Next-generation Infrastructure: Low-damage + Repairable Solutions

Going beyond simply life preservation, to limiting damage and disruption caused by earthquakes.

3 things to Reduce or Eliminate

- DOLLARS
- DEATHS
- DOWNTIME

over **$40 billion** worth of damage is attributed to the Canterbury Earthquakes

Reference 1

The Canterbury Earthquakes are **1 of the 5 most costly earthquakes** by insured losses ever recorded.

Reference 2

INFORMED CHOICE FOR SEISMIC BUILDING PERFORMANCE

EDUCATING ENGINEERS WHO IN TURN EDUCATE:

INDUSTRY, ARCHITECTS, DEVELOPERS and others about the different engineering solutions...

to understand the choices they are making between materials/methods.

- ENGINEERING SOLUTION 1: ROCKING WALLS
- ENGINEERING SOLUTION 2: BASE ISOALTION
- ENGINEERING SOLUTION 3: VISCOUS DAMPER

Because the cost to enhance the seismic performance of buildings with these innovations is not always more expensive.

REPAIRABILITY & DAMAGE-CONTROL

IS EXPLICITLY CONSIDERED IN THE DESIGN PROCESS

We are working on:

- Development of new low-damage systems
- Ensuring repairability is affordable and timely
- Putting research into practice updating design process methodologies for implementation
- Raising the bar higher than making buildings and infrastructure "life safe" (i.e low probability of life loss), increasing the seismic resilience of a community by having limited interruptions (downtime) and limited monetary loss.

NON-STRUCTURAL ELEMENTS

Often, damage to non-structural elements can hold up businesses and tenants getting back into buildings after an earthquake. For example:

Acoustical ceilings can be heavy and sway significantly causing dislodged/broken ceiling tiles, and damage to HVAC services.

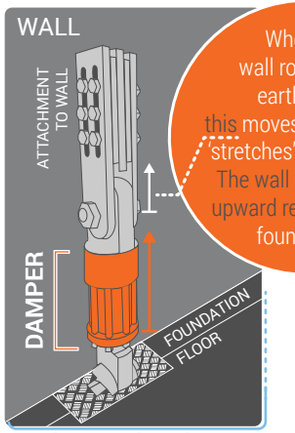
Earthquake induced damage to sprinklers and pipes can flood a premises and make it unusable for a period.

QuakeCoRE research into low-damage structural and non-structural building components now means the likelihood of such damage can be greatly reduced.

Cracking to plasterboard walls can compromise a building's fire rating and prevent people from re-entering the building until it is fixed.

Glass is a brittle material and if not well connected will crack when subjected to small deformations

STRUCTURAL ELEMENTS



When the wall rocks in an earthquake this moves upward and 'stretches' the damper. The wall then moves upward relative to the foundation.

Lead extrusion damper

Beams, columns, walls, braces and floors – are the skeleton of a structure. New structural systems and their components have been developed that **allow buildings to deform in major earthquakes with little to no damage.** A lead extrusion damper dissipates energy by the movement of an internal rod causing the extrusion of a lead core around an inner protrusion.

Te Hiranga Rū | QuakeCoRE
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Te Hiranga Rū QuakeCoRE: New Zealand Centre for Earthquake Resilience. It is a Centre of Research Excellence funded by the New Zealand Government.