

Wind Load Calculation IS 875 Part 3 2015

Basic Wind Speed (As per DBR)	V _b =	50.00	m/s
Risk coefficient (for General Buildings as per DBR)	K ₁ =	1.00	
Terrain, height and structure size factor (from Table 2 of IS:875 III, for Terrain category 2 & Class B)	K ₂ =	1.07	
Topography factor (As per Cl: 5.3.3.1 for upwind slope < 3°)	K ₃ =	1.00	
Design Wind Speed V _z = V _b *k ₁ *k ₂ *k ₃	=	53.50	m/s
Design Wind Pressure P _z = 0.6 V _z ²	=	1717.4	N/m ²
	P_z =	1.5	kN/m²

Building Dimensions:

Length of the building	l =	48.00	m
Width of the building	w =	14.000	m
Height of the building	h =	12.200	m
Slope of the roof	1 in 10 =	5.7	deg

P_d from design basis

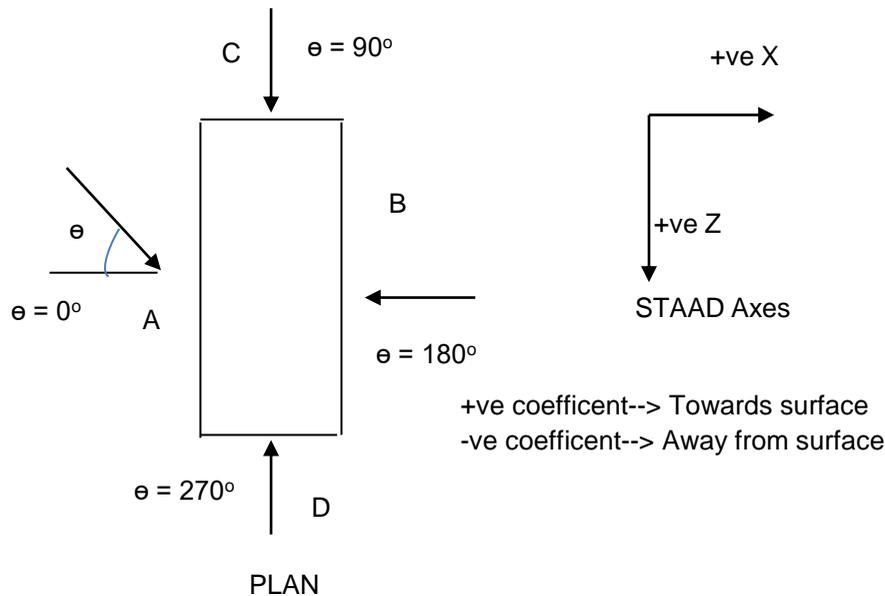
1.50 kN/m² - 12m for roofs

Pressure Coefficients:

Internal pressure coefficient	C _{pi} =	0.7	(Cl.6.2.3.1 of IS 875- PART-3)
Opening area		434.0	m ²
building area		832.0	m ²
(for % of openings > 20)			
Height to width	h/w =	0.8714	(1/2 < h/w)
length to width	l/w =	3.4286	(3/2 < l/w < 4)

$\frac{1}{2} < \frac{h}{W} < \frac{3}{2}$ $\frac{3}{2} < \frac{l}{W} < 4$			0	+0.7	-0.3	-0.7	-0.7	} -1.1
			90	-0.5	-0.5	+0.7	-0.1	

External Pressure Coefficient:



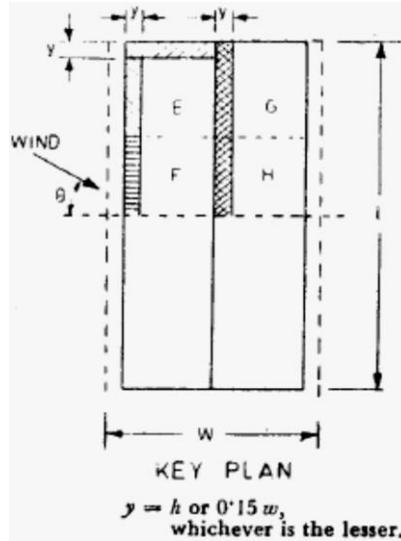
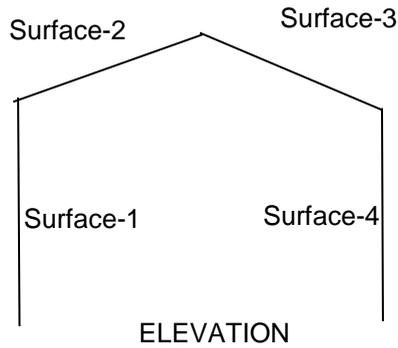
C_{pe} for walls:

Table 4 of IS: 875 (III)

External Pressure Coefficient(C_{pe})

θ	A	B	C	D
0	0.70	-0.3	-0.7	-0.7
90	-0.6	-0.6	0.70	-0.25
180	-0.2	0.70	-0.5	-0.5
270	-0.5	-0.5	-0.2	0.7

C_{pe} for Roof:



Surface 5 is gable end on side 'C'
Surface 6 is gable end on side 'D'

For roof slope = 5.71deg

θ	EF	GH	EG	FH
0	-0.94	-0.40		
90			-0.80	-0.43
180	-0.4	-0.94		
270			-0.43	-0.8

Overall pressure coefficient = C_{pe} ± C_{pi}

Notation

- +ve Wind Transverse (+ve Internal Pressure)
- +ve Wind Transverse (-ve Internal Pressure)
- ve Wind Transverse (+ve Internal Pressure)
- ve Wind Transverse (-ve Internal Pressure)
- +ve Wind Longitudinal (+ve Internal Pressure)
- +ve Wind Longitudinal (-ve Internal Pressure)
- ve Wind Longitudinal (+ve Internal Pressure)
- ve Wind Longitudinal (-ve Internal Pressure)

Load Case	Overall Pressure Coefficient					
	Surface-1	Surface-2	Surface-3	Surface-4	Surface-5	Surface-6
WLx P	0.00	-1.64	-1.10	-1.00	-1.40	-1.40
WLx S	1.40	-0.24	0.30	0.40	0.00	0.00
WL-x P	-1.00	-1.10	-1.64	0.00	-1.40	-1.40
WL-x S	0.40	0.30	-0.24	1.40	0.00	0.00
WLz P	-1.30	-1.50	-1.50	-1.30	0.00	-0.95
WLz S	0.10	-0.10	-0.10	0.10	1.40	0.45
WL-z P	-1.30	-1.50	-1.50	-1.30	-0.95	0.00
WL-z S	0.10	-0.10	-0.10	0.10	0.45	1.40

Design wind load on surface = (C_{pe} ± C_{pi}) * Pd * tributary width kN/m

Main Frame

Frame	Trib, m
Frame-1 and 4	3
Frame-2 to 3	6
Gable end	7
Gable end	3.5

Gable End

Col	Trib, m
Col -1	7
Col -2	7

Loads on Frame-1

Load Case	Design Wind Load (kN/m)					
	Surface-1	Surface-2	Surface-3	Surface-4	Surface-5	Surface-6
WLx P	0.00	-7.38	-4.95	-4.50	-7.35	-7.35
WLx S	6.30	-1.08	1.35	1.80	0.00	0.00
WL-x P	-4.50	-4.95	-7.38	0.00	-7.35	-7.35
WL-x S	1.80	1.35	-1.08	6.30	0.00	0.00
WLz P	-5.85	-6.75	-6.75	-5.85	0.00	-4.99
WLz S	0.45	-0.45	-0.45	0.45	7.35	2.36
WL-z P	-5.85	-6.75	-6.75	-5.85	-4.99	0.00
WL-z S	0.45	-0.45	-0.45	0.45	2.36	7.35

Loads on Frame-2 to 3 upto 10m ht

Load Case	Design Wind Load (kN/m)					
	Surface-1	Surface-2	Surface-3	Surface-4	Surface-5	Surface-6
WLx P	0.00	-14.76	-9.90	-9.00	-14.70	-14.70
WLx S	12.60	-2.16	2.70	3.60	0.00	0.00
WL-x P	-9.00	-9.90	-14.76	0.00	-14.70	-14.70
WL-x S	3.60	2.70	-2.16	12.60	0.00	0.00
WLz P	-11.70	-13.50	-13.50	-11.70	0.00	-9.98
WLz S	0.90	-0.90	-0.90	0.90	14.70	4.73
WL-z P	-11.70	-13.50	-13.50	-11.70	-9.98	0.00
WL-z S	0.90	-0.90	-0.90	0.90	4.73	14.70

Loads on Frame-2 to 3 upto 10 to 15

Load Case	Design Wind Load (kN/m)			
	Surface-1	Surface-2	Surface-3	Surface-4
WLx P	0.00	-14.76	-9.90	-9.00
WLx S	12.60	-2.16	2.70	3.60
WL-x P	-9.00	-9.90	-14.76	0.00
WL-x S	3.60	2.70	-2.16	12.60
WLz P	-11.70	-13.50	-13.50	-11.70
WLz S	0.90	-0.90	-0.90	0.90
WL-z P	-11.70	-13.50	-13.50	-11.70
WL-z S	0.90	-0.90	-0.90	0.90

Load on open structure

Wind force on member, $F=C_f A_e p_d$

The value of force coefficients apply to a building or structure as a whole, and when multiplied by the effective frontal area A_e of the building or structure and by design wind pressure p_d , gives the total wind load on that particular building or structure.

$$F = C_f A_e p_d$$

where F is the force acting in a direction specified in the respective tables and C_f is the force coefficient for the building.

C_f - Net force coefficient

1.6

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Level	ground "m"	Pd (kN/m ²)	Cf * Pd (kN/m ²)
Level-1	0.00 - 5.00	1.587	2.54
Level-2	5.00 - 10.00	1.587	2.54
Level-3	10.00 - 15.00	1.750	2.80

z, (m)	Member	Member wind exposed width	F=qzxC _f xG _d , (kN/m) (Per frame)	Direction "X" or "Z"	Elevations in 'm'	Remarks
5.00	UB357	0.171	0.43	X	105.000	Column
9.50	UB533	0.210	0.53	X	109.500	Column
5.70	UC203	0.200	0.56	X	105.700	Beams
5.00	UB533	0.533	1.35	Z	105.000	Column
9.50	UB533	0.533	1.35	Z	109.500	Column

*Fireproof exposed wind area considered upto 9.5m. Above 9m applied using staad definition.