



# The Australasian Wind Engineer

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Welcome Wind Engineers to the June edition of the AWES Newsletter, the first for 2011.

Obviously the lead story from the past 6 months is Cyclone 'Yasi', that occurred in February this year, and John Holmes has contributed an in-depth account of this event.

We also have more information on the Dines anemometer analysis work performed by the JCU Cyclone Testing Station which has provides some very interesting findings.

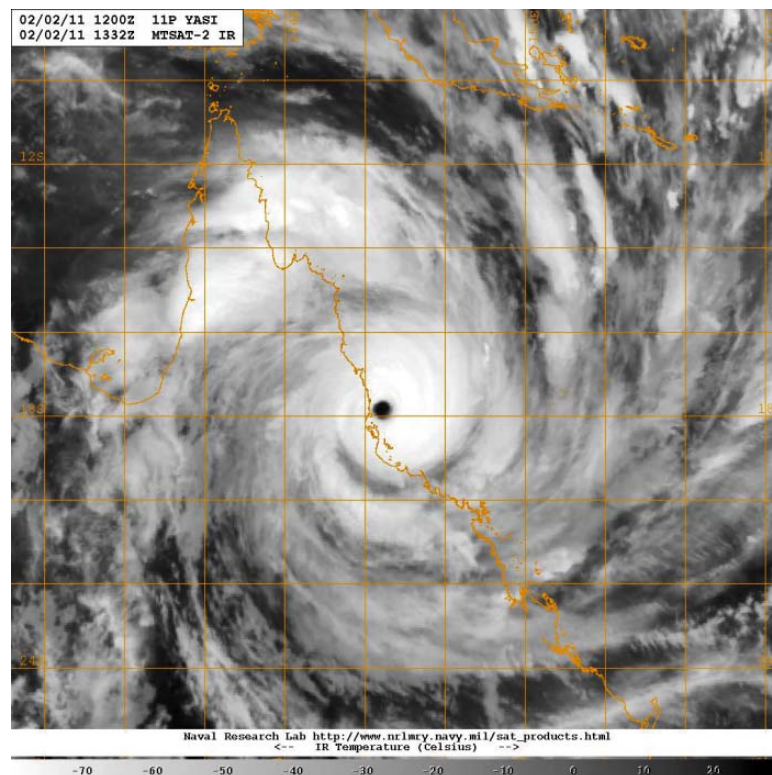
For those interested in further research we also have some information on the Fulbright Scholarship for 2012.

Finally, details on the next AWES Workshop are also appended to this edition of the newsletter.

Happy Reading!

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Tropical Cyclone 'Yasi' crosses the North Queensland coastline near Mission Beach



## The response of the Dines Anemometer and the '3-second' gust

**Contributor: John Ginger**

The Dines anemometer was the mainstay of wind speed measurements by the Bureau of Meteorology from 1936 to 1990 and provided the historical wind record in Australia during that period.

Starting about the mid 1980's, Automatic Weather Stations with cup anemometers (usually of the Synchrotac 706 type) replaced the Dines to record wind speeds, including the maximum daily gusts.

The wind loading Standard AS/NZS 1170.2 analyses these historical data records to stipulate the design wind speed to be applied when designing a structure. Reliable wind speed measurements are important for estimating extreme wind speeds given in AS/NZ1170.2, for the forensic analysis of assessing structural damage following wind storms for use in hazard-vulnerability models and for analysis of climate change impacts.

The Dines used a pressure tube head, with the pressure changes in the tube related to the wind velocity raising and lowering a shaped float in a water chamber. The two main types being the low- speed or standard type (measuring to 100 knots) and the high -speed type (measuring to 200 knots), were used in non-cyclonic and cyclonic regions, respectively. From the few occasions that the cup and Dines anemometers were operating in parallel during a storm event, the responses of the Dines and 3 cup differed; for example, the Dines peak gust reading was about 15% higher than that recorded by the 3 cup during Cyclone 'Vance' at Learmonth, WA and about 20% higher during Cyclone Yasi in Townsville.

A project was carried out for the Department of Climate Change & Energy Efficiency in 2009-11 to determine the response of the Dines and compare gust wind speeds measured against the 3-cup. The project was supported by the AWES and conducted by teams from GeoScience Australia, Bureau of Meteorology, JDH Consulting and the Cyclone Testing Station. The study established differences in response characteristics and produced appropriate correction factors for gust wind speeds measured by the Dines and 3-cup anemometers.

The project found that:

- The response of the Dines anemometer is mainly governed by the dynamics of the float system, with the connecting 10m tubing having negligible effect. The mean wind speed averaged over 1 to 10 mins appears to have been accurately measured by the Dines.
- Because of the resonance in the float system, the Dines anemometer recorded higher gusts than the (unfiltered) cup anemometer. The application of a 3-second moving average filter to the cup anemometer outputs in the Automatic Weather Stations has resulted in a further increase in the apparent overshoot of the Dines ranging from about 7 to 20%.

The report recommended that;

- The use of the three-second moving average wind speed to report gust speeds by the Bureau of Meteorology and the World Meteorological Organization (and hence in many other countries elsewhere in the world) will require the definition of the peak gust in AS/NZS1170.2 to be reviewed. The so-called '3-second' gust in the Standard has traditionally been based on readings from the Dines anemometer, which the project has shown, actually has a much shorter response time, when equated to an equivalent moving average.
- Correction factors given in the report can be applied to daily maximum gusts formerly generated by the Dines anemometers, and currently being generated by Automatic Weather Stations in Australia before extreme value analyses are undertaken to develop revised design wind speeds.
- The Bureau of Meteorology should provide details of instrument changeover and describe methods of measurement/ recording, and provide correction factors for users of wind speed data.
- Field testing of 3-cup anemometers should be conducted, and their response compared with theoretical assessments.
- Standardized procedures should be developed for producing a baseline wind speed dataset from the correction factors given in this report.



The report on the DCCEE project is posted on the Cyclone Testing Station web site at: [www.jcu.edu.au/cts/](http://www.jcu.edu.au/cts/)



Dines Anemometer at the Bureau of Meteorology in Townsville



3-cup Anemometer at the Bureau of Meteorology in Townsville

## **Cyclone ‘Yasi’**

**Contributor: John Holmes**

Tropical Cyclone ‘Yasi’ was a severe tropical cyclone, with a relatively large diameter, that crossed the Queensland coast near Mission Beach just after midnight on Thursday 3 February 2011. It moved into the Coral Sea from the east, having been named in the Fiji region.

‘Yasi’ received extensive coverage by the media due to its size, and it being called a Category 5 event by the Bureau of Meteorology. Damage from wind forces and storm surge occurred between Townsville to Cairns, with the most severe damage occurring between Cardwell and Innisfail.

A team of investigators from the Cyclone Testing Station of James Cook University, and elsewhere, funded by the Australian Building Codes Board, extensively surveyed the damaged region in the week after the event.

Three approaches were used to estimate the maximum values of gusts reached at the main centres affected by Cyclone ‘Yasi’:

- a) Use of anemometer data from the Bureau of Meteorology, or other agencies, where available. However these were sparsely distributed and generally had siting problems.
- b) A field investigation of failed and non-failed road signs (‘windicators’)
- c) Use of the standard Holland windfield model to predict wind speeds, and interpolate between the ‘windicator’ estimates.

The ‘windicator’ technique, which had been used in Australia since Cyclone ‘Althea’ in 1971, was further developed in this event.

Over 100 failed road signs were inspected during the course of the field investigation. Many of these were found to have failed as a result of a footing failure and were ignored.

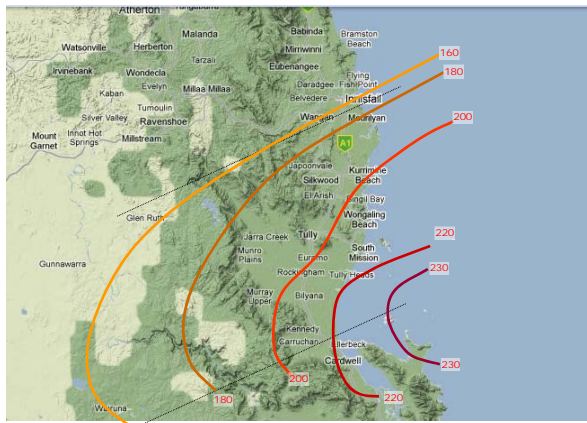
Detailed dimensions were obtained from those that had shown a permanent deformation resulting from generation of a plastic moment at, or near, ground level. In those cases, a suitable non-failed sign was sought in the general vicinity, although this was not always possible. When the information was available, lower and upper limits of gust wind speed could be derived.



A failed road sign used to establish a lower limit of gust wind speeds in Cyclone 'Yasi'

The wind field for the study area was also mapped, using the Holland model to interpolate between the recordings from the 'windicators'.

The windfield data suggested that the maximum gusts experienced by structures in the study area were around 230 km/h (standardized to 10 m height over flat, open terrain, and approximately the gust to which a road sign of about 1m<sup>2</sup> responds to).



'Footprint' of maximum gusts during Cyclone 'Yasi' - estimates of maximum gusts (km/h) to have occurred at any time during the event.

It was found that less than 3% of houses built post-1980s and located in the area of highest estimated wind speeds, suffered significant roof damage. Allowing for damage by debris and vegetation, this level of damage was an expected level of performance for the estimated gust wind speed. However, more than 12% of pre-1980s housing suffered significant roof damage.



Damage suffered by pre-1980s houses during Cyclone 'Yasi'



An undamaged modern house near Tully



A roller door failure leading to roof failure

As in previous events, such as Cyclone 'Larry' in 2006, many failures of roller doors during 'Yasi' were identified. The failure of a roller door leads to high internal pressures, an often results in loss of walls or roof, or both. Tiled roofs showed a significantly higher level of damage in post-1980s buildings compared with sheet roofs.



[Extensive tile damage on a modern house](#)

A detailed report on building damage in Cyclone 'Yasi' can be downloaded from the website of the James Cook University, Cyclone Testing Station at the following URL:

[http://www.jcu.edu.au/cts/research\\_reports/index.htm](http://www.jcu.edu.au/cts/research_reports/index.htm)

Thanks to the members of the CTS/ABCB study team who contributed to the investigation, particularly Geoff Boughton, John Ginger, John Holmes, George Walker, David Henderson, Cam Leitch, Lex Somerville, Ulrich Frye, Nana Jayasinghe, Peter Kim and Matt Mason.

### **2012 Fulbright Scholarship**

Applications for the 2012 Fulbright Scholarships are now open.

Valued at between USD30,00 and USD64,000 (please note that the ANSTO Senior Scholar Scholarship is valued at up to AUD40,000) Fulbright scholarships are open to Australian citizens to undertake research or study in the United States for 3 – 12 months. Scholarships can be started between 1 July 2012 and 30 June 2013.

As the largest and one of the most prestigious educational scholarship programs in the world, Fulbright provides unique opportunities for Australians to build long-term research collaboration and linkages with U.S. universities.

Applications are open from any field of study to:

- Postgraduates (to do research related to their Australian PhD. or enrol in a US degree)
- Postdoctoral
- Professionals
- Senior Scholars

Applicants from every state are also encouraged to consider the state/territory specific Fulbright Scholarships that have now been established.

For further information, please direct people to see: [www.fulbright.com.au](http://www.fulbright.com.au)

Applications close 31 August 2011.

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Well, that's it for this edition of the AWES Newsletter. Many thanks must go to our contributors.

As always, a newsletter cannot exist without news, so any stories, photos or information on upcoming events will always be appreciated.

Cheers,

Leighton Aurelius  
AWES Newsletter Editor.

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**Disclaimer:** The articles appearing in The Australasian Wind Engineer are obtained from many sources and do not necessarily represent the views of the Editor, Committee or Members of the AWES.

The Australasian Wind Engineering Society Email: [newsletter@awes.org](mailto:newsletter@awes.org)

## WIND LOADING DAY

### Wednesday 15<sup>th</sup> Feb

The official launch of The AWES Designers Handbook to complement AS/NZS 1170.2 - 2011. The one day workshop will introduce the design guide and offer practicing engineers insight into the application the code and the differences of the new edition. Attendees will be led by the authors of the handbook and will receive a copy on the day.

08:30 – 10:00	Introduction and wind speeds/multipliers
10:00 – 12:00	Shape factors for rectangular buildings and attachments
12:30 – 14:00	Shape factors for other structures
14:00 – 16:00	Dynamics
16:00 – 17:00	Q & A and forum

	Fees		Early-Birds	
	Member	Non-Member	Member	Non-Member
Single Day	\$500	\$600	\$400	\$500
With Workshop	\$700	\$850	\$600	\$750

## KEY CONTRIBUTORS

### Committee

Dr Steve Cochard  
Dr Matthew Mason  
Dr Mick Chay  
Mr Daniel Lander

### Executive

A. Prof. John Ginger  
Dr Katrina Swalwell  
Dr Graeme Wood  
Dr Matthew Mason  
Mr Leighton Aurelius  
Mr Bob Cechet  
Prof. Chris Letchford  
Dr Mick Chay  
Prof. Richard Flay

### Life

Dr John Holmes  
Dr George Walker  
Prof. Bill Melbourne  
Prof. Kenny Kwok  
Prof. John Cheung

## CONTACT DETAILS

The conference committee are happy to answer questions regarding any aspect of the workshop, wind loading day or student seminar. For additional general information, please see the AWES Website.

(e) [AWES15@awes.org](mailto:AWES15@awes.org)

(w) [www.awes.org](http://www.awes.org)

## SUMMER SCHOOL

### Monday & Tuesday 13<sup>th</sup> & 14<sup>th</sup>

Final year undergraduate and graduates are invited to attend this interactive two-day seminar. Students will learn the fundamentals of Wind Engineering and have the opportunity to interact and learn from academics and industry experts in a relaxed environment and develop an appreciation for wind and its effect on structures.

#### Monday:

08:30 – 09:00	Welcome and registration
09:00 – 10:45	Introduction to wind engineering
11:00 – 12:45	Aerodynamic of bluff bodies
13:45 - 15:30	Wind tunnel test techniques
15:45 - 17:00	Aerodynamic of wind-turbines

#### Tuesday:

08:30 – 09:00	Welcome and registration
09:00 – 10:45	CFD in wind engineering
11:00 – 12:45	Wind loads and the wind-induced response of tall buildings and towers
13:45 - 15:30	Natural ventilation in buildings
15:45 - 17:00	Risk and damage assessment

	Member	Non-Member
Students	\$100	\$150
Industry	\$400	\$500

## SYDNEY

Sydney is a cosmopolitan city surrounded by iconic beaches, a beautiful harbour and countless parks. The city was the site of the first British colony founded in 1788 and has remained Australia's largest and most international city.

Sydney has one of the worlds largest proportions of foreign born inhabitants and enjoys a broad cultural mix that is visible throughout the city. A temperate and humid climate, with abundant sunshine and blue skies. February is known for it's pleasant afternoon sea breezes and boasts average maximum and minimum temperatures of 26°C and 19°C.

CALL FOR ABSTRACTS

# 15<sup>TH</sup> AUSTRALASIAN WIND ENGINEERING SOCIETY WORKSHOP

16<sup>th</sup> - 17<sup>th</sup> FEBRUARY 2012  
THE UNIVERSITY OF SYDNEY  
AUSTRALIA



Dear Colleagues,

*The Australasian Wind Engineering Society promotes the advancement and the practice of wind engineering and industrial aerodynamics. The AWES workshops provide an opportunity for academics and practitioners to present their work and exchange ideas with their peers from the region and around the world*

*The committee extends an invitation to members, industry and students to submit an abstract and participate the proceedings.*

*Sincerely Yours,  
Steve Cochard*



## WORKSHOP

### Thursday & Friday 16<sup>th</sup> & 17<sup>th</sup>

The workshop is intended to provide a forum for scientists, academics, architects and engineers to present their latest finding in the fields of wind engineering and wind energy. The workshop aims to encourage collaborations, address new challenges and provide a platform for the discussion of the social and economic effects of the wind environment. A broad scope of topics and interested parties are welcomed.

The workshop committee invites abstract submissions on all wind engineering and related topics, including wind energy. Recommended categories include:

- Aerodynamics
- Bridges and tall buildings
- Codification & standards
- Meteorological events
- Structural dynamics
- Transport, dispersion & deposition of pollutants
- Ventilation and human comfort
- Wind damage & structural failures
- Wind energy & wind turbines
- Wind hazards, vulnerability & risk
- Wind modelling (numeric & physical)

The latest research on these topics and many others will be explored during the workshop.

### Sponsors

The organising and executive committees are currently considering sponsorship proposals. Please email the committee to discuss participating with the event.

## INFO

### Registration

Registration is available for the entire week or individual days. The full registration fee includes the program and abstract book, attendance at all sessions, refreshment breaks (including lunch), the welcome reception (icebreaker) and the Conference dinner. Please use the registration tool on the AWES website at: [www.awes.org](http://www.awes.org)

### Abstracts & Paper Handling

Abstracts can be submitted through the AWES website. Extended abstract templates will be available for download in MS Word and LaTeX formats. Papers will be peer reviewed by the committee and members of the scientific community. Authors retain all rights to their content. For more information, please see the AWES website.

### Key Dates

1st Oct 2011:	Registration opening
1st Dec 2011:	Four page extended abstract submission Early-bird registration deadline
13th Jan 2012:	Final registration deadline
27th Jan 2012:	Notice of acceptance

### Accommodation & Dining

Hotel and dining information for attendees will be made available on the AWES website.

### Fees

	Fees		Early-Birds	
	Member	Non-Member	Member	Non-Member
Full	\$500	\$600	\$400	\$500
Single Day	\$250	\$300	\$350	\$400
Student	\$100	\$150	\$200	\$250