The gust wind speed duration in AS/NZS 1170.2[*]

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ABSTRACT: *This paper discusses the rationale behind the redefinition of the design gust speed in the Australian/New Zealand Standard for Wind Actions, AS/NZS 1170.2, as one with a duration of 0.2 seconds, based on a moving average of that time. The origin of the basic gust in the Australian Standards since 1971, from the Dines anemometer, is discussed, and the relative response of that anemometer to gusts is compared with the current recording system based on cup anemometers, with digital processing including a moving average filter. The cup anemometers in the automatic weather stations (AWS), with the associated 3-second digital averaging, that have replaced the Dines in Australia, since the early 1990s, are shown to significantly attenuate the high frequency wind fluctuations, and hence record lower gust wind speeds. The correction factors provided in the paper for the post-1990 gusts should be applied by writers of future editions of the standard wishing to use AWS data. It should be noted that users of the standard will not be affected by the redefinition as there will be no changes to either the wind speeds or the shape factors.*

KEYWORDS: Cup anemometer; Dines anemometer; gust duration; standard; wind loads.

1 INTRODUCTION

The design wind speeds given for the non-cyclone regions in the Australian/New Zealand Standard for Wind Actions AS/NZS 1170.2:2011 (Standards Australia, 2011), and its predecessors in Australia, have been based on an extreme value statistical analysis carried out on the daily maximum gust wind speeds recorded by the Bureau of Meteorology at stations around the country. The original version of AS1170.2-1973 (Standards Australia, 1973), and its predecessor CA 34 Part 2 (Standards Australia, 1971), both referred to "a gust of 2 to 3 seconds duration" as the basic wind speed. This definition originated from the report by Whittingham (1964), who stated that "the Dines anemometer gives a good indication of the speed of strong gusts of 2 to 3 seconds duration". The

"2-3 second" definition continued up the 1989 edition of AS1170.2 (Standards Australia, 1989), which stated that "the basic design gust wind speed is defined in this Standard as being the maximum 2-second to 3-second gust occurring within 1 hour...". In the 2002 edition (Standards Australia, 2002), it was referred to as a "3-second gust".

The Dines anemometer, consisting of a pressure-tube and float system, was the main instrument for measuring wind gusts recorded by the Bureau of Meteorology from the 1930s to the early 1990s. Standard (ie. low-speed) Dines instruments were used in non-cyclonic regions, while the high-speed version was deployed in cyclonic regions from the 1970s. The Dines anemometer was also used extensively in the UK, India and many other countries. Since the switch to cup-anemometer-based automatic weather stations (AWS) in Australia in the early 1990s, questions have been raised about the response of the Dines system to atmospheric turbulence, and whether the gust wind speeds are comparable to

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those recorded by the cup anemometers currently in use, or whether some form of correction is required to the pre- and post-1990 data. For example, Reardon et al (1999) noted a 15% higher peak gust recorded by the Dines situated about 20 m away from the 3-cup anemometer during Cyclone Vance at Learmonth in 1999. Similarly, Boughton et al (2011) found that the Dines gave a peak gust wind speed about 20% higher than the nearby 3-cup at Townsville, during Cyclone Yasi in 2011.

A recent project, supported by the Department of Climate Change and Energy Efficiency (DCCEE) (Ginger, 2011), has shown that the first natural mode of the low-speed Dines anemometer has a natural period of about 2 seconds, and the high-speed type, has a natural period of about 3 seconds. However, these values are not equivalent moving, or block, averaging times. It was shown, from the results in the DCEE project, that the equivalent moving averaging time for the damped resonant response of the Dines anemometer, in relation to the maximum gusts produced, is actually a much shorter time than the 2 to 3 seconds stated in AS/NZS 1170.2. Since the standard is largely based on uncorrected gusts from the Dines anemometers, it can therefore be asserted that the basis of the Standard is a gust with a much shorter averaging time.

With the above background, this paper discusses the rationale behind the redefinition of the design gust speed in AS/NZS 1170.2, as one with a duration of 0.2 seconds. Note that this redefinition will have no effect on the listed regional wind speeds or on calculated wind loads from AS/NZS 1170.2, and is primarily directed to anyone wishing to independently analyse historical wind data for compatibility with the standard. However, generally, daily gust data recorded by the Bureau of Meteorology from AWS since about 1990 will need correction to be compatible with the Standard. The present regional wind speeds for Region A in Australia are based on the analysis by Holmes (2002), which, almost entirely, used pre-1990 Dines anemometer data. Wind speeds in Regions C and D, dominated by tropical cyclones, were derived by Monte Carlo simulations (Gomes & Vickery, 1976; Holmes et al, 1990) and not from recorded anemometer data, however, the latter were used for calibration purposes and hence the averaging times associated with Dines anemometer gusts can be assumed to applicable in the standard for all regions.

2   RANDOM PROCESS THEORY

Random process theory can be used to predict the wind gust factors recorded by cup and Dines anemometers in a turbulent wind of known intensity and spectral density. It can also be used to derive the gust factor for the wind spectral density "filtered" by a moving average filter with a defined averaging time of seconds. Full descriptions of random process modelling are given in texts such as Bendat & Piersol (1986) and Newland (1993). The application to wind engineering was pioneered by Davenport (1961; 1964), and was summarised by Simiu & Scanlan (1996) and Holmes (2007).

Using this approach, the spectral density of the wind turbulence is modelled using the well-known von Karman form, which, in non-dimensional form, can be written as follows:

$$\frac{nS_u(n)}{\sigma_u^2} = \frac{4\left(\dfrac{n\ell_u}{\bar{U}}\right)}{\left[1+70.8\left(\dfrac{n\ell_u}{\bar{U}}\right)^2\right]^{5/6}} \qquad (1)$$

where n is frequency, $S_u(n)$ is the spectral density of the longitudinal velocity component, u, and $\bar{U}$ is the mean wind speed (usually averaged over 10 minutes to 1 hour). ℓ_u is an integral length scale, and σ_u is the standard deviation of velocity, which can be obtained from the mean wind speed and the intensity of turbulence (ie. $\sigma_u = I_u\bar{U}$).

Equation (1) is used in AS/NZS 1170.2 for calculation of the dynamic response factor, C_{dyn} for along-wind dynamic response of tall structures (Section 6.2.2 in the standard). For a height of 10 m, AS/NZS 1170.2 gives a value of ℓ_u of 85 m.

An anemometer, when responding to wind gusts, "filters" the atmospheric turbulence with a transfer function $|H(n)|^2$.

The cycling rate or average frequency, υ, of the filtered process can be calculated as follows (eg. Davenport, 1964; Simiu & Scanlan, 1996, Eq. A2.38):

$$\upsilon = \left\{\frac{\int_0^\infty n^2 S_u(n)|H(n)|^2\,dn}{\int_0^\infty S_u(n)|H(n)|^2\,dn}\right\}^{1/2} \qquad (2)$$

The right-hand side of this equation is the ratio of the standard deviation of the time derivative of the filtered wind velocity, to the standard deviation of the filtered wind velocity itself. It represents an average frequency of that random process, and is useful for predicting expected peak values of it (see equation (3) following).

Note: the numerator in equation (2) with use of $S_u(n)$ from equation (1), unfiltered, ie. with $|H(n)|^2$ equal to 1.0 for all n, will not converge. Thus, some form of filtering is required for a cycling ratio to be calculated. At very high frequencies in the atmosphere, the spectrum decays faster than given by equation (1) due to the formation of a viscous sub-range.

The expected peak factor can be calculated using the well-known formula for Gaussian random processes of Davenport (1964):

$$g = \sqrt{2\log_e \upsilon T} + \frac{\gamma}{\sqrt{2\log_e \upsilon T}} \qquad (3)$$

where γ is Euler's Constant (0.5772) and T is the sample time for which the expected peak is to be determined.

Finally, the expected gust factor (ie. ratio of peak gust to mean wind speed ($\hat{U} / \bar{U}$) can be obtained from:

$$G = 1 + g\sigma_{u,f} / \bar{U} \tag{4}$$

where $\sigma_{u,f}$ is the standard deviation of the filtered process given by:

$$\sigma_{u,f} = \left\{ \int_0^\infty S_u(n) |H(n)|^2 \, dn \right\}^{1/2} \tag{5}$$

The relative magnitudes of expected maximum gusts, measured by different anemometer systems, can be determined by taking ratios of gust factors, G, determined as outlined above. The same approach can be used to determine the magnitude of the expected "ideal" maximum gust with a 0.2-second averaging time.

3   THE DINES ANEMOMETER AND ITS RESPONSE TO GUSTS

The main components of the Dines system were: head/vane (figure 1(a)), float/rod in a water chamber (figure 1(b)), and the 10 m long, 25-30 mm internal diameter connecting tube. The Dines anemometer used pressure changes within the tube, related to the square of the wind velocity at the head, to raise and lower the float in the water chamber. A pen attached to the float rod recorded its displacement on a chart, which was attached to a timed rotating drum. The main types of Dines used were the standard (low-speed type, measuring to 100 knots) used in non-cyclonic regions, and the high-speed type (measuring to 200 knots) used in cyclonic regions.

Standard and high-speed Dines instruments, provided by the Bureau of Meteorology were tested, both statically and dynamically, by the Cyclone Testing Station, James Cook University in Townsville, as part of the DCCEE project. The high-speed Dines is identical to the low-speed Dines, with the exception of a modified float chamber and float, that allow higher wind speeds to be measured. The Dines and 3-cup located at the Bureau Station at Townsville Airport are shown in figure 2. The experimental assessment and analysis of the Dines and 3-cup anemometers are presented in the DCCEE report (Ginger, 2011). The dynamic responses of the low-speed and high-speed Dines are dominated by the response of the float and the water in the chamber, to fluctuating pressures.

Figures 3(a) and 3(b) show the measured static displacements of the low- and high-speed Dines float rods, respectively, obtained by applying step pressures (related to the approach wind velocity) at the head. Figures 3(a) and 3(b) show that the float chambers of the Dines are designed in such a way that it produces a linear displacement of the float rod that is proportional to the velocity at the head; giving 0.29 and 0.59 m/s/mm respectively, for the low- and high-speed Dines. The paper chart attached to the drum measures 177 mm, which is equivalent to 0.290 and 0.583 m/s for each millimetre of float displacement of the 100 and 200 knot range standard and high speed Dines, respectively.

The dynamic responses of the low- and high-speed Dines (their float rod displacements) are presented as their transfer function $|H(n)|^2$ shown in figures 4(a) and 4(b), respectively. The transfer functions of the Dines show amplification at two low frequency peaks, and attenuation at higher frequencies. The
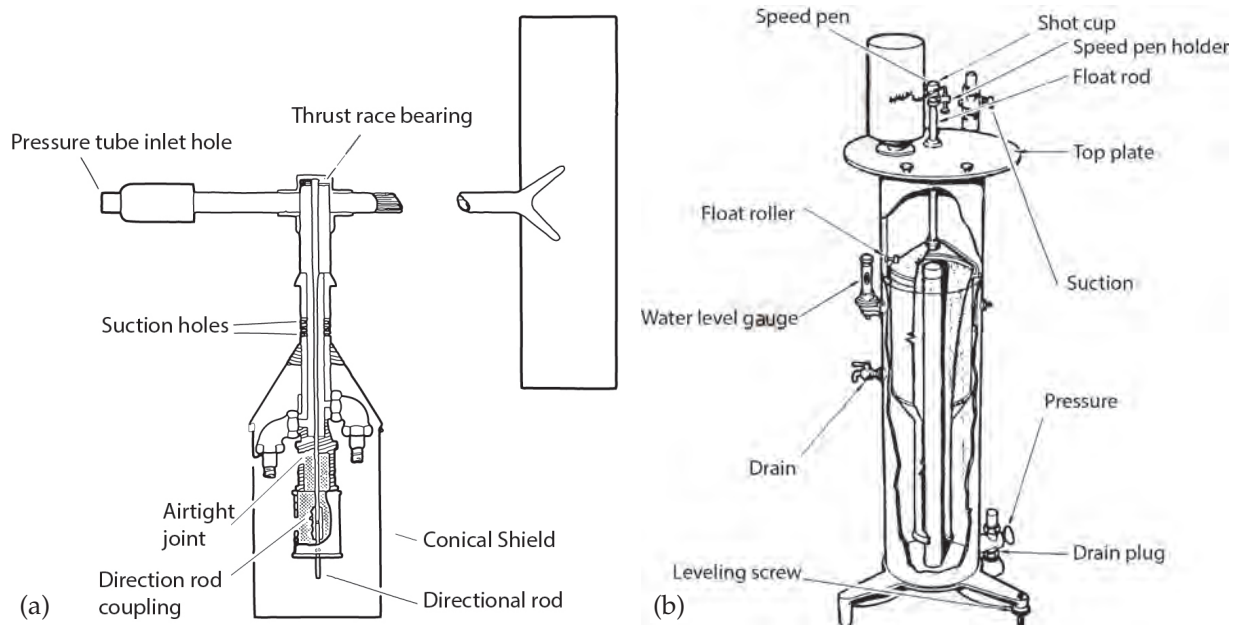

Figure 1:   The Dines pressure-tube anemometer as used in Australia from 1936 to 1990 (Meteorological Office, 1956).
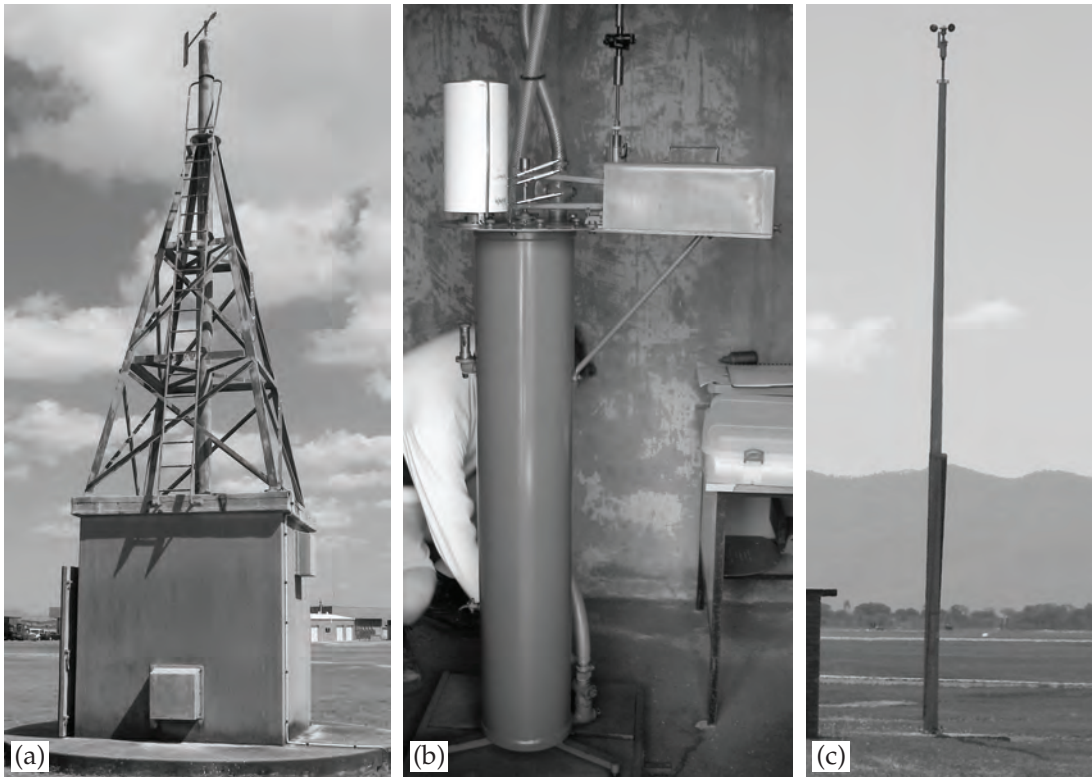
Figure 2:   Co-located Dines and 3-cup anemometer at Bureau of Meteorology station, Townsville Airport – (a) Dines head and vane, with supporting tower and blockhouse containing the float system, (b) Dines float chamber, and (c) cup anemometer.
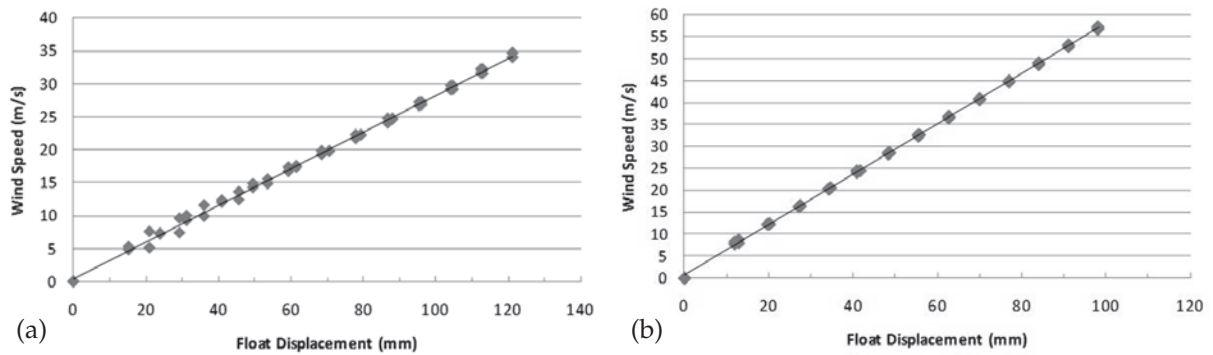

Figure 3:   Wind speed versus vertical displacement of the float rod of the (a) low-speed and (b) high-speed Dines.
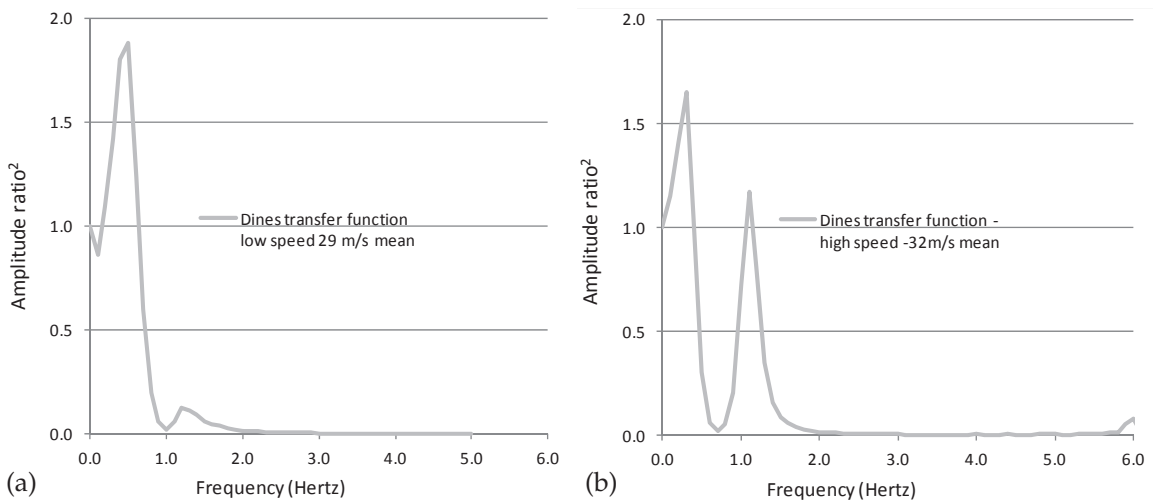

Figure 4:   Transfer functions $|H(n)|^2$ for (a) standard and (b) high-speed Dines anemometers.

response of the standard and high speed Dines, which show peaks at about 0.5 and 0.3 Hz, respectively, and second lower peaks at 1.2 and 1.1 Hz, respectively, are discussed in more detail by Miller et al (2012).

4 AWS AND THE 3-SECOND MOVING AVERAGE GUST

For the case of the cup anemometer (the most common type used currently to record wind speeds throughout the world), the transfer function can be represented by:

$$|H_1(n)|^2 = \frac{1}{1 + \left(\dfrac{2\pi nD}{\bar{U}}\right)^2} \tag{6}$$

where D is the distance constant for the anemometer.

The distance constant depends largely on the mass and inertia of the rotating parts of the anemometer. In the case of the Synchrotac 706 anemometer, currently the most commonly-used type in AWS in Australia, the value of D is 13 m (Dr John Gorman, Bureau of Meteorology, personal communication, 2011).

Shortly after the introduction of AWS with cup anemometers (about 1990), the Bureau of Meteorology incorporated a 3-second moving average based on a World Meteorological Organization (WMO) specification (Beljaars, 1987), in addition to the inherent filtering of the cup anemometer itself. The digital moving average process is represented in the frequency domain by the following transfer function:

$$|H_2(n)|^2 = \left(\frac{\sin(n\pi\tau)}{n\pi\tau}\right)^2 \tag{7}$$

where τ is the moving average time.

The effect of the 3-second digital moving average filter as part of the processing in the AWS can be determined by incorporating a transfer function in the form of equation (7) with τ equal to 3 seconds.

The combined transfer function obtained by the combined effect of the anemometer and the digital moving average is then given by:

$$|H(n)|^2 = |H_1(n)|^2 |H_2(n)|^2 \tag{8}$$

This "double filtering" results in severely attenuated wind gust spectra at the high-frequency end, as shown in figure 5, and in maximum gusts significantly less than those previously recorded by the Dines anemometers that form the basis for the peak gust in AS/NZS 1170.2. It should be noted that the 3-second moving average filter completely suppresses fluctuations with frequencies of 0.333 Hz (ie. periods of 3 seconds) and its integer multiples, and severely attenuates all fluctuations with frequencies greater than 0.2 Hz.
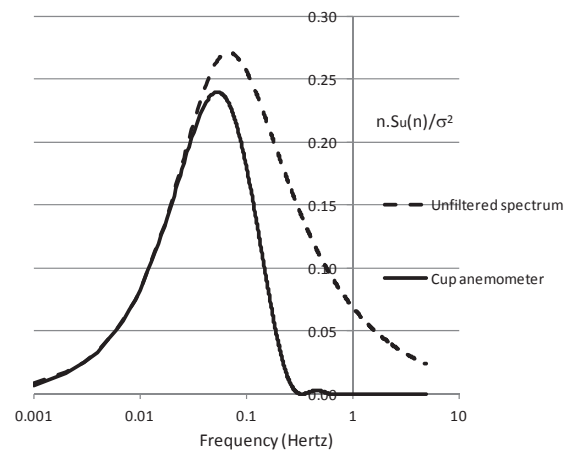

Figure 5: Effect of 3-second moving average filtering on the wind spectrum as "seen" by a cup anemometer (mean wind speed = 40 m/s).

Miller et al (2012), applying similar random process theory to that given in this paper, showed that a 3-second moving average filter applied to the output from a cup anemometer underestimates the maximum gust recorded by a standard (100 knot maximum speed) Dines anemometer by between 6% and 11%, depending on the mean wind speed and the intensity of turbulence. The underestimation of the gust recorded by the unfiltered cup anemometer is between 4% and 8%.

5 REDEFINITION OF THE PEAK GUST IN AS/NZS 1170.2: 2011

The proposed redefinition of the basic maximum gust in AS/NZS1170.2 is one with an equivalent moving average time of 0.2 seconds. This averaging time of 0.2 seconds has been primarily chosen as an average value with close equivalence to the expected maximum gusts recorded by both the low-speed (100 knots) and high-speed (200 knots) versions of the Dines anemometer. Another consideration was the effective averaging frontal area corresponding to that gust duration (see section 5.1).

Derived using the methodology described in sections 2 to 4, table 1 shows the calculated ratios of expected maximum gust recorded by the standard 100-knot Dines anemometer, and that obtained by a simple 0.2-second moving average filter. The same ratios are shown in table 2 for the high-speed version of the Dines, modified to read up to 200 knots for stations in the tropical cyclone affected regions.

Table 1 shows that the low-speed Dines slightly underestimated the expected 0.2-second gust with a maximum error of 2.4%. Thunderstorm downburst gusts, which produce the majority of the highest non-cyclonic gusts in Australia, have an effective turbulence intensity of about 10% (Holmes et al, 2008), and for that case the maximum error is 1.5%.

Table 1: Ratios of expected maximum gusts recorded before 1990 by a low-speed (100 knot) Dines anemometer and the 0.2-second maximum gust.

Mean wind speed (m/s)	Turbulence intensity	Gust ratio ($U_{Dines}/U_{0.2sec}$)	Error (%)
20	0.10	0.985	−1.5
25		0.985	−1.5
30		0.985	−1.5
35		0.986	−1.4
20	0.15	0.980	−2.0
25		0.980	−2.0
30		0.981	−1.9
35		0.981	−1.9
20	0.20	0.976	−2.4
25		0.976	−2.4
30		0.977	−2.3
35		0.977	−2.3

Table 2: Ratios of expected maximum gusts recorded by a high-speed (200 knot) Dines anemometer and the 0.2-second maximum gust.

Mean wind speed (m/s)	Turbulence intensity	Gust ratio ($U_{Dines}/U_{0.2sec}$)	Error (%)
30	0.15	0.998	−0.2
35		0.997	−0.3
40		0.998	−0.2
45		0.998	−0.2
50		0.998	−0.2
30	0.20	0.997	−0.3
35		0.996	−0.4
40		0.997	−0.3
45		0.997	−0.3
50		0.997	−0.3
30	0.25	0.997	−0.3
35		0.995	−0.5
40		0.997	−0.3
45		0.997	−0.3
50		0.997	−0.3

Table 2 shows that the high-speed Dines almost exactly recorded the average expected 0.2-second gust, with a maximum error of 0.4%.

Thus, the expected maximum gusts recorded by the Bureau of Meteorology in standard terrain conditions (ie. at 10 m height in flat, open country), by either type of Dines anemometer prior to 1990, are a good approximation to the redefinition of the peak gust in AS/NZS 1170.2, as an expected maximum gust with an equivalent moving average time of 0.2 seconds. The calculated corrections in table 1 are well within the order of accuracy of the standard in predicting wind loads, noting, for example, that estimated corrections to the anemometer data for terrain and topography at many recording stations are often considerably greater.

5.1   Effective frontal area

Another consideration by the standards committee in redefining the maximum gust was the effective frontal area over that the gust could be considered to act. An area as low as 1 m² was initially considered, but then it was agreed that a larger area – approximating that of a small building – was more appropriate.

In order to estimate the effective area of a maximum gust, a transfer function representing an "aerodynamic admittance" is required. The following expression was used, based on numerous measurements on small plates in grid turbulence (Vickery, 1968):

$$|H(n)|^2 = \frac{1}{\left[1 + \left(\frac{2n\sqrt{A}}{\bar{U}}\right)^{4/3}\right]^2} \qquad (9)$$

where A is the exposed area.

Using equation (9) and the methodology given in section 2, equivalent frontal areas for the 0.2-second gust have been derived by matching the calculated expected gust factors for a range of mean wind speeds and turbulence intensities. These are shown in table 3, and a plot of effective frontal area against mean wind speed is given in figure 6.

The effective frontal area increases with mean wind speed, but for the range of mean wind speeds of interest for structural design of 25 to 50 m/s, the frontal area of 11 to 39 m^2 approximates that of the windward wall of a small building such as a shed or house.

It should be noted that these "effective areas" are not necessarily the effective areas of pressures and forces derived from AS/NZS 1170.2 on all surfaces, as these are derived by applying various shape factors and adjustment factors to the basic pressures derived from peak gust speeds, which are intended to vary the effective averaging area. For the same reasons, the averaging time of peak pressures derived from the Standard is not 0.2 seconds (and in the past was not 3 seconds, as has been commonly and incorrectly, assumed).

5.2   Corrections to AWS data

Having established a 0.2-second gust as the redefined maximum gust in AS/NZS 1170.2, it is necessary to have correction factors for the peak gusts produced by the current measurement system in Australia of a Synchrotac 706 3-cup anemometer, with associated digital averaging with a moving average time of 3 seconds. These factors should then be applied to daily gust data from automatic weather stations in Australia recorded after about 1990 (the actual changeover date varies from station to station), when these gusts are used for structural design for AS/NZS 1170.2 or in conjunction with the Standard.

Such correction factors have been derived for a range of mean wind speeds and turbulence intensities and are tabulated in table 4. The gust factors listed are based on a sample time of 600 seconds, but the calculated correction factors are insensitive to the sample time. The correction factors require increases in the recorded gusts from 8% to 16%, depending on the mean wind speed and turbulence intensity. At

Table 3: Equivalent frontal area centred at 10 metres height corresponding to a 0.2-second gust.

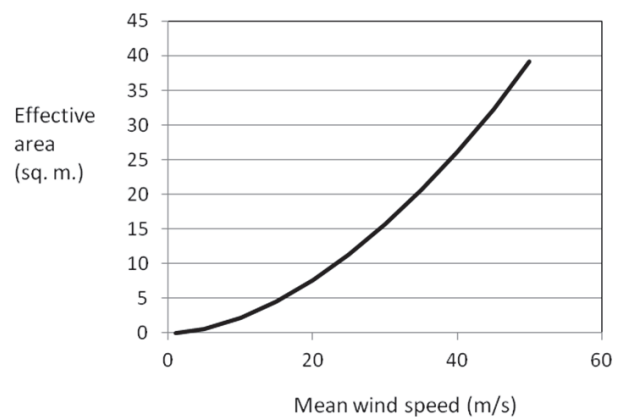| Mean wind speed (m/s)	Equivalent area (m²)
20	7.6
25	11.3
30	15.6
35	20.6
40	26.2
45	32.3
50	39.1

Figure 6: Effective frontal area of 0.2-second gust as a function of mean wind speed.

the standard recording height of 10 m in flat open country terrain, a turbulence intensity of about 0.20 is applicable for large scale synoptic-scale wind events such as extra-tropical gales or tropical cyclones. For downbursts from thunderstorms – the source of many damage wind events in Australia – the effective turbulence intensity is about 0.10 (eg. Holmes et al, 2008).

6   OTHER INTERNATIONAL CODES AND STANDARDS

For comparison with AS/NZS 1170.2, the effective duration of gusts in codes and standards in other jurisdictions is of interest.

In the United States, ASCE 7 switched to a gust wind speed from the previous "fastest mile" definition in 1995, and similar gust speeds have continued since then (ASCE, 2010). The analysis by Peterka & Shahid (1998) for non-hurricane regions in the US used gusts recorded primarily from the analogue outputs from cup anemometers prior to the introduction of automatic weather stations. The estimated duration of these gusts can be related to the distance constant, D (see definition in equation (6)), divided by the mean wind speed. For a typical distance constant for a heavy-duty cup anemometer of 12-13 m and a

Table 4: Correction factors for post-1990 AWS gusts to 0.2-second gusts.

Mean wind speed (m/s)	Turbulence intensity	Gust factor 0.2-sec average	Max. gust (m/s)	Gust factor (filtered cup anemometer)	Correction factor
20		1.334	26.7	1.236	1.078
25		1.335	33.4	1.234	1.081
30	0.10	1.336	40.1	1.232	1.084
35		1.336	46.8	1.229	1.087
40		1.337	53.5	1.226	1.090
20		1.500	30.0	1.354	1.108
25		1.502	37.6	1.352	1.111
30	0.15	1.504	45.1	1.348	1.116
35		1.505	52.7	1.343	1.120
40		1.505	60.2	1.339	1.124
20		1.667	33.3	1.472	1.132
25		1.670	41.7	1.469	1.137
30		1.672	50.1	1.464	1.142
35	0.20	1.673	58.5	1.458	1.147
40		1.673	66.9	1.452	1.153
45		1.674	75.3	1.445	1.158
50		1.674	83.7	1.439	1.164

mean wind speed of 25 m/s, this corresponds to a "time constant" of about 0.5 seconds; approximately equivalent to a gust duration of 1 second by the moving average definition. However, design gust speeds in the hurricane-affected regions of the US have been generated by simulation methods, and it appears that the gust factors are equivalent to 3-second moving average gusts, similar to the WMO definition (Vickery & Skerlji, 2005).

In Europe, the Eurocode for wind actions (BSI, 2009) is based on a 10-minute mean wind speed. However, in Section 4.5 of the Eurocode, a "peak velocity pressure" is calculated; this is based on a peak factor, g (see equation (3)), of 3.5. It can be shown, using the methods discussed in sections 2 and 4, for T equal to 600 seconds, that this is also approximately equivalent to a 0.2-second moving average gust.

Finally, the International Standard for wind actions (ISO, 2009), in Table B.1, allows for conversion between a range of averaging times, but the main body of the standard (in Section 7) is based on a maximum "3-second mean gust wind speed", which is a 3-second moving average gust speed defined similarly to the WMO (Beljaars, 1987) definition, with a peak factor of 3.0 for a 1-hour reference period.

Thus, there is apparently some unintended variation in the actual definition of peak gust wind speeds around the world that were historically based on a "3-second gust". This is unfortunate, is confusing for both users and code-writers wishing to compare provisions, and needs to be resolved.

7   CONCLUSIONS

The peak gusts in the Australian Standards since 1971 were derived from gusts derived from the Dines anemometer, used as the primary recording instrument for wind since 1936. The response of standard (low-speed) and high-speed Dines anemometers using experimental and analytical methods, and the gust wind speeds produced by the Dines, have been discussed. The cup anemometers in the AWS, with the associated 3-second digital averaging, that have replaced the Dines in Australia since the early 1990s, are shown to significantly attenuate the high-frequency wind fluctuations and hence record a lower gust wind speed. This has led to a redefinition of the peak gust in AS/NZS 1170.2 as a "0.2-second gust", based on a moving-average definition of gust duration.

The Dines anemometer response to fluctuating velocities results from a characteristic shape of the transfer function, with a main peak at about 0.5 or 0.3 Hz, depending on whether it is a standard (100 knot) or high-speed (200 knot) version. The random process approach to gust factors and Dines/cup gust ratios gives good agreement with measured values of gust ratios from the two measurement systems in several windstorms. It enables adjustment for varying parameters such as mean wind speed, turbulence intensity, turbulence length scale and the distance constant of the cup anemometer.

The low- and high-speed Dines anemometers give expected peak gust wind speeds that are within

0.2% to 2.4% of the maximum gust with 0.2-second duration derived from random process theory. The corresponding effective frontal area is between 11 and 39 m^2. The effect of applying a 3-second moving average filter to the 3-cup anemometer output, as recommended by the WMO, is to truncate the high-frequency end of the wind spectrum and greatly increase the difference in peak gusts between the 0.2-second gust and cup anemometers. Correction factors ranging from 1.08 to 1.16 are applicable to the AWS gust wind speeds. These factors are dependent on the mean wind speed and turbulence intensity.

Note that the redefinition of the peak gust in AS/NZS 1170.2 to a "0.2-second gust" has no effect on the listed regional wind speeds or on calculated wind loads from the standard, and is primarily directed to anyone wishing to independently analyse historical wind data for compatibility with the standard. Generally, daily gust data recorded by the Bureau of Meteorology from AWS, since about 1990, will need correction to be compatible with the standard.

It should also be noted that the peak pressures in the standard were not "3-second peak pressures" in the past (as mistakenly assumed by some) and will not be "0.2-second pressures" in the future. The peak wind pressures obtained from AS/NZS 1170.2, are intended to be the expected maximum (or minimum) pressures applied to a defined area, and are determined by factors such as the local pressure factor, K_ℓ, and the area reduction factor, K_a.

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