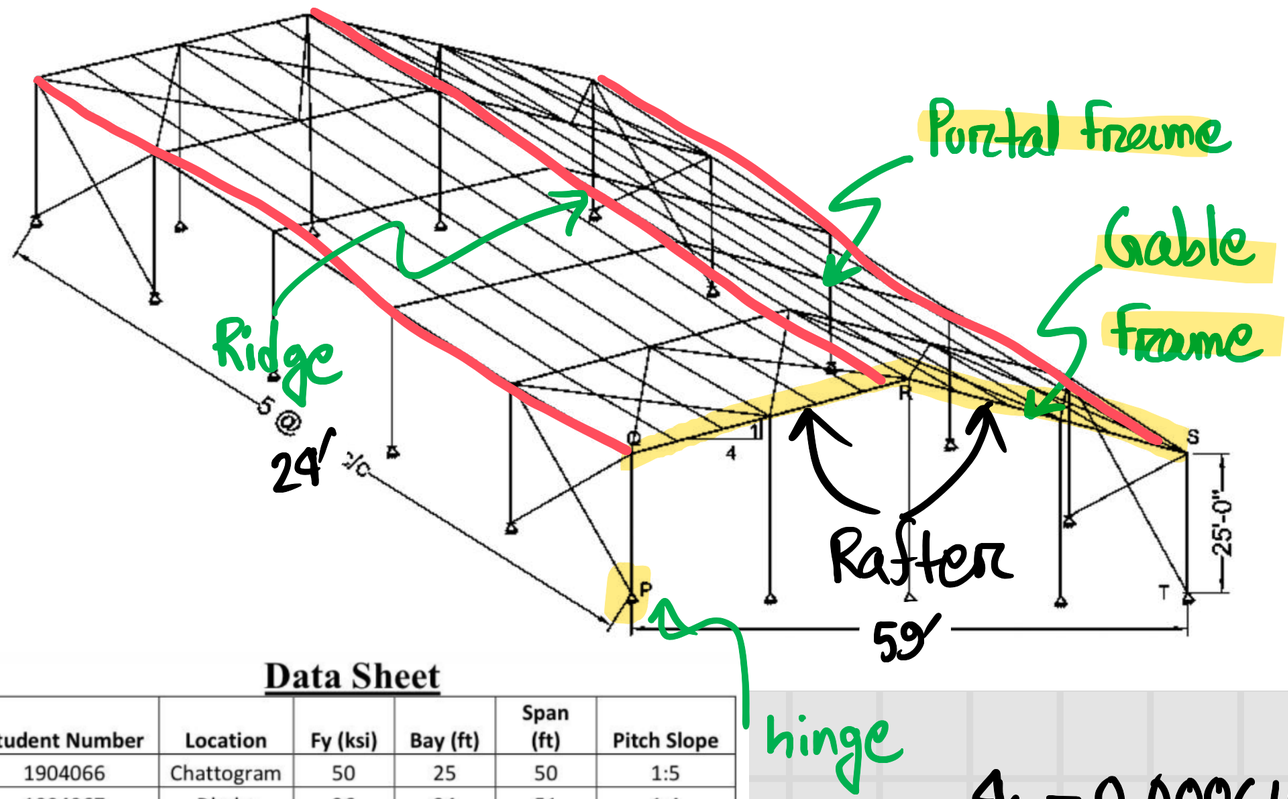












Design Code: BNBC 2020

Design Method: LRFD

Design Data

Site: View Datasheet.

Roofing Material: 0.8 mm thick GI sheet.
LL = 20 psf
Purlin & Miscellaneous load=3psf.
Terrain Exposure Category: B
Soil property: Average SPT value in top 30 m is 20
Occupancy: Industrial Warehouse building
Gust Factor, G: 0.85

Directionality Factor, Kd : 0.85

Topographic factor, Kzt: 1

Structural material property:
f_y = View Datasheet.
f'c= View Datasheet

Data Sheet

Student Number	Location	Fy (ksi)	Bay (ft)	Span (ft)	Pitch Slope
1904066	Chattogram	50	25	50	1:5
1904067	Dhaka	36	24	51	1:4
1904068	Chattogram	50	23	52	1:5
1904069	Dhaka	36	22	53	1:4
1904070	Chattogram	50	21	54	1:5
1904071	Dhaka	36	20	55	1:4
1904072	Chattogram	50	25	56	1:5
1904073	Dhaka	36	24	57	1:4
1904074	Chattogram	50	23	58	1:5
1904075	Dhaka	36	22	59	1:4
1904076	Chattogram	50	21	60	1:5
1904077	Dhaka	36	20	61	1:4
1904078	Chattogram	50	25	60	1:5
1904079	Dhaka	36	24	59	1:4

V:H

$$q_z = 0.000613 K_z K_{zt} K_d V^2 I \qquad (K_{zt}=1,\ K_d=0.85,\ I=1)$$

$1\ kN/m^2 = 20.89\ psf$

K_z → Chart = f(z)

$$= 0.000613 \times K_z \times 1 \times 0.85 \times 65.7^2 \times 1$$

$$= 2.249\, K_z\ (kN/m^2) = 46.984\, K_z\ psf$$

BNBC 2020 – Wind Loading Provisions

Table 6.2.8: Basic Wind Speeds, *V*, for Selected Locations in Bangladesh

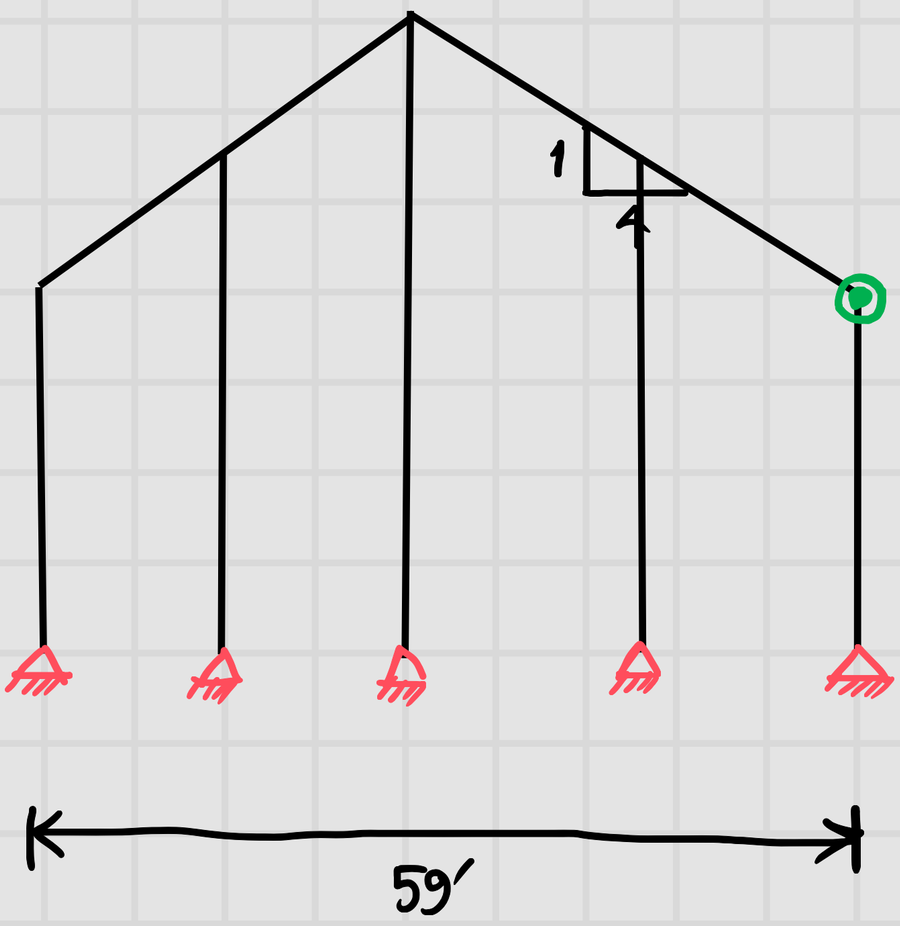
Location	Basic Wind Speed (m/s)	Location	Basic Wind Speed (m/s)
Angarpota	47.8	Lalmonirhat	63.7
Bagerhat	77.5	Madaripur	68.1
Bandarban	62.5	Magura	65.0
Barguna	80.0	Manikganj	58.2
Barisal	78.7	Meherpur	58.2
Bhola	69.5	Maheshkhali	80.0
Bogra	61.9	Moulvibazar	53.0
Brahmanbaria	56.7	Munshiganj	57.1
Chandpur	50.6	Mymensingh	67.4
Chapai Nawabganj	41.4	Naogaon	55.2
Chittagong	80.0	Narail	68.6
Chuadanga	61.9	Narayanganj	61.1
Comilla	61.4	Narsinghdi	59.7
Cox's Bazar	80.0	Natore	61.9
Dahagram	47.8	Netrokona	65.6
Dhaka	65.7	Nilphamari	44.7
Dinajpur	41.4	Noakhali	57.1
Faridpur	63.1	Pabna	63.1

Table 6.2.8: Basic Wind Speeds, *V*, for Selected Locations in Bangladesh

Location	Basic Wind Speed (m/s)	Location	Basic Wind Speed (m/s)
Gaibandha	65.6	Patuakhali	80.0
Gazipur	66.5	Pirojpur	80.0
Gopalganj	74.5	Rajbari	59.1
Habiganj	54.2	Rajshahi	49.2
Hatiya	80.0	Rangamati	56.7
Ishurdi	69.5	Rangpur	65.3
Joypurhat	56.7	Satkhira	57.6
Jamalpur	56.7	Shariatpur	61.9
Jessore	64.1	Sherpur	62.5
Jhalakati	80.0	Sirajganj	50.6
Jhenaidah	65.0	Srimangal	50.6
Khagrachhari	56.7	St. Martin's Island	80.0
Khulna	73.3	Sunamganj	61.1
Kutubdia	80.0	Sylhet	61.1
Kishoreganj	64.7	Sandwip	80.0
Kurigram	65.6	Tangail	50.6
Kushtia	66.9	Teknaf	80.0
Lakshmipur	51.2	Thakurgaon	41.4

$$P_z = q_z G_f C_p - q_i (GC_{pi}) = 39.936 \times k_z \times C_p - q_i (GC_{pi})$$

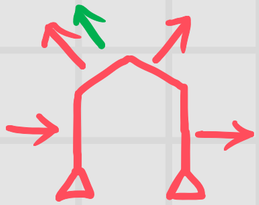
0.85



* eave height $= 25' = 7.62\,m$ (z)
* Mid Roof Height $= 25 + \frac{59/4}{4} = 28.69' = 8.75m$ (h)

Top height $= 25 + 2 \times \frac{59}{16} = 32.375' = 9.87m$

X-Direction:



Windward,

$C_p = 0.8$

$k_z = k_{eave} = k_{7.62}$

$q_i \rightarrow k_z = k_h = k_{8.75}$

Leeward,

$C_p = f(L/B)$

$k_z = k_h = k_{8.75}$

$q_i \rightarrow k_z = k_h = k_{8.75}$

Sidewall

$C_p = -0.7$

$k_z = k_h = k_{8.75}$

$q_i \rightarrow k_z = k_h = k_{8.75}$

$C_p = -0.5$

$k_z = 0.94$

$k_h = 0.97$

} using next pages

BNBC 2020 – Wind Loading Provisions

Table 6.2.11: Velocity Pressure Exposure Coefficients, K_h and K_z

Height above ground level, z	Exposure (Note 1)			
	A		B	C
(m)	Case 1	Case 2	Case 1 & 2	Case 1 & 2
0-4.6	0.70	0.57	0.85	1.03
6.1	0.70	0.62	0.90	1.08
7.6	0.70	0.66	0.94	1.12
9.1	0.70	0.70	0.98	1.16
12.2	0.76	0.76	1.04	1.22
15.2	0.81	0.81	1.09	1.27
18	0.85	0.85	1.13	1.31
21.3	0.89	0.89	1.17	1.34
24.4	0.93	0.93	1.21	1.38
27.41	0.96	0.96	1.24	1.40
30.5	0.99	0.99	1.26	1.43
36.6	1.04	1.04	1.31	1.48
42.7	1.09	1.09	1.36	1.52
48.8	1.13	1.13	1.39	1.55
54.9	1.17	1.17	1.43	1.58
61.0	1.20	1.20	1.46	1.61
76.2	1.28	1.28	1.53	1.68
91.4	1.35	1.35	1.59	1.73
106.7	1.41	1.41	1.64	1.78
121.9	1.47	1.47	1.69	1.82
137.2	1.52	1.52	1.73	1.86
152.4	1.56	1.56	1.77	1.89

Notes:

1. Case 1:
   (a) All components and cladding.
   (b) Main wind force resisting system in low-rise buildings designed using Figure 6.2.10.

   Case 2:
   (a) All main wind force resisting systems in buildings except those in low-rise buildings designed using Figure 6.2.10.
   (b) All main wind force resisting systems in other structures.

2. The velocity pressure exposure coefficient K_z may be determined from the following formula:

   For 4.57 m $\leq z \leq z_g$: $K_z = 2.01\ (z/z_g)^{2/\alpha}$

   For $z < 4.57$ m: $K_z = 2.01\ (4.57/z_g)^{2/\alpha}$

   Note: z shall not be taken less than 9.1 m for Case 1 in exposure A.

3. α and z_g are tabulated in Table 6.2.10.

4. Linear interpolation for intermediate values of height z is acceptable.

5. Exposure categories are defined in Sec 2.4.6.3.

Table 6.2.11: Velocity Pressure Exposure Coefficients, K_h and K_z

Height above ground level, z	Exposure (Note 1)			
	A		B	C
(m)	Case 1	Case 2	Case 1 & 2	Case 1 & 2
0-4.6	0.70	0.57	0.85	1.03
6.1	0.70	0.62	0.90	1.08
7.6	0.70	0.66	0.94	1.12
9.1	0.70	0.70	0.98	1.16
12.2	0.76	0.76	1.04	1.22
15.2	0.81	0.81	1.09	1.27
18	0.85	0.85	1.13	1.31
21.3	0.89	0.89	1.17	1.34
24.4	0.93	0.93	1.21	1.38
27.41	0.96	0.96	1.24	1.40
30.5	0.99	0.99	1.26	1.43
36.6	1.04	1.04	1.31	1.48
42.7	1.09	1.09	1.36	1.52
48.8	1.13	1.13	1.39	1.55
54.9	1.17	1.17	1.43	1.58
61.0	1.20	1.20	1.46	1.61
76.2	1.28	1.28	1.53	1.68
91.4	1.35	1.35	1.59	1.73
106.7	1.41	1.41	1.64	1.78
121.9	1.47	1.47	1.69	1.82
137.2	1.52	1.52	1.73	1.86
152.4	1.56	1.56	1.77	1.89

7.62m

8.75m

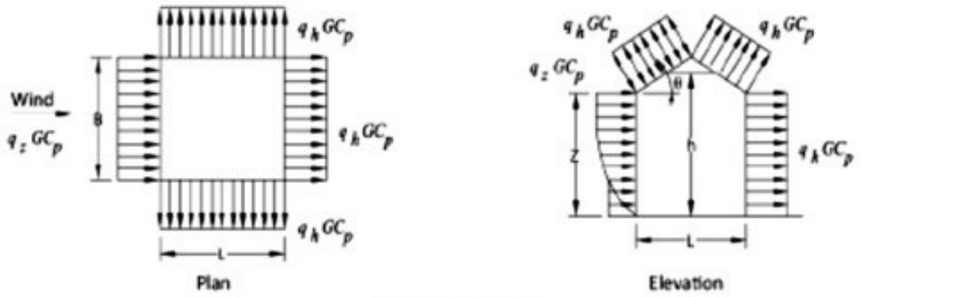
$$K_z = K_{7.62} = 0.94$$

$$K_{8.75} = K_h = 0.94 + \frac{0.98-0.94}{9.1-7.6} \times (8.75-7.6)$$

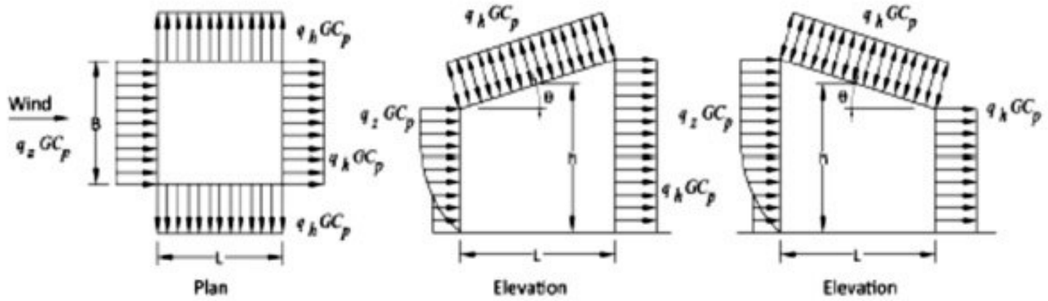
$$= 0.97$$

WL (Parallel to Ridge) Calculation of a Warehouse Building

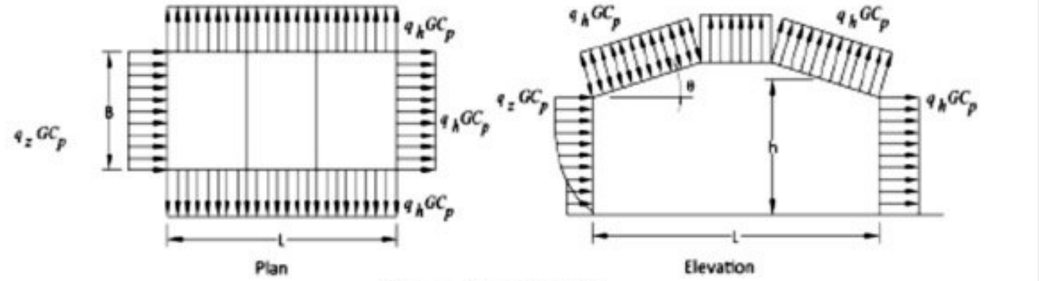
Enclosed, Partially Enclosed Buildings: Walls & Roofs



Gable, Hip Roof



Monoslope Roof (Note 4)



Mansard Roof (Note 8)

Wall Pressure Coefficients, C_p

Surface	L/B	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	≥ 4	-0.2	
Side Wall	All values	-0.7	q_h

Figure 6.2.6 External Pressure Coefficients, C_p main wind force resisting system - Method 2 (All Heights)

Mansard Roof (Note 8)

Wall Pressure Coefficients, C_p

Surface	L/B	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	≥4	-0.2	
Side Wall	All values	-0.7	q_h

$B = 120'$ ← 5x24'

$L = 59'$

$L/B = 0.491$

± 0.55

$$P_z = q_z G_f C_p - q_h (GC_{pi})$$

External Internal

Windward

Lee

Side

Roof (Windward $-x_1$)

(Windward $-x_2$)

Roof (Leeward)

Roof (windward)

↓

$C_p = f(h/L, \theta)$ → 2 ta value

$K_z = K_h = 0.97$

$K_h = 0.97$

$h = 28.69'$

$L = 59'$

$\frac{h}{L} = 0.486$

$\theta = \tan^{-1}\left(\frac{1}{4}\right) = 14^\circ$

	10°	14°	15°
	-0.7	-0.54	-0.5
0.25	-0.18	-0.036	0
0.486	-0.729		C_p
	-0.172		
	-0.9	-0.74	-0.7
0.5	-0.18	-0.18	-0.18

Wind Direction	Windward								
	Angle, θ (degrees)								
	h/L	10	15	20	25	30	35	45	>60*
Normal To ridge for $\theta \geq 10^0$	≤0.25	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.3	-0.2 0.3	0.0* 0.4	0.4	0.01θ
	0.5	-0.9 -0.18	-0.7 -0.18	-0.4 0.0*	-0.3 0.2	-0.2 0.2	-0.2 0.3	0.0* 0.4	0.01θ
	≥1.0	-1.3** -0.18	-1.0 -0.18	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.2	0.0* 0.3	0.01θ

$$0.7 - \frac{0.7-0.5}{15-10} \times (14-10) = 0.54$$

$$0.54 + \frac{0.74-0.54}{0.5-0.25} \times (0.486-0.25) = 0.729$$

WL (Normal to Ridge) Calculation of a Warehouse Building

Roof Pressure Coefficients, C_p, for use with q_h

Wind Direction		Windward								Leeward		
		Angle, θ (degrees)								Angle, θ (degrees)		
	h/L	10	15	20	25	30	35	45	>60#	10	15	>20
Normal To ridge for θ ≥10°	≤0.25	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.3	-0.2 0.3	0.0* 0.4	0.4	0.01θ	-0.3	-0.5	-0.6
	0.5	-0.9 -0.18	-0.7 -0.18	-0.4 0.0*	-0.3 0.2	-0.2 0.2	-0.2 0.3	0.0* 0.4	0.01θ	-0.5	-0.5	-0.6
	≥1.0	-1.3** -0.18	-1.0 -0.18	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.2	0.0* 0.3	0.01θ	-0.7	-0.6	-0.6

Normal To ridge for θ <10° and Parallel to ridge for all θ		Horizontal distance from Windward edge	C_p
	≤0.5	0 to h/2	-0.9, -0.18
		h/2 to h	-0.9, -0.18
		h to 2 h	-0.5, -0.18
		> 2h	-0.3, -0.18
	≥1.0	0 to h/2	-1.3*, -0.18
		> h/2	-0.7, -0.18

* Value is provided for interpolation purposes

** Value can be reduced linearly with area over which it is applicable as follows

Area (m²)	Reduction Factor
≤9.3	1.0
23.2	0.9
≥92.9	0.8

$A = 42 \times 100 \times \frac{1}{3.982} = 390.9\,m^2$

$-1.3 \times 0.8 =$

Notes:

1. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
2. Linear interpolation is permitted for values of L/B, h/L and θ other than shown. Interpolation shall only be carried out between values of the same sign. Where no value of the same sign is given, assume 0.0 for interpolation purposes.
3. Where two values of C_p are listed, this indicates that the windward roof slope is subjected to either positive or negative pressures and the roof structure shall be designed for both conditions. Interpolation for intermediate ratios of h/L in this case shall only be carried out between C_p values of like sign.
4. For monoslope roofs, entire roof surface is either a windward or leeward surface.
5. For flexible buildings use appropriate G_f as determined by Sec 2.4.8.
6. Refer to Figure 6.2.7 for domes and Figure 6.2.8 for arched roofs.
7. Notation:
   - B: Horizontal dimension of building, in meter, measured normal to wind direction.
   - L: Horizontal dimension of building, in meter, measured parallel to wind direction.
   - h: Mean roof height in meters, except that eave height shall be used for e 10 degrees.
   - z: Height above ground, in meters.
   - G: Gust effect factor.
   - q_z, q_h: Velocity pressure, in N/m², evaluated at respective height.
   - θ: Angle of plane of roof from horizontal, in degrees.
8. For mansard roofs, the top horizontal surface and leeward inclined surface shall be treated as leeward surfaces from the table
9. Except for MWFRS's at the roof consisting of moment resisting frames, the total horizontal shear shall not be less than that determined by neglecting wind forces on roof surfaces.

*For roof slopes greater than 80°, use C_p = 0.8

Figure 6.2.6 (Contd.) External pressure coefficients, C_p main wind force resisting system - Method 2 (All Heights)

	Angle, θ (degrees)		
	10	15	>20
0.25	-0.3	-0.5	-0.6
0.5	-0.5	-0.5	-0.6

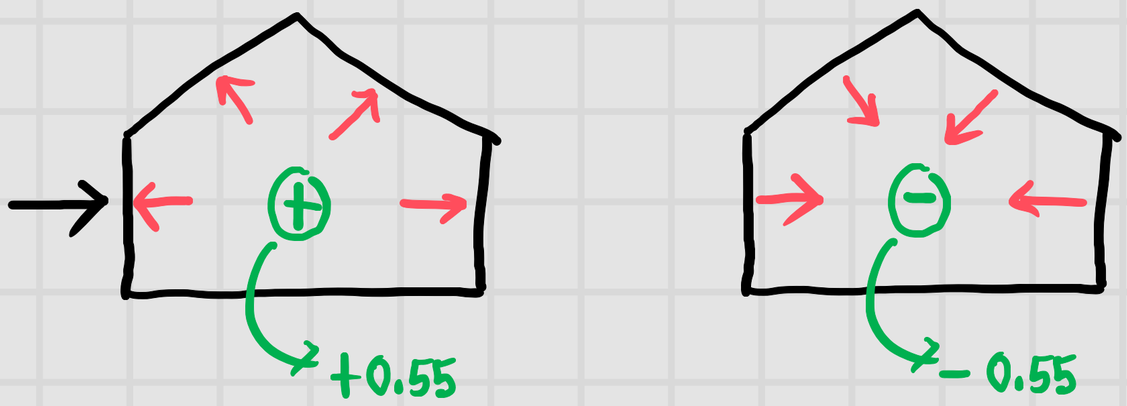
$GC_{pi} = \pm 0.55$

	10°	14°	15°
0.25	−0.3	−0.46	−0.5
0.486		−0.498 ≈ −0.5	
0.5	−0.5	−0.5	−0.5

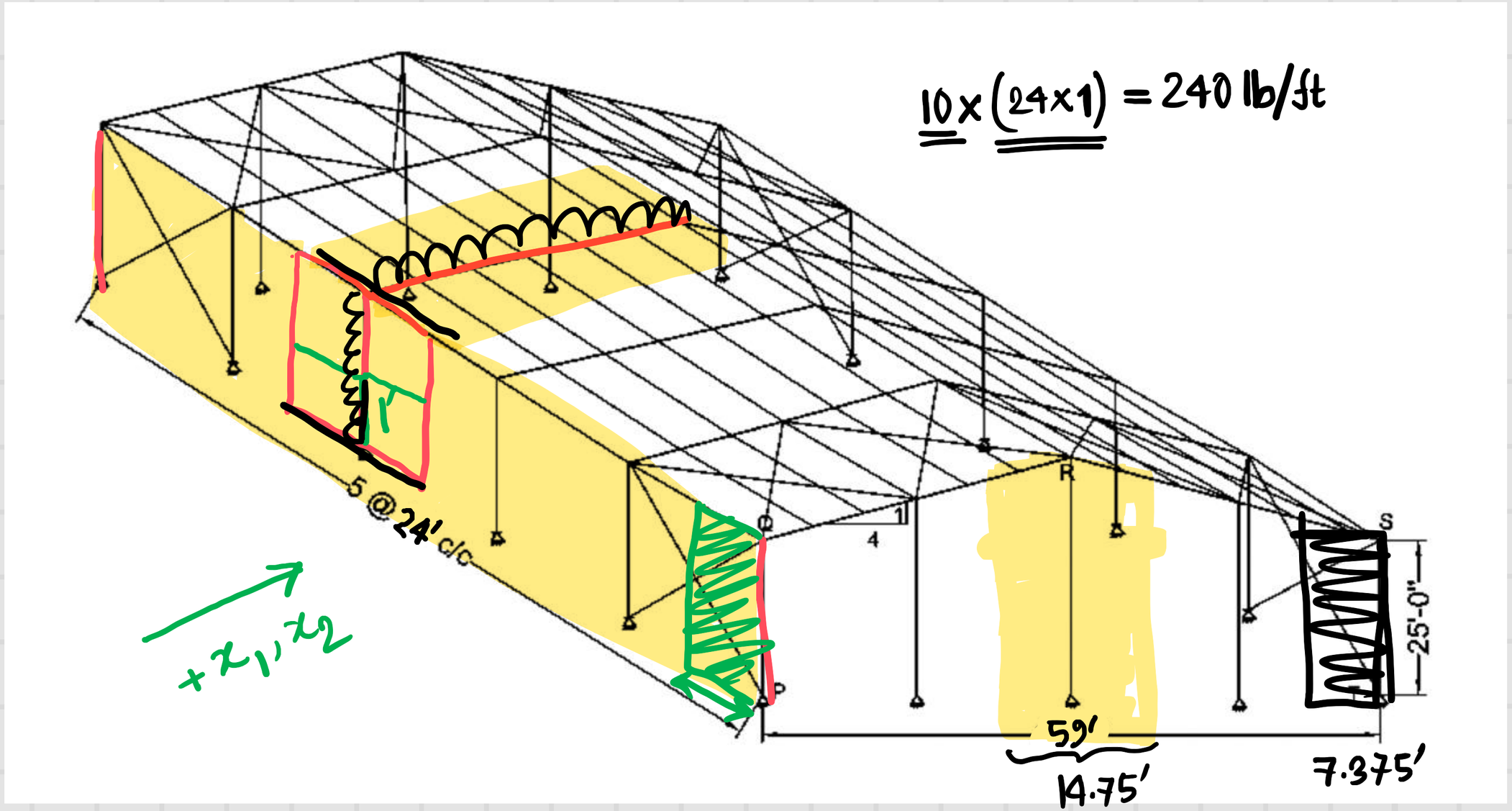
external → (+) thrust

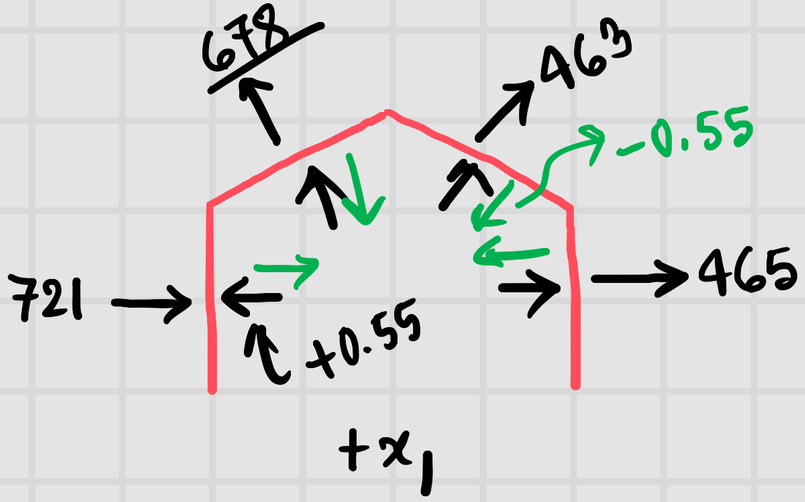
(−) Suction

Internal →

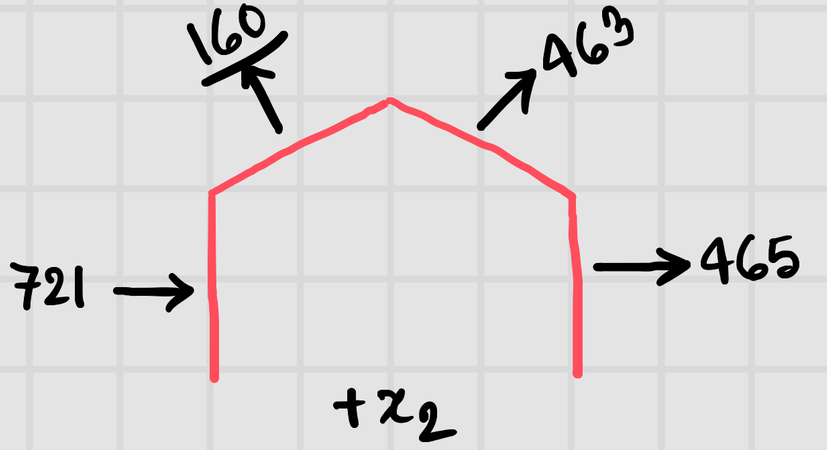


$$p_z = V G_f C_p - V(G C_{pi})$$

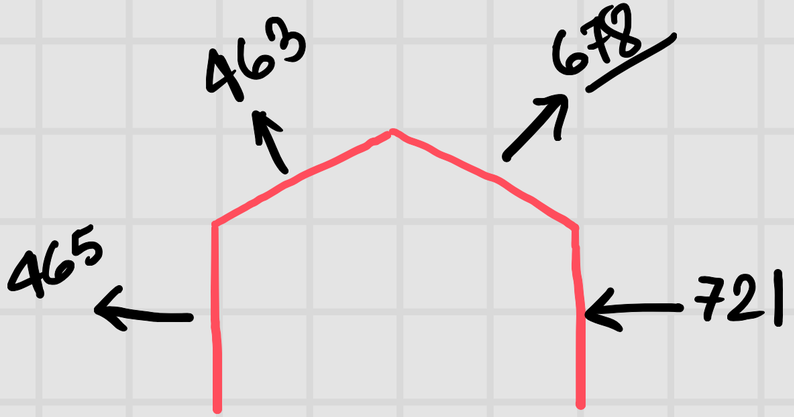




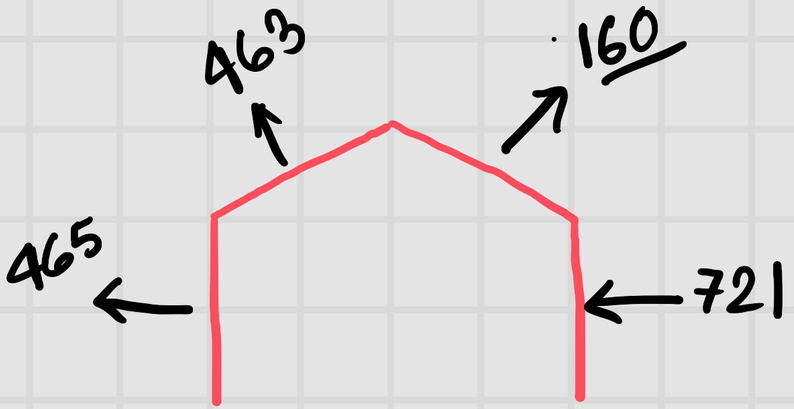
$+x_1$



$+x_2$



$-x_1$



$-x_2$

$\times 2$

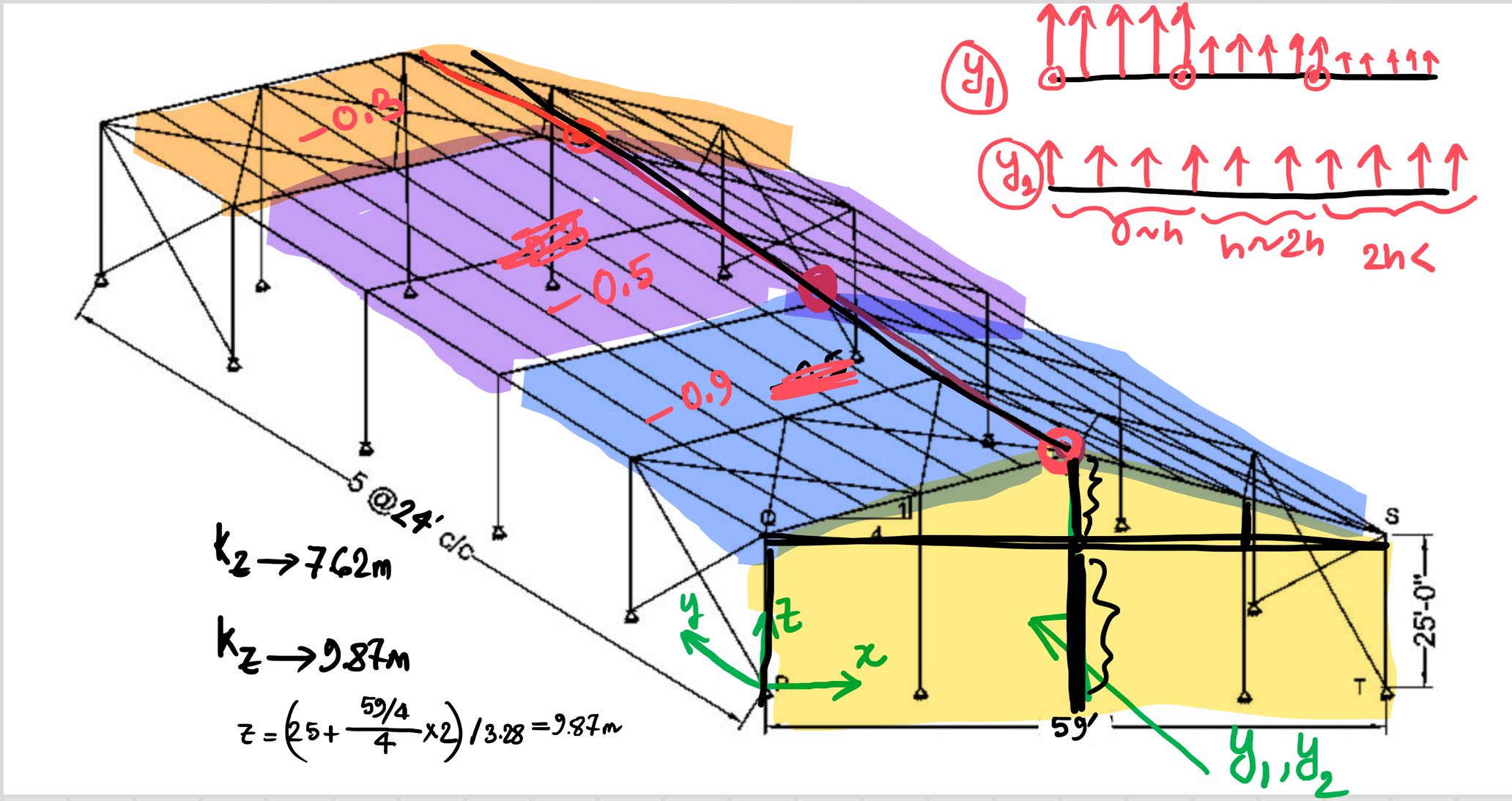


Table 6.2.11: Velocity Pressure Exposure Coefficients, K_h and K_z

Height above ground level, z	Exposure (Note 1)			
	A		B	C
(m)	Case 1	Case 2	Case 1 & 2	Case 1 & 2
0-4.6	0.70	0.57	0.85	1.03
6.1	0.70	0.62	0.90	1.08
7.6	0.70	0.66	0.94	1.12
9.1	0.70	0.70	0.98	1.16
12.2	0.76	0.76	1.04	1.22
15.2	0.81	0.81	1.09	1.27
18	0.85	0.85	1.13	1.31
21.3	0.89	0.89	1.17	1.34
24.4	0.93	0.93	1.21	1.38
27.41	0.96	0.96	1.24	1.40
30.5	0.99	0.99	1.26	1.43
36.6	1.04	1.04	1.31	1.48
42.7	1.09	1.09	1.36	1.52
48.8	1.13	1.13	1.39	1.55
54.9	1.17	1.17	1.43	1.58
61.0	1.20	1.20	1.46	1.61
76.2	1.28	1.28	1.53	1.68
91.4	1.35	1.35	1.59	1.73
106.7	1.41	1.41	1.64	1.78
121.9	1.47	1.47	1.69	1.82
137.2	1.52	1.52	1.73	1.86
152.4	1.56	1.56	1.77	1.89

k_z at $z = 7.62m$ ← eave height

$$k_z = 0.94 + \frac{0.98 - 0.94}{9.1 - 7.6} \times (7.62 - 7.6) = 0.94$$

k_z at $z = 9.87m$ ← Ridge height

$$k_z = 0.98 + \frac{1.04 - 0.98}{12.2 - 9.1} \times (9.87 - 9.1) = 0.995$$

k_h at $z = 8.75m$ ← mid roof height

$$k_h = 0.94 + \frac{0.98 - 0.94}{9.1 - 7.6} \times (8.75 - 7.6) = 0.97$$

C_p

Roof: Windward, leeward নাই কেনো,

ছোট dimention / প্রস্থ

mid Roof height

$$\frac{h}{L} = \frac{28.69'}{59} = 0.486$$

Normal To ridge for $\theta < 10°$ and Parallel to ridge for all θ	≤ 0.5	Horizontal distance from Windward edge	C_p
		0 to $h/2$	-0.9, -0.18
		$h/2$ to h	-0.9, -0.18
		h to $2h$	-0.5, -0.18
		$> 2h$	-0.3, -0.18
	≥ 1.0	0 to $h/2$	-1.3**, -0.18
		$> h/2$	-0.7, -0.18

← Same value → So 0 → h এটা Range

← Same value for all

y_1	y_2
-0.9	-0.18
-0.5	-0.18
-0.3	-0.18

Wall:

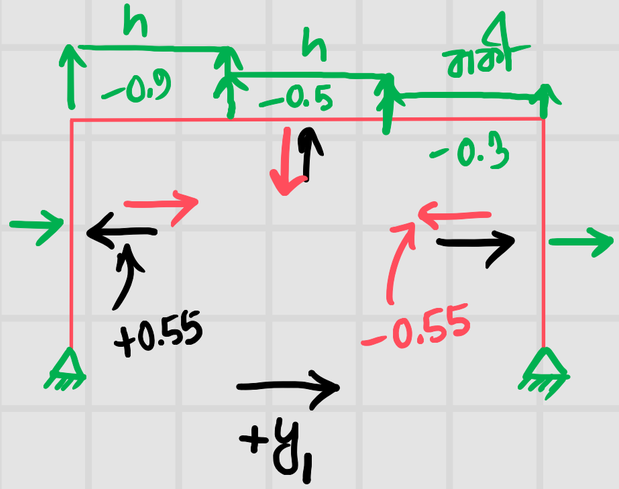
Wall Pressure Coefficients, C_p			
Surface	L/B	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	≥ 4	-0.2	
Side Wall	All values	-0.7	q_h

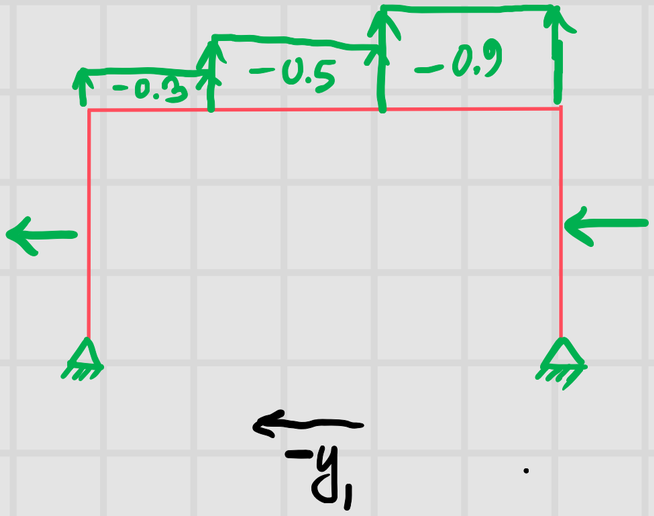
Windward → 0.8

Sidewall → -0.7

Leeward → $\frac{L}{B} = \frac{120}{59} \approx 2.038$ | interpolation → -0.298

= এখানে 2 Consider করে $C_p = -3$ নিলেও আমরা, ইনাই করলাম,





X 2 total 8 টি Case

Design Data of a Steel Building

Design Code: BNBC 2020

Design Method: LRFD

Design Data:

Concrete: f'c = 4ksi

~~Steel: ASTM A992 Grade 50~~

3-Storied Building

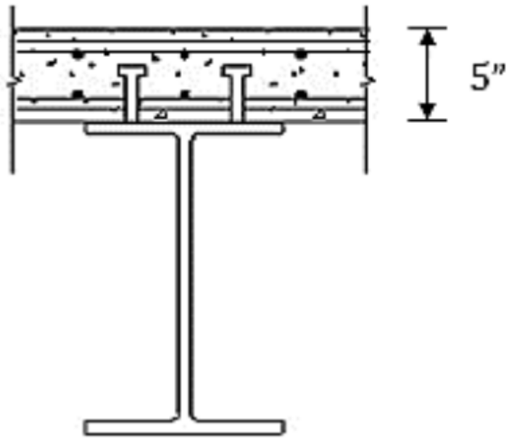
Story Height = 11 ft

LL = 40 psf

Location: ~~Gazipur~~

Wind Speed: 66.5 m/s

Exposure Category: B



Section Details:

C1: W14 X90

C2: W14X109

SB1: W12X26

MB1: W12X16

MB2: W14X22

SDL = Superimposed DL

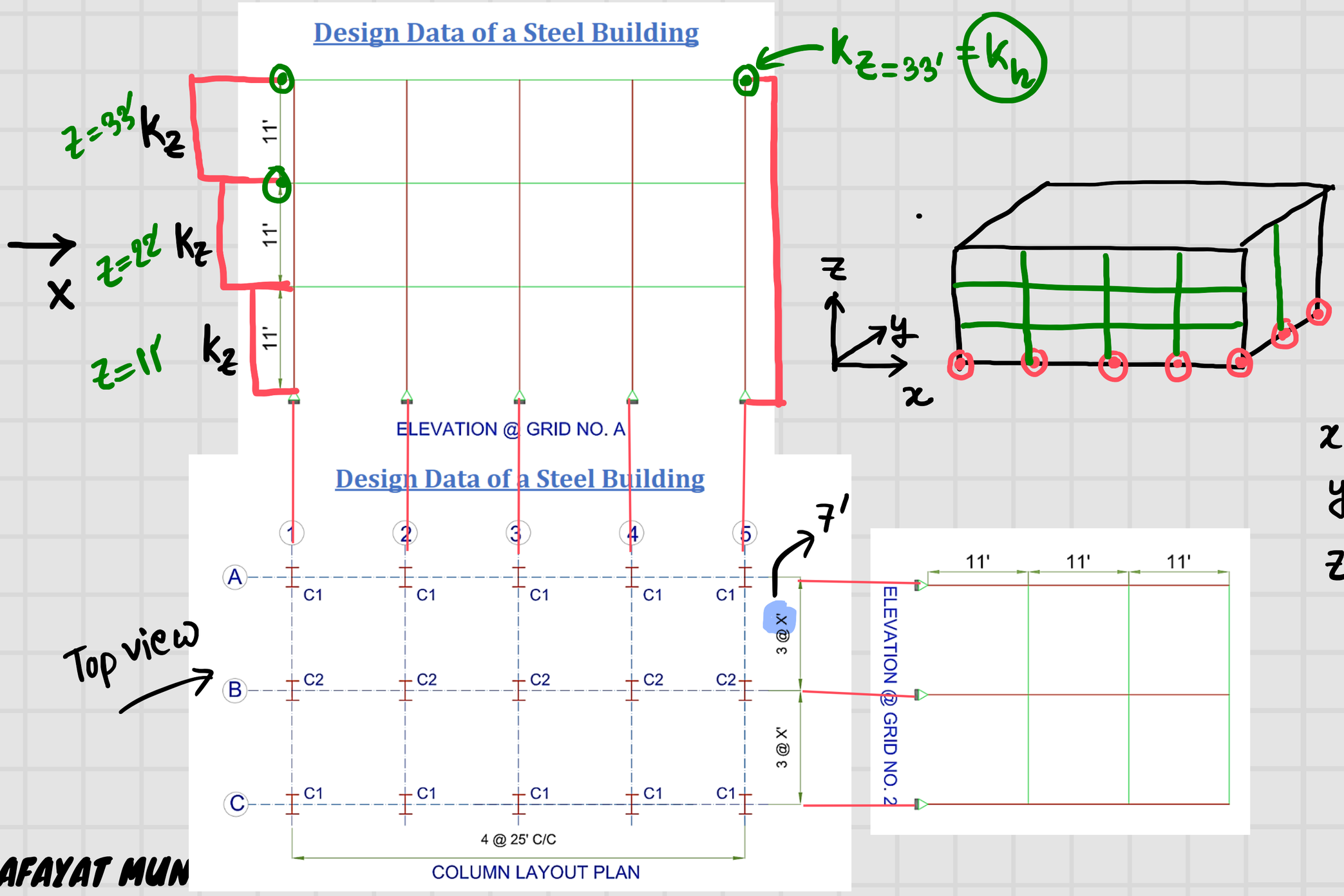
DL = Self Weight LL = Live load

SAFAYAT MUNNA

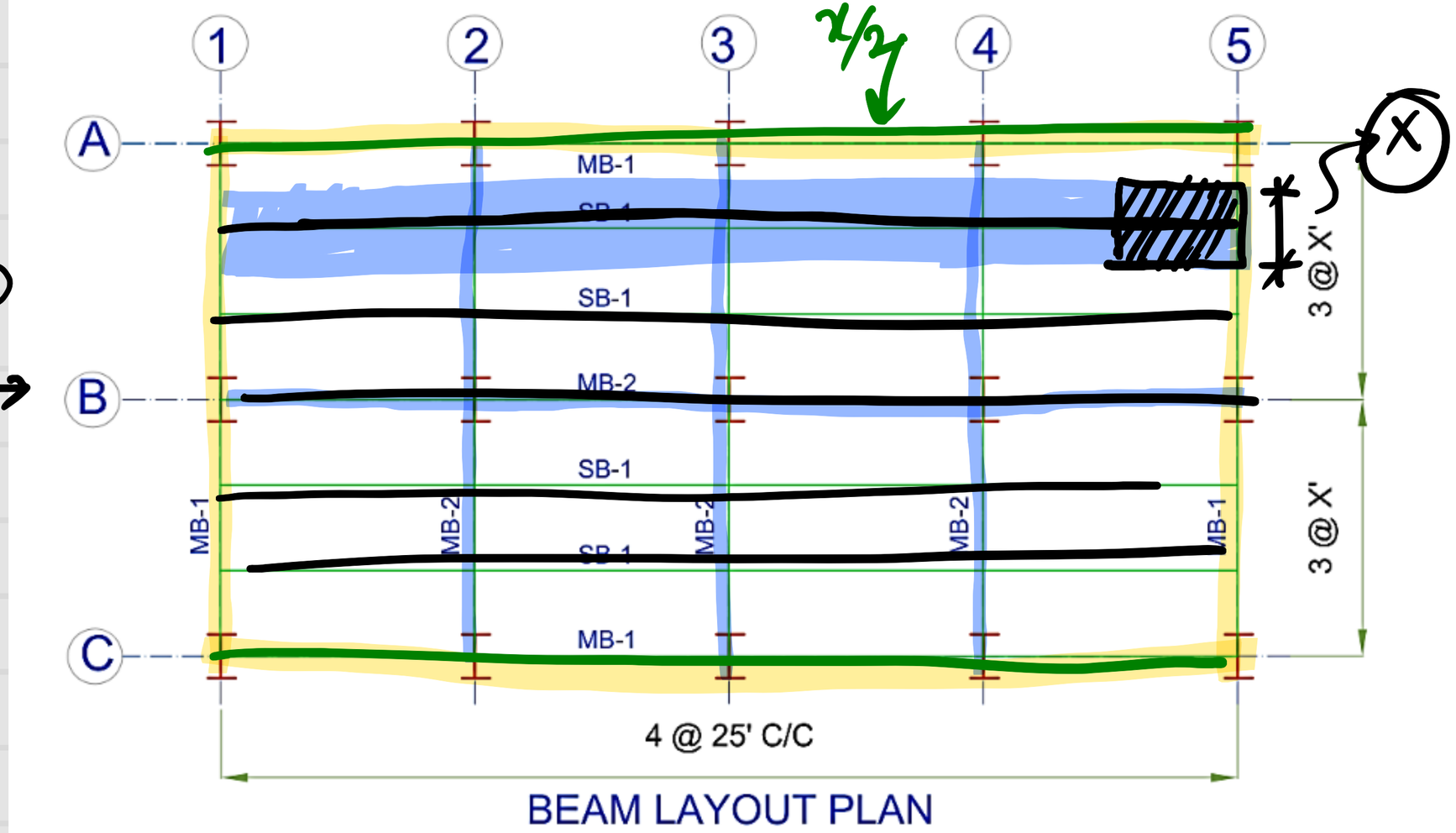
Design Data of a Steel Building

Data Sheet

Student Number	Location	fy (ksi)	f'c (ksi)	X (ft)
1904066	Chattogram	ASTM A992 Grade 50	3	6
1904067	Dhaka	ASTM A36	4	7
1904068	Chattogram	ASTM A992 Grade 50	3	8
1904069	Dhaka	ASTM A36	4	9
1904070	Chattogram	ASTM A992 Grade 50	3	6
1904071	Dhaka	ASTM A36	4	7
1904072	Chattogram	ASTM A992 Grade 50	3	8
1904073	Dhaka	ASTM A36	4	9
1904074	Chattogram	ASTM A992 Grade 50	3	6
1904075	Dhaka	ASTM A36	4	7
1904076	Chattogram	ASTM A992 Grade 50	3	8
1904077	Dhaka	ASTM A36	4	9
1904078	Chattogram	ASTM A992 Grade 50	3	6
1904079	Dhaka	ASTM A36	4	7
1904080	Chattogram	ASTM A992 Grade 50	3	8
1904081	Dhaka	ASTM A36	4	9
1904082	Chattogram	ASTM A992 Grade 50	3	6
1904083	Dhaka	ASTM A36	4	7
1904084	Chattogram	ASTM A992 Grade 50	3	8
1904085	Dhaka	ASTM A36	4	9
1904086	Chattogram	ASTM A992 Grade 50	3	6
1904087	Dhaka	ASTM A36	4	7
1904088	Chattogram	ASTM A992 Grade 50	3	8
1904089	Dhaka	ASTM A36	4	9
1904090	Chattogram	ASTM A992 Grade 50	3	6
1904091	Dhaka	ASTM A36	4	7
1904092	Chattogram	ASTM A992 Grade 50	3	8
1904093	Dhaka	ASTM A36	4	9
1904094	Chattogram	ASTM A992 Grade 50	3	6
1904095	Dhaka	ASTM A36	4	7
1904096	Chattogram	ASTM A992 Grade 50	3	8
1904097	Dhaka	ASTM A36	4	9


Design Data of a Steel Building
11'
11'
11'
ELEVATION @ GRID NO. A
Design Data of a Steel Building
1
2
3
4
5
A
B
C
C1
C2
7'
3 @ X'
3 @ X'
4 @ 25' C/C
COLUMN LAYOUT PLAN
11'
11'
11'
ELEVATION @ GRID NO. 2
Top view
z
y
x
x → 5
y → 3
z → 4

Design Data of a Steel Building



Top view

Steel Building:

self weight

Section Details:
C1: W14 X90
C2: W14X109
SB1: W12X26
MB1: W12X16
MB2: W14X22

C_1: $n = 5 \times 2 \times 3 = 30$ $l = 11'$
$\gamma = 90$ lb/ft
$\omega = 90 \times 11 \times 30 = 29700 = 29.7^k$

$C_2 = 5 \times 3 = 15$ $l = 11'$
$\gamma = 109$ lb/ft
$\omega = 109 \times 11 \times 15 = 17.985^k$

SB1: $\gamma = 26$ lb/ft
$n = 4 \times 3 = 12$ $l = 100'$
$\omega = 26 \times 100 \times 12 = 31.2^k$

MB1: $\gamma = 16$ lb/ft
$n_1 = 2 \times 3 = 6$ $l_1 = 100'$
$n_2 = 2 \times 3 = 6$ $l_2 = 42'$
$\omega = 13.632^k$

MB2: $\gamma = 22$ lb/ft
$n_1 = 3 \times 3 = 9$ $l_1 = 42'$
$n_2 = 1 \times 3 = 3$ $l_2 = 100'$
$\omega = 14.916^k$

$W = 107.433^k$

$$\text{Slab} = \frac{5}{12} \times 1 \times 1 \times 150 = 62.5 \text{ psf}$$

$LL = 40$ psf

$PW = 80$ psf

$FF = 25$ psf

PW → ext $= 0.28^k$, int $= 0.56^k$

FF → ext $= 0.0875^k$, int $= 0.175^k$

Slab → ext $= 62.5 \times 3.5 \times \frac{1}{1000} = 0.21875^k$
int $= \frac{3.5}{7} = 0.4375^k$

LL → ext $= 40 \times 3.5 \times 10^{-3} = 0.14^k$
int $= \frac{3.5}{7} = 0.28^k$

$$\text{Total Slab} = 62.5 \times (42 \times 100) \times 3 \times \frac{1}{1000} = 787.5^{k}$$

$$\text{Total PW} = \cancel{30}\ 70 \times (42 \times 100) \times 2 \times \frac{1}{1000} = 672^{k} / 588^{k}$$

$$\text{Total FF} = \cancel{25}\ 30 \times (42 \times 100) \times 2 \times \frac{1}{1000} = 210^{k} / 252^{k}$$

$$\text{Total LL} = 40 \times (42 \times 100) \times 3 \times \frac{1}{1000} = 504^{k}$$

Total Dead = 894.933^{k}

Dead → Self weight { Frame, Slab }

LL →

Super Dead { FF, PW }

Wind in X:

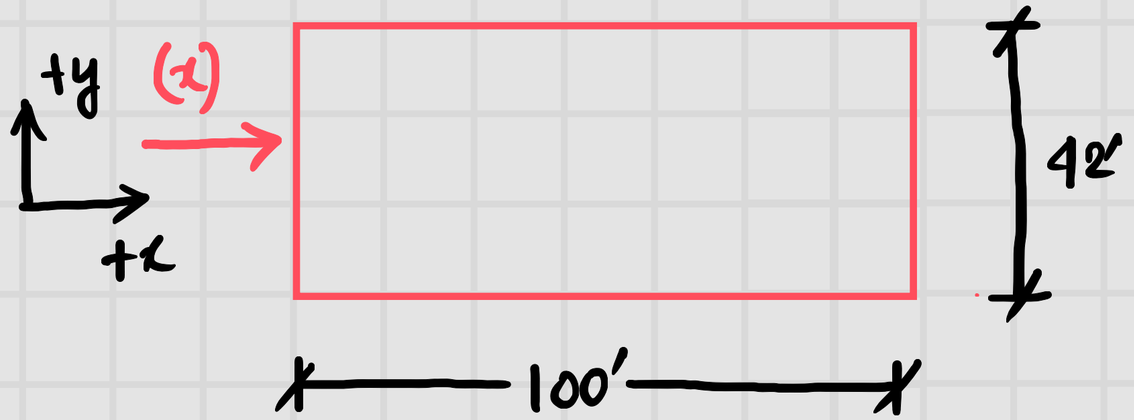
$$k_z \begin{cases} k_{11} = 0.85 \\ k_{22} = 0.92 \\ k_{33} = 0.99 \end{cases} \qquad k_h = k_{33} = 0.99$$

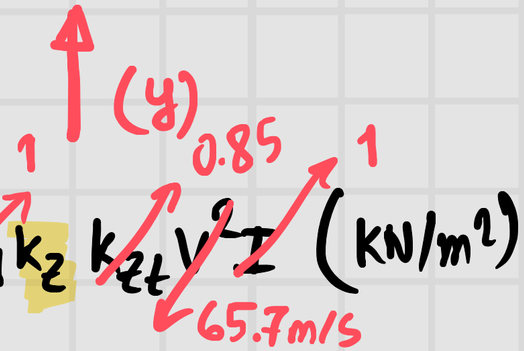
$$\frac{L}{B} = \frac{100}{42} = 2.38$$

Wall Pressure Co-efficient $\begin{cases} 0.8\ (W) \\ -0.281\ (L) \\ -0.7\ (S) \end{cases}$

$$\frac{h}{L} = \frac{33}{100} = 0.33$$

Roof Pressure Co-efficient, $C_p = -0.9$





$$q_z = 0.000613 K_d K_z K_{zt} V^2 I \quad (kN/m^2)$$

$$= (\quad) \times 20.89 \quad (psf)$$

$$= 49.98 K_z \quad (psf)$$

internal: $q_h \times (\pm GC_{pi})$ → ± 0.18

External: $q_z \times G_f \times C_p$

Design Pressure, P_z = External − (Internal)

Enclosed, Partially Enclosed, and Open Buildings: Walls & Roofs

Enclosure Classification	GC_{pi}
Open Building	0.00
Partially Enclosed Building	+0.55 -0.55
Enclosed Building	+0.18 -0.18

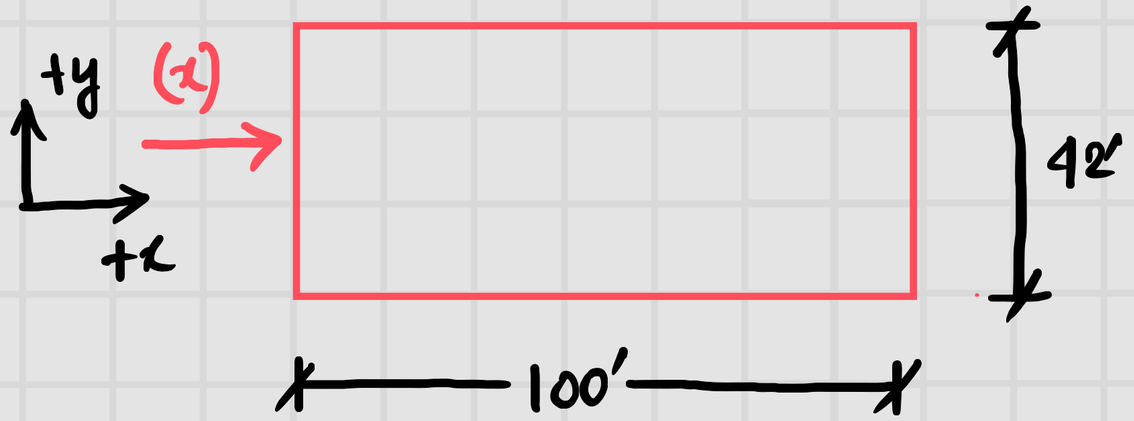
Notes:

1. Plus and minus signs signify pressures acting toward and away from the internal surfaces, respectively.
2. Values of GC_{pi} shall be used with q_z or q_h as specified in Sec 2.4.11.
3. Two cases shall be considered to determine the critical load requirements for the appropriate condition:
   (i) a positive value of GC_{pi} applied to all internal surfaces
   (ii) a negative value of GC_{pi} applied to all internal surfaces.

$+x$
$+y$
$+GC_{pi}$

$+x - GC_{pi}$
$+x - (-GC_{pi})$
$+y - GC_{pi}$
$+y - (-GC_{pi})$

Wind in Y :



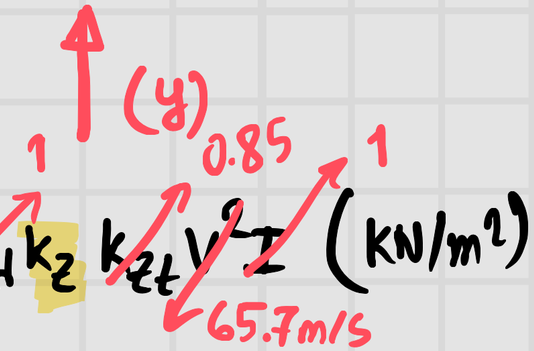
$$k_z \begin{cases} k_{11} = 0.85 \\ k_{22} = 0.92 \\ k_{33} = 0.99 \end{cases} \qquad k_h = k_{33} = 0.99$$

$$\frac{L}{B} = \frac{42}{100} = 0.42 < (0 \sim 1)$$

Wall Pressure Co-efficient $\begin{cases} 0.8\ (W) \\ -0.5\ (L) \\ -0.7\ (S) \end{cases}$

$$\frac{h}{L} = \frac{33}{42} = 0.79$$

Roof Pressure Co-efficient, $C_p = -0.98$



$$q_z = 0.000613 K_d K_z K_{zt} V^2 I \ (kN/m^2)$$

$$= (\quad) \times 20.89 \ (psf)$$

$$= 49.98 K_z \ (psf)$$

$x-(GC_{pi})$ $\quad x-(-GC_{pi})=x+GC_{pi}$

$y-GC_{pi}$ $\quad y+GC_{pi}$

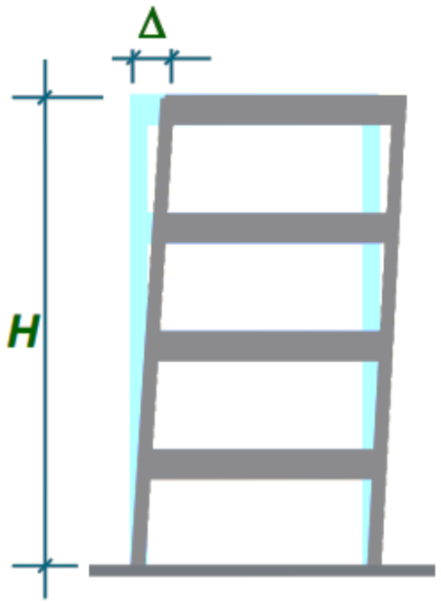
~~Local Axes~~

$u_1 \rightarrow x$

$u_2 \rightarrow y$

$u_3 \rightarrow z$

SERVICEABILITY CONSIDERATIONS



Overall sway of the building at top shall not be more than 1/500 of the height of the building. (Sec. 1.5.6.2, Part 6)

$$\Delta \leq \frac{H}{500} = \frac{33\times12}{500} = 0.792$$

Load combination for checking sway. (Sec. 2.7.5, Part 6)

$D + 0.5L + 0.7W$ → M1 M3 M2 M4