NEWSLETTER - OCTOBER 2012

A word from our Chairman

The Cyclone Testing Station continues to focus on sustainable and economical buildings that have adequate resistance to wind events. To support that process, the CTS Management Committee has made way for a CTS Advisory Board. I am confident that the membership of that Board gives us excellent stakeholder representation across industry and government.

While I welcome everyone to their new roles, I would particularly like to welcome two people as we launch into the next phase of our journey. I am very pleased that David Henderson has accepted the position of Director of the Cyclone Testing Station. Many of you will know David, who was Manager of the Cyclone Testing Station prior to commencing his PhD in 2007.

I would also like to welcome Greg du Chateau as our inaugural Deputy Chairman of the Advisory Board. Greg is Managing Director of Philip Chun and Associates and is a previous Chairman of the Australian Institute of Building Surveyors.

We were fortunate to get through the last cyclone season with little damage but of course another cyclone season is imminent.

Townsville unfortunately did experience a tornado earlier this year. This edition of the CTS Newsletter includes an article on the damage investigation performed by the CTS team.

The Newsletter also includes updates on anemometers and garage doors, as well as an article on the wind tunnel modelling of Queensland's new cyclone shelters.

In closing, I would like to once again thank our Benefactors and Sponsors for their support. This funding is vital for the team to continue its involvement in the development of building regulations and standards, as well as its involvement in community education on issues of building resilience in response to wind actions. We are well aware of the difficult economic conditions that prevail across the industry and like everyone, we are doing our best to find efficiencies whilst staying focused on our key goals.

John Galloway,
Chairman, CTS Advisory Board

Roller Doors and Sectional Doors

Work has now been completed on AS/NZS 4505 Garage doors and other large access doors. From 2013, it will be referenced in the National Construction Code for cyclonic Regions C & D.

Requirements for cyclonic areas are similar to those in the existing (1998) version of the Standard, so any manufacturer whose product complies with that document should not experience any difficulty in complying with the new Standard. If any manufacturers have not yet tested their doors, please contact Tony Walther at Tony.Walther@jcu.edu.au to discuss your testing requirements.

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Townsville tornado

CTS staff spent time in the field investigating damage and debris paths following a severe storm that impacted areas of Townsville on 20 March 2012. Damage to buildings ranged from minor to the loss of complete roof structure and some walls.

Our analysis of the debris field along with information from the Bureau of Meteorology indicated that a severe thunderstorm and a tornado with erratic and partial touchdowns caused the severe damage to housing and commercial property.

Best guesstimates of peak gust wind speeds were in the range of 45 to 55 m/s (160 to 200 km/h) (referenced to 10m height in open terrain). These intense wind speeds were variable over the area of impact of the storm, with this variability also evident in the patchy damage to buildings and vegetation.

The storm path went over some of the older parts of Townsville that included houses built prior to the current cyclone wind resistant design standards (widely introduced in the early 80s). Consequently some of these older houses suffered significant damage.

Our report TR58 "Investigation of Townsville tornado, 20 March 2012" is available on the CTS web site: https://www.jcu.edu.au/cts/publications/technical-reports

Recommendations from our report included advice to homeowners that their housing along and adjacent to the storm's path to be inspected for areas of potential hidden damage; for example partial withdrawal of batten nails into rafters. The inspections should be conducted prior to the start of the upcoming cyclone season.

Tornados are classified using the Fujita (F) or Enhanced Fujita (EF) scale. These scales use a classification process that uses indicators from damage to houses and other structures. These amounts and types of damage are based on North American construction styles and codes, much of which is different to Australian building methods and codes. Therefore, care should be exercised in relating Australian building damage to the F or EF scales.

Failure of nailed batten to rafter connections

Debris and wind driven debris damage

Loss of cladding, and buckled purlins

Roller door and mullion failure

SWIRLnet - Portable Anemometers to improve knowledge on wind speeds impacting our communities

Existing wind speed measuring systems are sparse in the tropical regions of Australia. Less than 2% of the peak wind speeds of cyclones making landfall in Australian have crossed where there is a capability to measure them. We have to rely on guestimates of wind speeds derived from analysing bent simple structures. However, accurate information on peak wind speeds is important in understanding the vulnerability of housing and the effectiveness of current Standards and building regulations.

With a grant from the Queensland Department of Community Safety and seed funding from Risk Frontiers at Macquarie University, the Cyclone Testing Station is developing a re-locatable network of anemometers for monitoring surface wind speeds during land falling tropical cyclones.

Initially we are developing six 3.5 m tall tripod units for the 2012/2013 season. The units will record and store data on wind speed, temperature, relative humidity and pressure and upload 10 minute summaries via a 3G modem; thus the system has been named Surface Weather Information Relay and Logging Network (SWIRLnet).

In developing our units, we appreciate the advice and support from John Schroeder and his team from Texas Tech University and Forrest Masters and Dave Prevatt from University of Florida.

The positioning of the SWIRLnet units would be in the 24 to 48 hr period before landfall, and will be in consultation with Bureau forecasters and local councils. We are currently working with some councils to develop possible site locations.

This is a significant and long term project for the Cyclone Testing Station. Anyone who feels that they can make a contribution to the success of the project is welcome to contact David Henderson on 0747814340 or david.henderson@jcu.edu.au.

Prototype 3.5 m tripod on CTS house testing pad

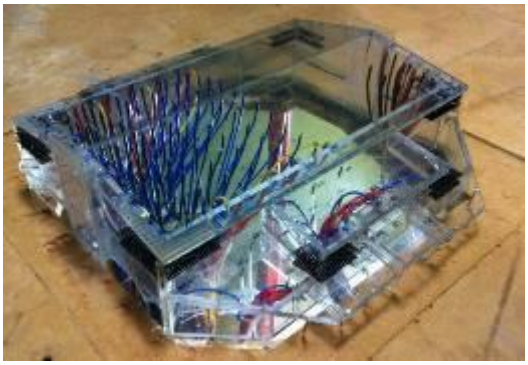
Wind Tunnel Study on Queensland's Cyclonic Shelters

The Cyclone Testing Station was commissioned to conduct a wind tunnel study for the Department of Public Works, Queensland, based on the design proposed for most of the Cyclone Shelter Buildings currently being built in Queensland. The buildings are equipped with a number of specific features intended to mitigate and reduce wind loading. The lower walls are chamfered, and the corners of the upper walls are equipped with porous horizontal sunshades and porous vertical wing walls, all intended to reduce the effects of flow separations and to reduce wind suction pressure peaks. The corners of the overhanging roof have been vented, also designed to reduce wind loading - based on previous experience with the cantilevered roofs of sports stadia.

The building was modelled at a length scale of 1/100 and tested in turbulent atmospheric boundary layer flow in the CTS boundary layer wind tunnel here at JCU. The modelled approach terrain was representative of open country. Wind pressures on the building model were measured using pressure taps installed on the roof and the walls. The external pressure coefficients obtained from the wind tunnel were combined with the design wind speeds, with a 10,000 year return period, to give design values of positive and negative external wind pressures on each face of the building. These pressures are combined with internal pressures to obtain the net design pressures on the envelope, and also used for determining wind load effects (i.e. bending moments, shear forces) for designing the structure.

The venting at the corner of the roof overhangs was shown to reduce the negative local pressures in that region by about 30%. Reductions in the negative pressures near the corners of the walls have also been achieved, as a result of the porous corner features and the chamfering.

Queensland Community Cyclone Shelter under construction in Bowen



Wind-tunnel model of Queensland Community Cyclone Shelters tested by the Cyclone Testing Station, James Cook University

Solar Panels – New design values

Following on from the wind tunnel study by CTS on behalf of Building Codes Queensland, pressure coefficients for wind load design of roof mounted PV panels have been incorporated into the latest revision to AS/NZS 1170.2 as a new appendix.

The appendix provides information for calculating the net pressure across the panels mounted parallel to the roof surface.

Just like other building products such as cladding, windows and doors, the different solar panel systems still need to be tested to show that they meet the design criteria. An evaluation would cover most, if not all, applications of that panel system allowing the development of installation guidelines to avoid the need for evaluation of specific installations.

CTS Team

There have been a number of staff changes since the last Newsletter.

We would like to congratulate Chana Jayasinghe on the completion of his PhD entitled "The distribution of wind loads and vulnerability of metal clad roofing structures in contemporary Australian houses".

Peter Kim has also submitted his thesis "Characteristics of internal pressures in buildings with a dominant opening" for completion of his Masters Degree. Peter has recently obtained a position with FM Global working from their Sydney office.

Bipin Sumant recently resigned from our testing team to take on a new role at IP Australia in Canberra.

We thank Bipin, Peter and Chana, for their hard work and contributions to CTS and wish them and their families all the best for their future careers.

David Henderson was appointed to the role of CTS Director in June. Cam Leitch is the Station's Senior Consultant and reports to the Director.

John Ginger (CTS Research Director) has been successful in securing a major grant to investigate the wind loading and structural response for a range of building types in Australia. The project comprises field surveys, wind tunnel model tests, full-scale structural tests, and structural and numerical analysis. The outcomes of the project will be used to assess the vulnerability of buildings to windstorms. The CTS is looking for a Post Doctoral Fellow and Postgraduate Students to be part of the CTS team. The positions are for a fixed term of 3 years starting in early 2013. The positions will be formally advertised in the near future. Email EOIs to David at david.henderson@jcu.edu.au

Tony Walther, the CTS Senior Testing Engineer, has been with us for a year now. His previous experience includes time at the Timber Development Association and the Building Research Association of New Zealand.

Tony is your main point of contact should you require testing services. He can be reached on 07 47816676 or e-mail cts.testing@jcu.edu.au.

The Cyclone Testing Station wishes to thank all of our Benefactors and Sponsors for their continued support