Learning From Earthquakes New Zealand Travel Study Program: Opportunities in Rebuilding the Built Environment

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Earthquake Background

Christchurch, Feb 22 2011

Building Collapses in Christchurch

- CTV Building
  - 115 casualties
- Pyne-Gould Building
  - 18 deaths

Widespread Access Restrictions

Hulsey et al. 2018
Earthquake Background

Christchurch, Feb 22 2011

Kaikoura, Nov 14, 2016

Damage to Malborough wineries

Damage in Wellington

Building damage in Kaikoura

Extensive ground displacements, landslides disrupt transportation


https://www.thorntontomasetti.com/2016_kaikoura_earthquake/
Damage to Lifelines from Kaikoura EQ
Framing the Discussion

Recovery

Risk Reduction  Readiness  Response

National Civil Defense Emergency Management (CDEM) Strategy
Opportunities in Risk Reduction

Rebuild with Enhanced Structures

Reconfigure the Built Environment
Rebuild with Enhanced Structures

**Updated Hazard Maps**
Before and After Canterbury EQ Sequence
Updated Provisions for Hollow-Core Slab construction

1) Increased minimum floor topping thickness to 75mm (~3 in.)
2) Prohibited the use of non-ductile reinforcing mesh
3) Hollow-core units must be supported away from the edge of the beam on low friction bearing strips.
4) Support details for hollow-core slabs must be able to sustain 1.5 times the interstory drift level and ensure the unit remains seated during design level earthquake.

Statistics House, Wellington after Kaikoura

Rebuild with Enhanced Structures

Low Damage Technologies

Rehua, University of Canterbury:
Viscous Dampers and Buckling Restrained Braces
Rebuild with Enhanced Structures

Low Damage Technologies

PwC Center, Wellington:
Base Isolation

Isolation Gap
Rebuild with Enhanced [Infra]Structure

Design for Quick Recovery of Road Networks
Opportunities in Risk Reduction

- Rebuild with Enhanced Structures
- Reconfigure the Built Environment
Reconfigure the Built Environment

Christchurch, Emergency Operations Center
Reconfigure the Built Environment

Turanga, Christchurch Public Library
Reconfigure the Built Environment

Red Zone, Repurpose Hazardous Areas

https://engage.regeneratechristchurch.nz/information-about-the-land
Opportunities in Rebuilding the Built Environment

Rebuild with Enhanced Structures
Reconfigure the Built Environment

Recovery
Risk Reduction
Readiness
Response
Thank you!