

### Introduction

The CWCT Standard for systemised building envelopes, Clause 2.3.1 states that 'Live loads other than snow load, do not act concurrently with the maximum wind load'.

This raises two issues:

- If wind load is considered to act concurrently with snow load, is it necessary to consider both loads acting at their maximum value?
- Whilst it is unlikely that live loads will act concurrently with the maximum wind load, it is not impossible for this to occur and it is probable that if live loads occur there will be some wind load acting.

This clause therefore requires clarification.

### Combination of wind load and snow load

The reference to snow and wind load acting in combination was introduced in the CWCT Standard for slope glazing and followed recommendations in BS 5516: 1991 which recommended combining wind and snow loads at their maximum values. BS5516: 1991 has been superseded by BS 5516: 2004 which applies a reduction factor of 0.6 to one of the loads. Thus design should be carried out for:

- wind load plus 0.6 snow load,
- or
- snow load plus 0.6 wind load,

whichever gives the more severe loading action. In assessing the severity of loading action due account should also be made for the effect of load duration on structural performance and glass selection.

It is recommended that the load combinations given above from BS 5516: 2004 should be adopted for the design of systemised building envelopes.

### Live loads on facades

The CWCT Standard identifies the following live loads:

1. Maintenance loads
2. Loads due to building occupants
3. Wind load on permanent fixtures

Maintenance loads are highly unlikely to occur concurrently with the maximum wind load as maintenance work should be suspended when severe weather likely to give rise to high wind is forecast. It is therefore unnecessary to consider maintenance loads acting concurrently with the maximum wind loads. Maintenance loads will normally be very much less than the maximum wind load so that the combination of maintenance load and a lower level of wind load is unlikely to be more critical than the maximum wind load on its own.

Wind load on permanent fixtures will always occur concurrently with the wind load on the façade.

For a predominately glass façade it might be prudent for building occupants to be kept well back from the façade when severe winds approaching the maximum design wind load are forecast and as a result occupancy loads would not occur concurrently with the maximum wind load. However, this cannot be guaranteed and it is therefore necessary to consider the combination of occupancy loads and wind loads. Depending on the nature of the building, occupancy loads may be equal to, or even exceed, the wind load for some parts of the façade. It has however been common practice for many years to assume that wind load does not occur concurrently with live loads and there is no evidence that this has given rise to failures.

Occupancy loads are set out in BS 6399-1. Different loads are given according to use of the building but these can be generalised as:

- Areas occupied by a restricted number of people including residential and office accommodation. In these areas occupancy loads are up to  $1.0\text{kN/m}^2$  as a distributed load in the spandrel zone or  $0.74\text{kN/m}$  as a barrier load at a height of 1.1m above floor level.
- Areas where people may congregate. In these areas occupancy loads are up to  $1.5\text{kN/m}^2$  as a distributed load in the spandrel zone or  $3.0\text{kN/m}$  as a barrier load at a height of 1.1m above floor level.
- Sports stadia where reference to certifying authorities is required.

Wind load is a short duration (approx 3 seconds) load and the design value will occur on average once in 50 years. A wind loading regime devised by BRE to represent 50 years of wind loading suggests that a wind load equal to fifty per cent of the design wind load will occur on average 24 times each year.

Barrier loads are also transient loads and are likely to apply for a few minutes. No statistics are available to predict the frequency of occurrence but it is likely that these loads will rarely be applied in residential and office accommodation but may occur more frequently in areas where people congregate.

Occupancy loads are outward loads and only need to be considered in conjunction with negative wind loads. Negative wind loads are normally greater than positive wind loads but high negative loads are limited to a small area of the façade.

It is recommended that:

- For office and residential accommodation, design should be carried out under the wind load or the occupancy load, whichever gives the more severe loading action.
- For areas where people may congregate:
  - Design for serviceability should be carried out under the wind load or the occupancy load, whichever gives the more severe loading action.
  - Design for safety should be carried out under a combined load equal to the wind load plus half the occupancy load or the occupancy load plus half the wind load whichever gives the more severe loading action.