IMPROVING THE RESILIENCE OF EXISTING HOUSING TO SEVERE WIND EVENTS

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MANY OF US LIVE IN HOMES WITH VULNERABILITIES THAT CONTRIBUTE TO COMMUNITY WIND RISK. THIS PROJECT AIMS TO INVESTIGATE WINDSTORM RISK MITIGATION BY: (A) DEVELOPING VULNERABILITY MODELS FOR STRUCTURAL STRENGTH OF HOUSING FROM FIELD AND LABORATORY OBSERVATIONS, AND (B) EVALUATING POTENTIAL UPGRADING AND RETROFITTING SOLUTIONS FOR RESIDENTIAL STRUCTURES.

TYPICAL POST-EVENT OBSERVATIONS

- In general, contemporary construction performance for single family residential housing was adequate for wind loading
- Significant structural damage to legacy (pre-1980s) housing was typically associated with loss of roof cladding and/or roof structure. There were many examples of legacy housing with relatively new roof cladding installed to contemporary standards (i.e. screwed fixing as opposed to nailed) but lacking upgrades to batten/rafter or rafter/top-plate connections, resulting in loss of roof cladding with battens attached

Wind-induced failure of a new (< 1 year) metal cladding roof on an old house at the rafter to top-plate connection during Cyclone Marcia (2015) in Yeppoon, Australia - there appeared to be no retrofitting of the weaker connections.

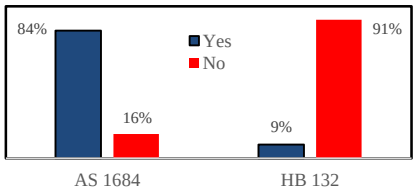
- Corrosion or degradation of connections and framing elements initiated failures
- Where wind-induced structural failures were observed for contemporary housing, they were often associated with either poor construction practice or design faults
- Breaches in the building envelope (i.e. failed doors and windows, debris impact, etc.) exacerbated failure potential from increased internal pressures
- Extensive water ingress damages were observed for structures with and without apparent exterior building damage

SEVERE WIND EVENT ANALYSIS

The 2014-15 year was very active from a severe wind event perspective, with five land-falling tropical cyclones in Australia and the pacific islands and several severe thunderstorm events. These events provide unique opportunities for the project to learn more about the vulnerabilities of residential construction. A key project objective is to increase cyclone mitigation and preparedness through education. This year the project team had a very active role in informing the public about these events through technical reports, magazine articles, and more than 50 television, newspaper, and radio interview appearances.

EXISTING GUIDELINES FOR UPGRADING

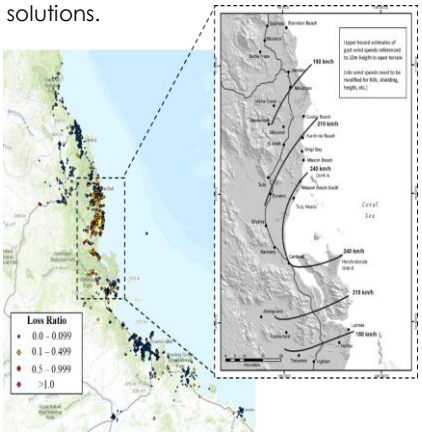
There are existing guidelines for upgrading of older houses in the form of handbooks (HB132) published by Standards Australia in 1999. However, the success of these handbooks has not been effective in light of recurring severe wind damage to older structures. These details and methods were reviewed to consider reasons for lack of use. To further investigate, an online survey was distributed nationally to members of the building industry. Objectives were to estimate the extent of HB132 usage and determine what other references and practices (if any) are used in retrofit construction.



Proportions of building industry personnel that reference ("Yes") or do not reference ("No") AS 1684 Residential Timber Framed Construction (Australian Standard for new construction) and HB 132 Structural Upgrading of Older Houses (non-mandatory reference guidelines for upgrading existing structures).

INSURANCE CLAIMS ANALYSIS

A direct relationship between observed damage modes and societal cost is needed to inform cost-benefit analysis of retrofit mitigation solutions.



North Queensland coastal region impacted by Cyclone Yasi (2011) with distribution of claims subdivided by four loss ratio bins (claim value/insured value) and wind field estimation (See complete reports at http://www.suncorpgroup.com.au/media/public-submissions)

In a research effort supported by Suncorp Group Limited, policy data from one insurer in the North Queensland region of Australia during Cyclone Yasi (2011) were analyzed to identify correlations between claim value, typical damage modes, and construction age. Qualitative and quantitative insights were extracted from aggregated insurance policy data from one insurer at the time of the event. A more detailed analysis that addresses detailed topographic effects at policy level will be completed as the next step.

CONTACT

The Cyclone Testing Station would like to hear from any organisation that would like to be involved. For more information please contact Daniel Smith at daniel.smith8@jcu.edu.au