

IMPROVING THE RESILIENCE OF EXISTING HOUSING TO SEVERE WIND EVENTS



Daniel Smith¹, David Henderson¹, John Ginger¹, Martin Wehner²

¹ Cyclone Testing Station, James Cook University, QLD ² Geoscience Australia, ACT

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.

POST-EVENT DAMAGE 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

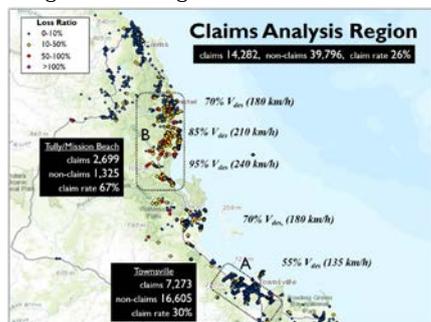


Wind-induced failure of a metal cladding roof at the batten to rafter connection during Cyclone Marcia (2015) in Yeppoon, Australia - there appeared to be no retrofitting of the weaker connections.

- ▶ 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

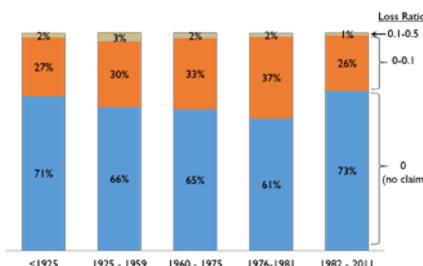
INSURANCE CLAIMS ANALYSIS

Post-event damage inspections is only a part of the full picture. Understanding sources and causes of financial losses is an integral part of determining appropriate mitigation strategies.



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: http://www.suncorpgroup.com.au/sites/default/files/pdf/news/Suncorp_Report_PhaseII_Final_21_07_2015.pdf

Research supported by Suncorp Group Limited, allowed policy data from one insurer in North Queensland during Cyclone Yasi (2011) to be analyzed to identify typical damage modes for different house types and locations. Costings of damage scenarios and mitigation measures were evaluated to provide direction on affordable mitigation strategies. Further analysis that addresses detailed topographic effects at policy level will be completed as the next step.



Claims loss ratio proportions for five building age groups to the total number of claims filed in relation to Cyclone Yasi for the Townsville region.

COMPILATION OF HOUSING DATA

Field survey, NEXIS (Geoscience Australia), and insurance data were used to determine a suite of representative housing types for modelling. Findings include:

- ▶ The NEXIS data show the prevalence of brick veneer construction in south-east Australian housing (based on data from TAS, NSW, and ACT). Housing post-1960 is dominated by tile roofs (except in Tasmania).
- ▶ The project team conducted twelve detailed field surveys of homes in the Canberra area for building attributes. Brick veneer (~80%) and tiles (~80%) were the most dominant form of wall type and roofing respectively.
- ▶ In January 2016, a survey was conducted of existing 1960's housing in the Bedford park area of Adelaide in collaboration with the Department of Planning, Transport and Infrastructure (DPTI) and the University of Adelaide. The majority of houses were 1960's single storey double brick houses with hardwood pitched roof framing and concrete tile cladding.

Based on the housing survey data, available load and resistance data, damage investigations and current knowledge gaps in the research, five house configurations were selected for modelling. A southern Australia house, typical of the 1950 - 1970 period with brick veneer or cavity brick and tiled or metal roofing (all four combinations) and a Queenslander with timber frame construction, timber or fibro clad walls, and corrugated iron roof.

CONTACT

The team would like to collaborate with you. Please contact Daniel Smith at daniel.smith8@jcu.edu.au.

