

# 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.



### 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.

## New Zealand

New Zealand has a long tradition of using light timber frame for construction of 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**.



Although the performance expectation in the NZ building code was met, thousands of houses have some degree of structural or non-structural damage.

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.



## 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

Followed by a structural review of a sample of the houses to identify common features and detail potential seismic concerns.

Review current technologies and their use (non- use) in Wellington.

Increase the trust of occupants toward the performance of their homes.

Keeping people at home during and after an event.

Seismic resilience of wooden-framed houses