WIND LOAD

Wind arises because air moves from areas of high pressure to areas of low pressure. However, due to friction with the Earth's surface (buildings, forests), air movement in the lower layers of the atmosphere is slowed down. As a result, wind speed increases significantly with height. This increase is further determined by the roughness of the Earth's surface.

For example, over the sea, a lower air layer is affected by friction. This explains why coastal areas generally experience stronger winds than inland regions.
Due to friction between different air layers, turbulence and gusts also occur. Especially for structures that are sensitive to time-dependent wind loads, it is advisable to take these effects into account.

- On one hand, it is necessary to consider that structures such as buildings, cranes, and towers are subject to specific wind loads.
- On the other hand, wind nuisance must also be considered, particularly in the vicinity of tall buildings.
- Another important factor to consider when orienting buildings relative to each other and designing entrances, etc., is the prevailing wind direction.

Wind nuisance occurs not only within large building complexes such as city centers but also in the immediate surroundings of a building.

Wind exerts a load on a structure, which can be divided into external pressure (or suction, or friction) and internal pressure (or suction). The standard specifies that the most unfavorable combinations of simultaneously acting wind loads must be included in calculations.

All our calculations are based on Eurocode 1, the European standard for determining wind loads on buildings (EN 1991_1-4, including the relevant National Annexes). Depending on factors such as building height and surroundings, the Eurocode provides a value for the maximum ‘stagnation pressure’ (in N/m^2) at the roof edge height. This value represents the force of the wind on a specific surface area during a storm that occurs once every 50 years.

The Eurocode also provides calculation rules for determining the ‘safe’ distances from the edge of the building and roof edge. The wind is much stronger and more turbulent at the corners or edges of a building than in the central area.

The standard states that external loads must be considered in certain situations both as pressure and suction. External suction on building components smaller than 10 m^2, particularly near roof edges and façade corners, is calculated using a special wind shape factor (Cp",1o..). This local external shape factor indicates that high wind loads can occur in specific local situations. In other words, wind suction is generally most significant along the edges of a building.

Given the geographical variations in extreme hourly mean wind speeds, NEN 6702:1991 divides the Netherlands into three regions. In each region, a representative extreme hourly mean wind speed has been established.

New buildings in urban areas alter the wind load on existing structures. This depends on the shape and dimensions of the buildings, the distance between them, and the roughness of the surroundings. In such cases, wind load is typically determined through wind tunnel testing using scale models. This is done during the design phase to assess the impact of new buildings on their surroundings. This information is particularly relevant for structural engineers and façade designers, but also for owners of buildings near a planned new construction.

Wind tunnel studies often reveal that local pressure effects can be more severe than those specified in the Eurocode.

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