The Effectiveness of Retrofit Technologies in Wooden-framed Houses in Wellington

The world
Wooden-framed houses (WFH) is one of the oldest construction type used in many parts of the world, including in seismic prone areas. Several worldwide studies have documented the observed damage to WFH during earthquakes, which has led to procedures being re-analysed in order to improve the design of new WFH and proposals for retrofit technologies to improve performance of existing WFH during seismic events.

New Zealand
New Zealand has a long tradition of using light timber frame construction for its domestic dwellings. After the most recent earthquakes (e.g. Canterbury earthquake sequence), wooden residential houses showed satisfactory life safety performance. However, poor performance was reported in terms of their seismic resilience.

Types of damage
- House sliding off the foundations
- Collapse of "cripple walls" in crawl space
- Collapse of add-ons (garages)
- Soft story failures

Deficiencies
- Frame not bolted to foundation
- No lateral bracing
- Stiffness incompatibilities (vertical and horizontal)
- Large openings
- Inadequate lateral strength

Taking action for future earthquakes
A survey will be conducted in Wellington about perceptions of homeowners towards the expected performance of their wooden-framed houses.

Seismic resilience of wooden-framed houses
- Increase the trust of occupants toward the performance of their homes.
- Review current technologies and their use (non-use) in Wellington.
- Following a structural review of a sample of the houses to identify common features and detail potential seismic concerns.
- Keeping people at home during and after an event.

Moving forward
The observed damage to residential houses has exposed the need for more resilient housing. The results from the survey conducted will allow to understand the community expectations, which are generally more demanding than life safety structural design of current buildings in New Zealand. This study will also help to understand how community expectations translate into more structurally resilient WFH, by applying the proper retrofitting actions.

Innovative methods to mitigate damage have been introduced to the New Zealand community in order to improve wooden house performance. However, these retrofit options have not been readily taken up. The low number of retrofitted wooden-framed houses leads to questions about whether homeowners are aware of the necessity of seismic retrofitting.

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