2.8 Design for wind action

The wind pressure on a structure depends on the location of the structure, height of structure above the ground level and also on the shape of the structure. The code gives the basic wind pressure for the structures in various parts of the country. Both the wind pressures viz. including wind of short duration and excluding wind of short duration, have been given. All structures should be designed for the short duration wind.

For buildings upto 10m in height, the intensity of wind pressure, as specified in the code, may be reduced by 25% for stability calculations and for the design of framework as well as cladding. For buildings over 10m and upto 30 m height, this reduction can be made for stability calculations and for design of columns only.

The total pressure on the walls or roof of an industrial building will depend on the external wind pressure and also on internal wind pressure. The internal wind pressure depends on the permeability of the buildings. For buildings having a small degree of permeability, the internal air pressure may be neglected. In the case of buildings with normal permeability the internal pressure can be $\pm$ 0.2p. Here '+' indicates pressure and '-' suction, 'p' is the basic wind pressure. If a building has openings larger than 20% of the wind pressure. If a building has openings larger than 20% of the wall area, the internal air pressure will be $\pm$0.5 p.

(a) Wind pressure on walls

The wind pressure per unit area 'p' on the wall is taken as 0.5p pressure on windward surface and 0.5p suction on leeward surface. When the walls form an enclosure, the windward wall will be subjected to a pressure of 0.5p and leeward

wall to a suction of 0.5p. The total pressure on the walls will depend on the internal air pressure also.

For buildings with small permeability, design pressure on wall = 0.5p

For buildings with normal permeability, design pressure on wall = 0.7p

For buildings with large openings, design pressure on wall = p

(b) Wind loads on roofs

TABLE 2.2

Wind pressure on roofs (Wind normal to eaves) Sums of external and internal pressure

Roof of pitch	Zero Permeability		Normal Permeability				Large openings			
	External Pressure		p_1^* =+0.2p		p_1^* = -0.2p		p_1^* =+0.5p		p_1^* = -0.5p	
	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward	Windward	Leeward
1	2	3	4	5	6	7	8	9	10	11
0	-1.00	-0.50	-1.2	-0.70	-0.8	-0.30	-1.5	-1.00	-0.5	0.00
10	-0.70	-0.50	-0.9	-0.70	-0.5	-0.30	-1.2	-1.00	-0.2	0.00
20	-0.40	-0.50	-0.6	-0.70	-0.2	-0.30	-0.9	-1.00	+0.1	0.00
30	-0.10	-0.50	-0.3	-0.70	+0.1	-0.30	-0.6	-1.00	+0.4	0.00
40	+0.10	-0.50	-0.1	-0.70	+0.3	-0.30	-0.4	-1.00	+0.6	0.00
50	+0.30	-0.50	+0.1	-0.70	+0.5	-0.30	-0.2	-1.00	+0.8	0.00
60	+0.40	-0.50	+0.2	-0.70	+0.6	-0.30	-0.1	-1.00	+0.9	0.00
70	+0.50	-0.50	+0.3	-0.70	+0.7	-0.30	0	-1.00	+1.00	0.00
80	+0.50	-0.50	+0.3	-0.70	+0.7	-0.30	0	-1.00	+1.00	0.00
90	+0.50	-0.50	+0.3	-0.70	+0.7	-0.30	0	-1.00	+1.00	0.00

p_1^* => internal pressure

The pressure normal to the slope of the roof is obtained by multiplying the basic pressure p by the factors given in Table 13-3. The table also shows the effect of internal pressure produced due to the permeability of the cladding or opening in walls and roof.

If the wind blows parallel to the ridge of the roof, the average external wind pressure of the roof may be taken as -0.6p on both slopes of the roof over a length from the gable end equal to the mean height of the roof above the

surrounding ground level and as-0.4p over the remaining length of the roof on both slopes.

When the wind blows parallel to a surface, a wind force acts on the surface in the direction of the wind. This force is called the 'Wind Drag'. In the case of industrial buildings, when the wind blows normal to the ridges, the wind drag is equal to 0.05p measured on plan area of roof and when the direction of wind parallel to the ridge, wind drag is equal to 0.025p measured on plan area of roof.

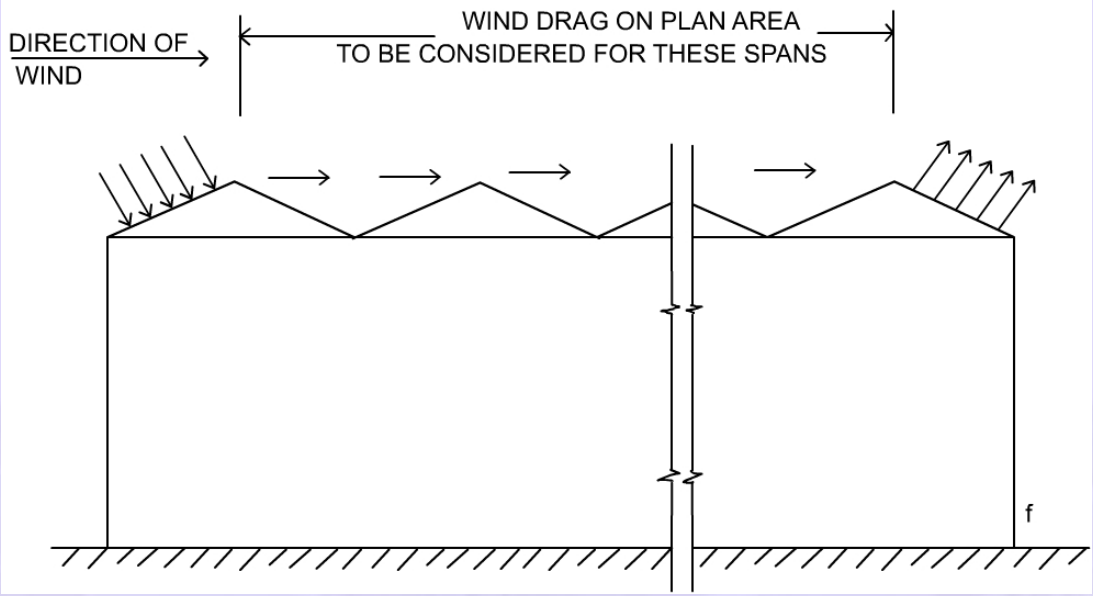

Fig. 2.29 Wind drag

In the multispan roofs with spans, heights and slopes nearly equal, the wind-ward truss gives shelter to the other trusses. For general stability calculations and for the design columns, the windward slope of wind-ward span and leeward slope of leeward span are subjected to the full normal pressure of suction as given in table 2.2 and on all other roof slopes, only wind drag is considered (see Fig. 2.29). For the design of roof trusses, however, full normal pressure or suction is considered on both faces, presuming that there was only one span.

The wind pressures given above are the average pressures on a roof slope. For designing the roof sheeting or the fastenings of roof sheeting, we may take a larger wind pressure because these pressures may considerably exceed the average value on small areas. For designing roof sheeting and its fastenings, the values given in Table 2.2 may be increased numerically by 0.3p. In a distance equal to 15% of the length of the roof from the gable ends, fastenings should be capable of resisting a section of 2.0p on the area of the roof sheeting them support.