

Company: Company

Project: IE HECTOR MANUEL VIDES BALLESTEROS (MÓDULO 5)

File: C:\IE REGIDOR\MOD5.rcb

Engineer: Name

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WIND LOADS NSR-10

Wind pressure

$$p = q G C_p \text{ rigid buildings}$$

$$= q G_f C_p \text{ flexible buildings}$$

$$q_z = 0.00483 K_z K_{zt} K_d V^2 I \text{ (Kg/m}^2\text{)}; V \text{ in Km/h}$$

WIND LOADING PARAMETERS

Basic wind speed (Km/h), V = 125

V: 3-second gust speed at 10 m, with annual probability of 0.002

Importance factor, I = 1.15

OCCUPANCY CATEGORY	IMPORTANCE (1)	F A C T O R (2)
I Normal occupancy buildings	0.87	0.77
II Especial occupancy buildings	1.00	1.00
III Public assistance facilities	1.15	1.15
IV Essential facilities	1.15	1.15
(1): Non-hurricane prone regions with V=140-160 km/h		
(2): Hurricane prone regions with V >160 Km/h		

Exposure category = C

ROUGHNESS	DESCRIPTION
B	Urban and suburban areas, wooded areas, obstructions >30ft
C	Open terrain with scattered obstructions less than 30 ft
D	Flat, unobstructed areas, wind over large bodies of water

Directionality factor, K_d = 0.85Topographic factor, K_{zt} = 1.0

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$

Wall pressure coefficients, C_p

Windward wall	 = 0.8
Leeward wall (Wind X)	 = -0.2
Leeward wall (Wind Y)	 = -0.5
Side walls	 = -0.7
Roof	 = 0.0

GUST EFFECTS FACTORS

Basic wind velocity, (Km/h) = 125

Exposure category = C

Exposed height, (m) = 3.05

	X-direction	Y-direction	
Computed natural frequency, f (Hz) =	4.878	6.024	
Height / Length ratio, H/L =	.047	.262	
Structure clasification =	RIGID	RIGID	
Background response index, Q =	.919	.82	(Eq. B.6.5-4)
Resonant response factor, R ₁ *.... =	.105	.035	(Eq. B.6.5-8)
Gh: Rigid - Simplified analysis .. =	.85	.85	(Sec B.6.5.8.1)
Gh: Rigid - Complete analysis =	.879	.822	(Eq. B.6.5-2)
Gf: Flexible -Analytical(2% dampng)=	1.057	.987	(Eq. B.6.5-6)
Gf: Flexible -Analytical(1% dampng)=	1.059	.987	(Eq. B.6.5-6)

Gust effects factor, G = .879 .822

* 1% damping ratio. For damping ratio β , $R = R_1 * (0.01/\beta)^{1/2}$

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VELOCITYPRESSURE

Floor -	Height z, m	Pressure qz, K/m2
-----	-----	-----
2	3.04	63.297
1	0.0	63.297

ACCIDENTAL TORSION FOR WIND LOADS

	X-direction -----	Y-direction -----
Accidental eccentricity as a percentage of building dimension, (%)=	15	15

WY is Envelope of:
Case 1: Pwy + Ply
Case 2: 0.75 (Pwy + Ply) + Mt
Mt=0.75(Pwy+Ply)Bx ex

WX is Envelope of:
Case 1: Pwx + Plx
Case 2: 0.75 (Pwx + Plx) + Mt
Mt=0.75 (Pwx+Plx)By ey

NOTE: Load cases 3 and 4 are handled through load combinations

ACCIDENTAL ECCENTRICITY WIND LOADS

	X-DIRECTION (WY) -----	Y-DIRECTION (WX) -----
Level -	ex (m)	ey (m)
-----	-----	-----
2	9.83	1.74

WY is Envelope of:
Case 1: Pwy + Ply
Case 2: 0.75 (Pwy + Ply) + Mt
Mt=0.75(Pwy+Ply)Bx ex

WX is Envelope of:
Case 1: Pwx + Plx
Case 2: 0.75 (Pwx + Plx) + Mt
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Wind nodal forces:

$P_w = \sum p_z A_i$
 $P_s = \sum p_h A_i$
 $A_i = \text{Nodal tributary area}$

$P_l = \sum p_h A_i$
 $P_r = \sum p_h A_i$

W I N D F O R C E S : X - D I R E C T I O N					
Floor No	Height z, m	Windward Pw, Ton	Leeward Pl, Ton	Side Ps, Ton	Roof Pr, Ton
2	3.04	0.79	0.20	3.89	0.0
1	0.0	0.55	0.14	0.0	0.0

Base shear, $V:\sum(P_w+P_l)$.. = 1.66 ton

Building Weight, W = 373.25 ton ($V/W = 0.004$)

Overturning moment

From horizontal forces . = 3.00 ton-m

From roof forces = 0.0 ton-m

Total moment, Mo = 3.00 ton-m

Stabilizing moment, Ms.... = 12103.59 ton-m ($M_o/M_s = 0.0$)

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$P_l = \sum p_h A_i$

$P_r = \sum p_h A_i$

W I N D F O R C E S : Y - D I R E C T I O N					
Floor No	Height z, m	Windward Pw, Ton	Leeward Pl, Ton	Side Ps, Ton	Roof Pr, Ton
2	3.04	4.15	2.59	0.65	0.0
1	0.0	0.0	0.0	0.45	0.0

Base shear, $V:\sum(P_w+P_l) \dots = 6.76 \text{ ton}$

Building Weight, $W \dots = 373.25 \text{ ton} \quad (V/W = 0.018)$

Overturning moment

From horizontal forces $\dots = 20.61 \text{ ton-m}$

From roof forces $\dots = 0.0 \text{ ton-m}$

Total moment, $M_o \dots = 20.61 \text{ ton-m}$

Stabilizing moment, $M_s \dots = 1257.56 \text{ ton-m} \quad (M_o/M_s = 0.016)$