

Averaging times and gust durations for codes and standards

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ABSTRACT

Codes and standards for wind loading are currently based on wind speeds with a variety of nominal averaging times ranging from 0.2 seconds to 1 hour. These variations have occurred for a number of reasons: the type of recording systems used by meteorological services to record winds, the type of extreme wind event that dominates designs for wind in a particular jurisdiction, and even the background of the members of the code committees, e.g. persons with a background in boundary-layer wind tunnels may tend to prefer longer averaging times, perceived as equivalent to the mean wind speeds in wind tunnels. Furthermore, there are several different ways of defining a ‘ τ -second gust’, that can give very different values.

This paper will review various aspects of this situation:

- the variety of different wind types generating extreme winds of relevance for structural design – e.g. extra-tropical cyclones, tropical cyclones including hurricanes, and thunderstorm winds including severe downbursts, and the appropriate averaging times for ‘quasi-stationarity’
- the variety of measuring instruments, their response characteristics and the digital methods used to process data in modern systems,
- the definition of gust averaging times – e.g. the moving or block average, exponential average and the ‘half-power’ definition,
- the equivalent spatial average for a τ -second gust, and the variation with ‘mean’ wind speed.

The experiences in Australia will be used to illustrate the complexity of this situation. Historically the ‘2-3 second gust’ used in the Australian Standard since 1971 can be linked to the characteristics of the Dines anemometer. However the dynamic response of this instrument has only recently been fully investigated and explained (Miller *et al.*, 2011) This has resulted in a proposed re-definition of the peak gust in the Australian/New Zealand Standard to a *0.2-second gust* (Holmes and Ginger, 2012). Finally some observations on the effective gust duration in the Eurocode for wind actions (BSI, 2005) will be given.

REFERENCES

- British Standards Institution (2005), *Eurocode 1: Actions on structures – Part 1-4: General actions – wind actions*, BS EN 1991-1-4:2005, BSI, London.
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