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

INFORMED CHOICE FOR SEISMIC BUILDING PERFORMANCE

EDUCATING ENGINEERS WHO IN TURN EDUCATE:

ENGINEERING SOLUTION 1: ROCKING WALLS
ENGINEERING SOLUTION 2: BASE ISOLATION
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.

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

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.
- 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

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.

Non-structural elements:

- Acoustical ceilings
- Earthquake induced damage to sprinklers and pipes
- Cracking to plasterboard walls
- Glass

Reciprocal movement of a lead core around a protrusion absorbs energy and moves upward allowing walls to "rock" in an earthquake.

WALL
DAMPER
FOUNDATION

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

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