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MEDIA RELEASE

RESEARCH LAUNCHED TO HELP HOMES BETTER WITHSTAND EARTHQUAKES

A key research project, to help improve the resilience of the types of homes that performed poorly in the Christchurch earthquakes, has been launched.

Engineering experts from BRANZ, with research support from EQC, will use computer modelling to assess the impact of simulated seismic action on modern homes with more complex configurations.

The research has been prompted by findings that less complex homes in Christchurch performed better in the quakes than those built beyond the limits of New Zealand Standard 3604.

Variation in the stiffness of the bracing systems in a house is a common occurrence in such homes, especially hillside houses or older houses that have been altered to make them more open plan.

The experts will examine how the bracing systems of different stiffness interact during a seismic event.

BRANZ and EQC expect the learnings from the research will be used to develop new guidelines for houses built outside the scope of NZS 3604 in order to mitigate the potential damage in earthquake events.

Project leader Angela Liu, a member of the BRANZ team that inspected residential properties for damage in Christchurch, said that one common phenomenon observed during the Canterbury earthquake sequence was the damage at the junctions where bracing systems changed or where the layout of the building changed.

“We found that many older buildings, pre-NZS 3604 Standard, light timber-framed houses with small windows and smaller rooms, had performed better than many modern buildings with complex seismic resisting systems,” said Ms Liu.

“The team observed more severe earthquake damage in homes that often had a mixture of different seismic resisting systems, either because of the presence of bigger rooms at one end of the dwelling or larger windows included on one side for a better view.

“According to the current regulations, seismic design of buildings mainly focuses on preserving life, and our residential houses performed very well in this regard, as observed in Canterbury earthquake sequence.

“Builders and designers are guided by the prescriptive standard NZS 3604 *Timber-framed buildings* unless architectural and structural designers are employed. Bracing elements as per NZS 3604:2011 are often sheathed timber walls.”

Ms Liu said that nowadays many people want bigger spacing between bracing lines so they can have bigger rooms or windows, and quite commonly, the spacing of bracing lines becomes too large to comply with NZS 3604.

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“The designer will bring in an engineer to design just that part of the house and often the engineer will design a specific bracing system, which is almost definitely not sheathed light timber walls as introduced in NZS 3604,” she said.

“Or an owner may want to take out supporting walls in an older house to make larger rooms or an open plan living area and the engineer may, for instance, recommend installing a steel portal to brace that wider space.

“Currently, it appears there is often a mismatch between the mixed stiffness bracing elements resulting in some parts of the house moving more than others in an earthquake. We repeatedly found that cracking had appeared at the points where the stiffer and the more flexible bracing met. We also found that the more flexible bracing associated with the desire to take advantage of the view resulted in significant cladding and window damage to the extent that the dwelling was uninhabitable.”

The team also observed cracking in extensions, at the junctions between pre-1978 suspended timber piles and modern concrete slab floors and noted similar problems with houses that had been built on different levels down hillsides.

“We are aiming to find better ways to improve the performance of these more complex houses,” said Ms Liu.

”We will be looking at what the action is in individual areas, and the computer model will allow us to adapt the bracing elements to ensure all the elements of bracing work together.

“That will enable us to provide guidance around areas where engineers need to pay more attention in future designs in order to mitigate problems associated with the potential differences in stiffness between the specifically designed bracing elements and NZS 3604 bracing elements.”

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In addition to natural disaster insurance provided for residential buildings, contents and land, another function of EQC is to facilitate research about natural hazards and methods of reducing or preventing natural disaster damage, with the aim of improving community resilience. For more details, see www.eqc.govt.nz/research