

ANOTHER MITEK ADVANTAGE

## TIE-DOWNS TESTED BY YASI

Tropical Cyclone Yasi passed through Cardwell and the Tully region of North Queensland on February 4, 2011.

Shortly after, I visited the area to witness first hand the aftermath of the destruction it left behind.

Unlike Cyclone Larry in 2006, which passed by each location in only 30 minutes, Yasi took three hours to cross because of its immense size.

This prolonged duration fully tested every roof system in its path.

On a broad scale, it is evident that newer construction with engineered roof trusses fared very well compared to older construction with pitched rafters.

It also clearly demonstrates an improved level of performance when current design codes and tie-down methods are used.

Some of the most common types of building failures found were:

- Loss of roof battens that were fastened to rafters with only one or two plain shank nails. This does not comply with AS1684.3. They would have survived if batten ties were used. This simple failure could have been prevented at minimal cost and accounted for up to 70% of the roof damage caused by Cyclone Yasi.
- Loss of pitched roof rafters that were anchored to top plates with only skew nails. As with roof battens, these do not comply with AS1684.3 either and failure could have been prevented just as easily.
- In another aspect of pitched roof rafter construction, many underpurlins and struts also failed because of inadequate connection to each other and to the wall. The structural anchorage details in AS1648.3 are far superior.
- Several complete verandah roof sections dislodged from post and rafters because of inadequate tie-down. In some cases, the verandah roof then flipped back onto the main roof thereby damaging the house as well.
- The premature deterioration of fasteners and sheeting due to corrosion, or timber due to rot, also led to failure in some buildings.

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Some of the lessons that could be applied from this disaster are as follows:

- The failures associated with degradation (rot and corrosion) of framing members and connections point to several areas for attention:



■ Inadequate batten to rafter fixing.



- the specification of materials with suitable durability for their environment or conditions of exposure;
- adequate ventilation to prevent condensation, particularly where exhaust fans above bathrooms vent into the roof space;
- regular maintenance of cladding and other membranes protecting critical structural elements from moisture.
- Accurate wind classifications must be obtained from AS 4055 or AS/NZS 1170.2 to reflect topographical conditions, such as locations on hill tops and exposed sites.
- Roller doors and fittings must be designed to resist severe wind loads.

- Closer adherence to fixings and anchorages in the roof structure according to AS1684.3, for example:

- all roof framing components, such as rafters and struts must be adequately tied to each other or anchored to the top plate with framing anchors or straps;
- use of robust fasteners, such as batten ties, to ensure correct fixing of battens to rafters;

- roof cladding must be held down with appropriate fasteners that have proven resistance to cyclical loading.

A team of experts from the Cyclone Testing Station at the School of Engineering at James Cook University also surveyed the area after Cyclone Yasi and will be releasing a detailed report on the effects of the cyclone in due course.

For more information, refer to their web site. [www.jcu.edu.au/cts/](http://www.jcu.edu.au/cts/)

However the main lesson is clear: paying due attention to humble tie downs and connections is a cost effective way of protecting your valuable asset.

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