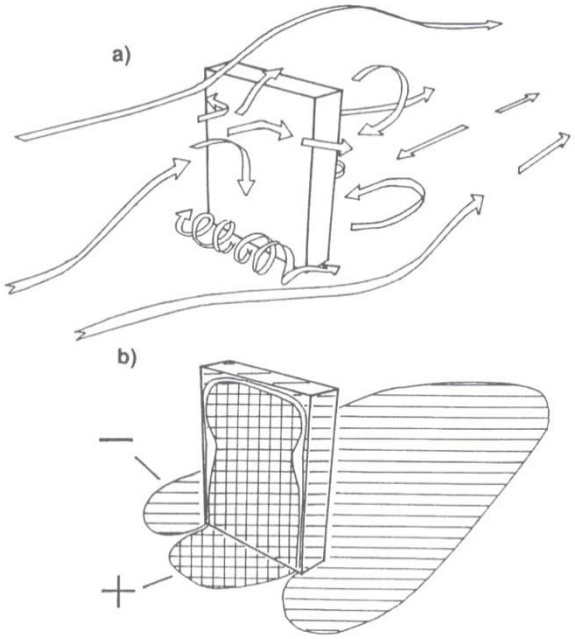
WINDLOADS EXPLAINED

Wind originates due to air movement from high pressure- to low pressure areas. Due to attrition with the earth's surface (buildings, forests), however, the air movement in the lower air layers will be slowed down: wind speed increases proportionately by height. This degree of increase is again determined by the roughness (construction) of the earth's surface.
Above sea e.g. a less high air layer will be slowed down. This explains why in the coastal regions the wind blows on average more than in inland areas.
Due to the friction of the air layers, swirls and gusts also occur. Especially in constructions that are sensitive to time-varying wind loads, it is considered advisable to take this into account. Wind nuisance occurs not only within a large complex of buildings such as e.g. the centre of a city, but also in the immediate vicinity of a building.

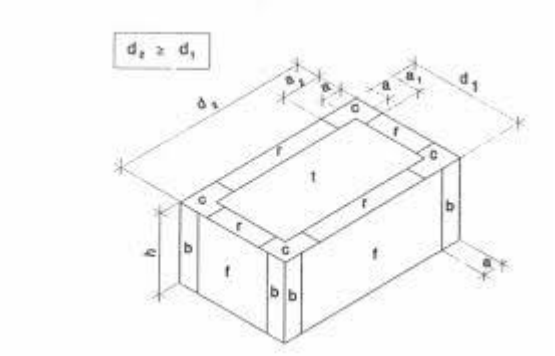


- On the one hand, the fact that constructions such as buildings, cranes and towers experience certain wind loads must be taken into account of.
- On the other hand, one has to deal with the occurrence of wind nuisance, especially in the vicinity of tall buildings.
- Another important factor that must be taken into account when orienting buildings, in relation to each other and locating the entrances, etc., is the most common wind direction.

The wind causes a load on a structure, where we can distinguish between external pressure (or suction, or friction) and internal pressure (or suction). Local Standards therefore indicates that the most unfavourable combination (s) of simultaneous effective wind loads must be directive in the calculations.

Local Standards (as in Europe the Eurocode 1, the European standard for determining the wind load on buildings (EN 1991 1-4 including the accompanying National Annexes)), are the basis for all your calculations. Depending on, among other things such as geographical differences, the building height and the surroundings, these Standards indicates a value for the maximum 'Windloads'. In the Eurocode 1 it is a measure of expected value of wind in a storm that can occur once every 50 years.

Term used	Beaufort scale	Speed in km/h	Speed in m/s	Speed in knots
Calm	0	Less than 1	0 to 0,2	Less than 1
Weak wind	1-2	1 to 11	0,3 to 3,3	1 to 6
Moderate wind	3-4	12 to 28	3,4 to 7,9	7 to 16
Strong wind	5	29 to 38	8 to 10,7	17 to 21
Strong wind	6	39 to 49	10,8 to 13,8	22 to 27
Very strong wind	7	50 to 61	13,9 to 17,1	28 to 33
Storm wind	8	62 to 74	17,2 to 20,7	34 to 40
Storm	9	75 to 88	20,8 to 24,4	41 to 47
Strong storm	10	89 to 102	24,5 to 28,4	48 to 55
Very strong storm	11	103 to 117	28,5 to 32,6	56 to 63
Hurricane	12	More than 117	More than 32,6	More than 63



At the corners or at the edges of a building, the wind loads are much heavier and turbulent than in the middle area due to wind-suction. Therefore Standards provides special calculation rules to determine the width of the strip of the building- and roof-edges on which a heavier and more turbulent wind load occurs.
Standard indicate that the external load must be regarded in a number of situations both in the form of pressure and in suction. A local external form factor expresses the fact that high wind loads can occur in typical local situations. Thus, for example, the load resulting from wind suction often will be normative along the edges of a building.

New buildings to be reconstructed in an already built-up area mutate the wind load on the existing buildings. This all related to the shape and dimensions of the buildings, the mutual distance and the roughness of the surroundings. In such cases the wind load has to be determined by measurements on scale models in a wind tunnel model. This has to be carried out in the so-called design phase so the influence of, and on, the existing surrounding buildings can be taken into account. This is especially for construction engineers and façade builders of importance, but also for owners of buildings where a new building is scheduled nearby.

TWEHA, 2020