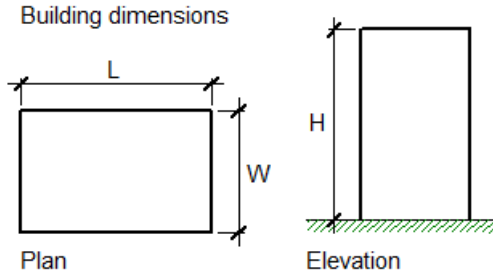


Wind loading details.;Case 1



Calculations for wind loads are in accordance with BS6399:Part 2:1997

The following calculations are in accordance with the flowchart stages indicated in Figure 1 of the code. The building shape is taken as rectangular, with a roof shape as defined later.

Stage 1 - Dynamic augmentation factor

The dynamic augmentation factor is determined, in accordance with clause 1.6.1, from the building type and the height of the building. The building type factor for portal sheds and similar light structures with few internal walls, $K_b = 2$ and the building height, H , is 7 m.

Using equation C.2 of annex C, the dynamic augmentation factor $C_r = 0.033$.

Stage 2 - Check limits of applicability

The dynamic augmentation factor is less than 0.225 and the height of the building is less than 300m, hence, in accordance with clause 1.6.2, BS6399:Part 2:1997 is applicable.

Stage 3 - Basic wind speed

In accordance with clause 2.2.1 and Figure 6, the basic wind speed, $V_b = 22$ m/s.

Stage 4 - Site wind speed

Now determine the site wind speed in accordance with clause 2.2.2. The direction factor (S_d), the seasonal factor (S_s) and the probability factor (S_p) are all taken as 1.0. As there are no significant topographical features, the site altitude factor, S_a , is determined using clause 2.2.2.2.2, where

$$\begin{aligned} S_a &= 1 + 0.001 \cdot \Delta_s \\ &= 1 + 0.001 \cdot 35.7 \\ &= 1.036 \end{aligned}$$

Hence, the site wind speed is determined from

$$\begin{aligned} V_s &= V_b \cdot S_a \cdot S_d \cdot S_s \cdot S_p \\ &= 22 \cdot 1.036 \cdot 1 \cdot 1 \cdot 1 \\ &= 22.792 \text{ m/s} \end{aligned}$$

Stage 5 - Terrain categories effective height

The reference height (H_r), will be taken conservatively as the maximum height of the building above ground level in accordance with 1.7.3.1. The effective height (H_e) will be determined in accordance with clauses 1.7.3.2 and 1.7.3.3 for the appropriate terrain type and pressure coefficient tables & figures. The maximum height of the building above ground level (H) is 7.576 m, with the ridge assumed to be at the midpoint of the flat roof. *Side 1* ground terrain type is 'country', *Side 2* ground terrain type is 'country', *Side 3* ground terrain type is 'country' and *Side 4* ground terrain type is 'country'.

Stage 6 - Choice of method

The **standard method** of analysis in accordance with clause 1.8.2 and as defined in section 2 of the code, will be used.

Stage 7 - Standard effective wind speed

The building will be considered in two directions; a) wind perpendicular to the longer sides and b) wind perpendicular to the shorter sides. First, establish the number of parts the height of the building should be divided into, in accordance with clause 2.2.3.2. Refer to the tabulated output below for; the reference height (H_r), the effective height (H_e), the terrain and building factor (S_b), the site wind speed (V_s) and the effective wind speed (V_e) for the number of parts relevant to each direction. *Side 1* of the building is located 58 km from the sea, *side 2* - 58 km, *side 3* - 58 km and *side 4* - 58 km from the sea.

Case a) - the windward width, B , of the building is 32 m and its height, H , is 7.576 m. As the building height is not more than the windward width, the building is considered to be formed from 1 part.

Side	Part	H_o (m)	X_o (m)	V_s (m/s)	H_r (m)	H_e (m)	S_b	V_e (m/s)
1	1	7	30	22.792	7.576	7.576	1.59	36.2
2	1	7	30	22.792	7.576	7.576	1.59	36.2
3	1	7	30	22.792	7.576	7.576	1.59	36.2
4	1	7	30	22.792	7.576	7.576	1.59	36.2

Case b) - the windward width, B , of the building is 22 m and its height, H , is 7.576 m. As the building height is not more than the windward width, the building is considered to be formed from 1 part.

Side	Part	H_o (m)	X_o (m)	V_s (m/s)	H_r (m)	H_e (m)	S_b	V_e (m/s)
1	1	7	30	22.792	7.576	7.576	1.59	36.2
2	1	7	30	22.792	7.576	7.576	1.59	36.2
3	1	7	30	22.792	7.576	7.576	1.59	36.2
4	1	7	30	22.792	7.576	7.576	1.59	36.2

Stage 8 - Dynamic pressure

The dynamic pressure (q_s) is determined in accordance with clause 2.1.2 and are tabulated below for cases a) and b) defined in stage 7.

Case a)

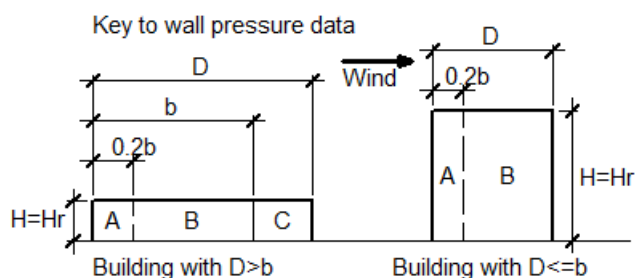
Side	Part	V_e (m/s)	q_s (Pa)	q_s (kN/ m ²)
1	1	36.2	803.3	0.8
2	1	36.2	803.3	0.8
3	1	36.2	803.3	0.8
4	1	36.2	803.3	0.8

Case b)

Side	Part	V_e (m/s)	q_s (Pa)	q_s (kN/ m ²)
1	1	36.2	803.3	0.8
2	1	36.2	803.3	0.8
3	1	36.2	803.3	0.8
4	1	36.2	803.3	0.8

Stage 9 - Standard pressure coefficients

Wall pressure coefficients



For rectangular plan buildings, the external pressure coefficients for the walls are determined in accordance with clause

2.4.1 and table 5. The exposure condition for each face of the building is determined in accordance with clauses 2.4.1.3 and 2.4.1.4.

Side	B (m)	H (m)	b (m)	X_o (m)	H _r (m)	Isolated/ Funnelling
1	32	7	14	30	7.576	Isolated
2	22	7.576	15.153	30	7.576	Isolated
3	32	7	14	30	7.576	Isolated
4	22	7.576	15.153	30	7.576	Isolated

Case a) - the windward width, B , of the building is 32 m, its depth, D, is 22 and its height, H , is 7 m.

Side	Wall face	D/H	C_{pe}	length of zone (m)
1	Windward	3.14	0.67	n/a
	Leeward	3.14	-0.5	n/a
	Side - zone A	n/a	-1.3	2.8
	- zone B	n/a	-0.8	11.2
	- zone C	n/a	-0.5	8
3	Windward	3.14	0.67	n/a
	Leeward	3.14	-0.5	n/a
	Side - zone A	n/a	-1.3	2.8
	- zone B	n/a	-0.8	11.2
	- zone C	n/a	-0.5	8

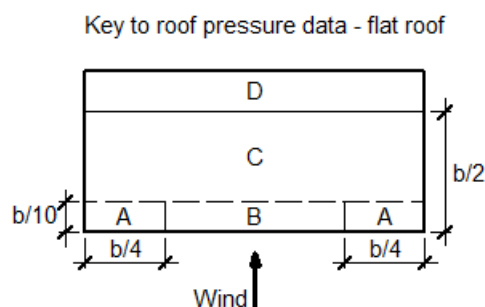
As the building width, D, exceeds dimension b, the surface in side wall zone C is subject to friction induced loads, in accordance with clause 2.4.5. The wall surface is smooth without corrugations or ribs across the wind direction and has a frictional drag coefficient of 0.01.

Case b) - the windward width, B , of the building is 22 m, its depth, D, is 32 m and its height, H , is 7.576 m.

Side	Wall face	D/H	C_{pe}	length of zone (m)
2	Windward	4.22	0.6	n/a
	Leeward	4.22	-0.5	n/a
	Side - zone A	n/a	-1.3	3.03
	- zone B	n/a	-0.8	12.123
	- zone C	n/a	-0.5	16.847
4	Windward	4.22	0.6	n/a
	Leeward	4.22	-0.5	n/a
	Side - zone A	n/a	-1.3	3.03
	- zone B	n/a	-0.8	12.123
	- zone C	n/a	-0.5	16.847

As the building width, D, exceeds dimension b, the surface in side wall zone C is subject to friction induced loads, in accordance with clause 2.4.5. The wall surface is smooth without corrugations or ribs across the wind direction and has a frictional drag coefficient of 0.01.

Roof pressure coefficients



The external pressure coefficients for the roof are determined in accordance with clause 2.5.1 and table 8. The slope of the roof is parallel to the shorter dimension of the building.

Case a) - the windward width, B , of the building is 32 m, its depth, D, is 22 m and its height, H , is 7 m. Dimension b, in

accordance with clause 2.5.1.2 is 14 m. The building has a flat roof with sharp eaves, with a roof pitch of 3° . The pressure coefficients for various roof zones are as tabulated below;

Flat roof surface	C_{pe}	length of zone (m)	width of zone (m)
Zone A	-2	1.4	3.5
Zone B	-1.4	1.4	25
Zone C	-0.7	5.6	32
Zone D - positive	0.2	15	32
- negative	-0.2		

As the roof surface is considered to be 'long' in accordance with clause 2.5.10.1, friction induced loads will result on the roof. These loads will be applied to zone D of the roof only. The roof surface is smooth without corrugations or ribs across the wind direction and has a frictional drag coefficient of 0.01.

Case b) - the windward width, B, of the building is 22 m, its depth, D, is 32 m and its height, H, is 7 m. Dimension b, in accordance with clause 2.4.1.3 is 14 m.

Flat roof surface	C_{pe}	length of zone (m)	width of zone (m)
Zone A	-2	1.4	3.5
Zone B	-1.4	1.4	15
Zone C	-0.7	5.6	22
Zone D - positive	0.2	25	22
- negative	-0.2		

As the roof surface is considered to be 'long' in accordance with clause 2.5.10.1, friction induced loads will result on the roof. These loads will be applied to zone D of the roof only. The roof surface is smooth without corrugations or ribs across the wind direction and has a frictional drag coefficient of 0.01.

Internal pressure coefficients

The internal pressure coefficients will be considered in turn as described in clause 2.6.1 and Table 16 of the code.

Stage 10 - Wind loads

Now determine the sub-division of the building to establish overall and local loads based on the relevant diagonal dimensions defined by clauses 2.1.3.4 and 2.6. This allows the external and internal surface pressures to be established in accordance with clauses 2.1.3.1 and 2.1.3.2. The net surface pressures, surface loads and overall loads can then be calculated in accordance with clauses 2.1.3.3, 2.1.3.5 and 2.1.3.6 respectively.