Progressive failures of roofs under wind loading

Korah Parackal

Cyclone Testing Station, James Cook University, QLD

Progressive or cascading failures of roofing connections were simulated using a computer model based on wind tunnel data, dynamic connection tests and damage surveys observations. Results identify the most vulnerable parts of the roof and how damage can spread during a storm, which is essential for developing retrofitting measures for older houses.

Fig1. *Batten to rafter failure caused by Tropical Cyclone Marcia*

1) Wind tunnel tests are used to record wind pressures on the roof surface

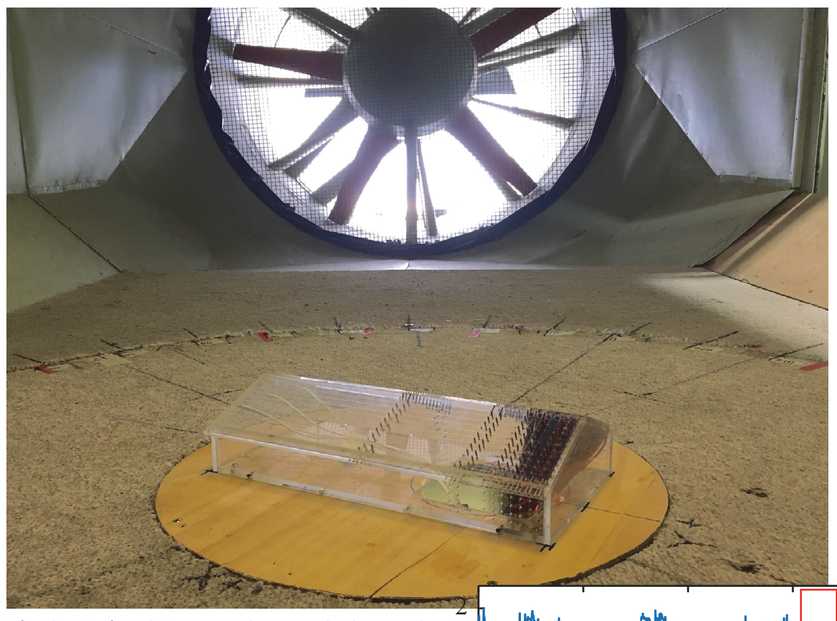
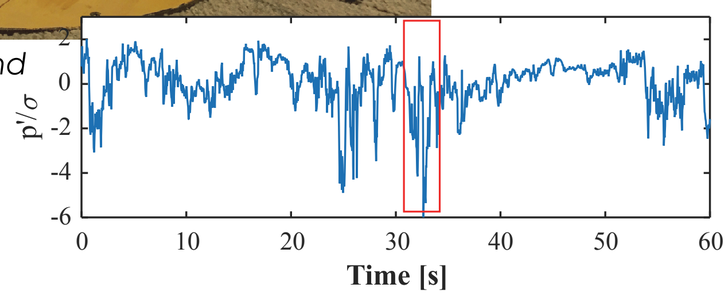


Fig2. *Wind tunnel model and recorded load fluctuations*



2) Connection samples are tested under fluctuating loads from wind tunnel data

Fig3. *Connection testing apparatus and connection response*

3) Testing data are used to create simulated connections in a structural analysis model

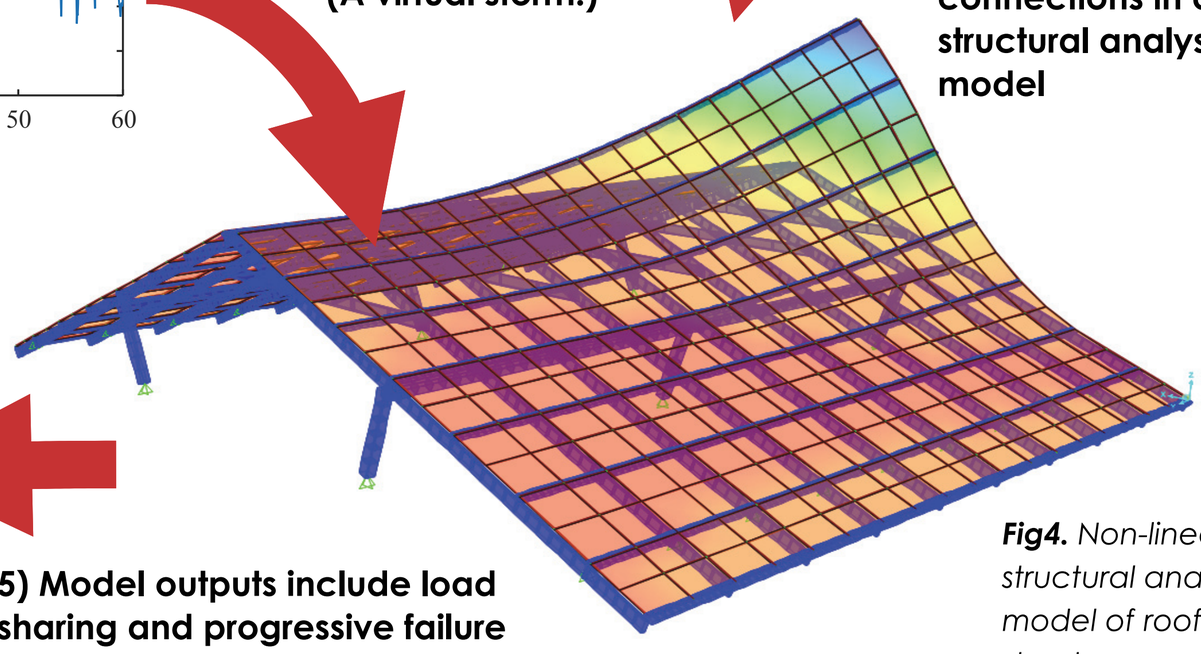


Fig4. *Non-linear structural analysis model of roof structure*

4) Time history analysis is performed using wind tunnel data

(A virtual storm!)

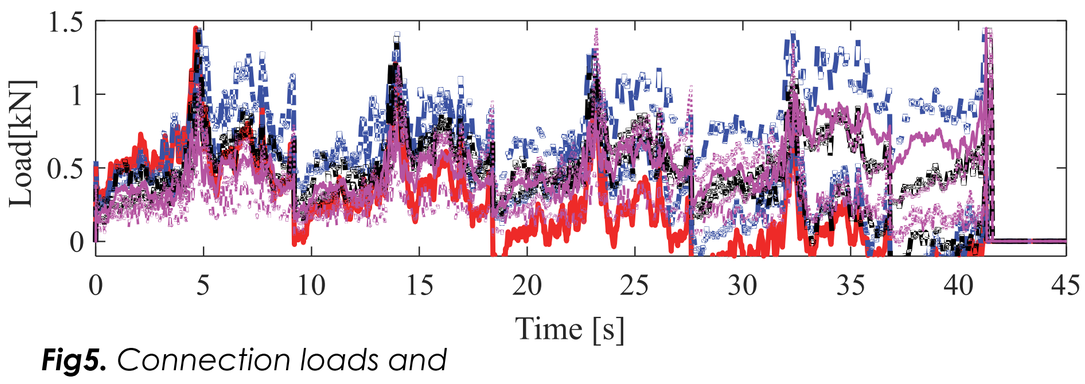


Fig5. *Connection loads and failure during the simulation*

5) Model outputs include load sharing and progressive failure information

Australian Government
Department of Industry, Innovation and Science
Business Cooperative Research Centres Programme
CYCLONE TESTING STATION
JAMES COOK UNIVERSITY AUSTRALIA