

Homes



Government Buildings



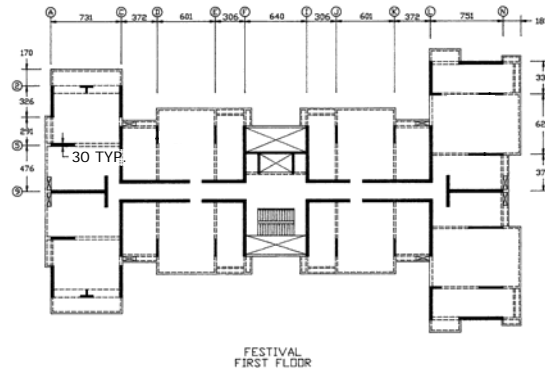
Schools



The 27 February 2010
South Central Chile
Earthquake

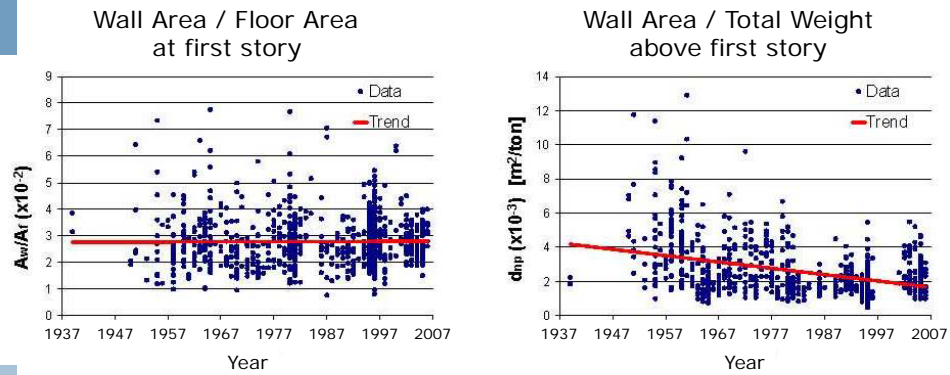


Engineered buildings



Santiago

Construction trend



Rene Lagos

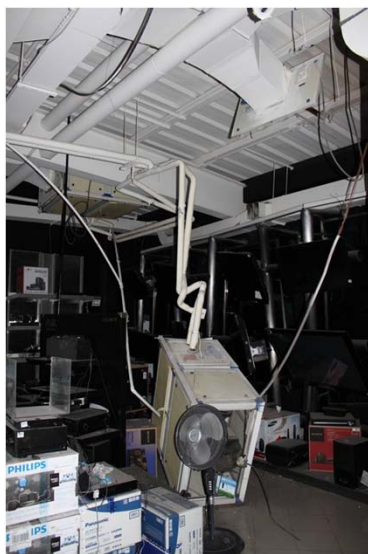
Wall damage



Anchoring to concrete



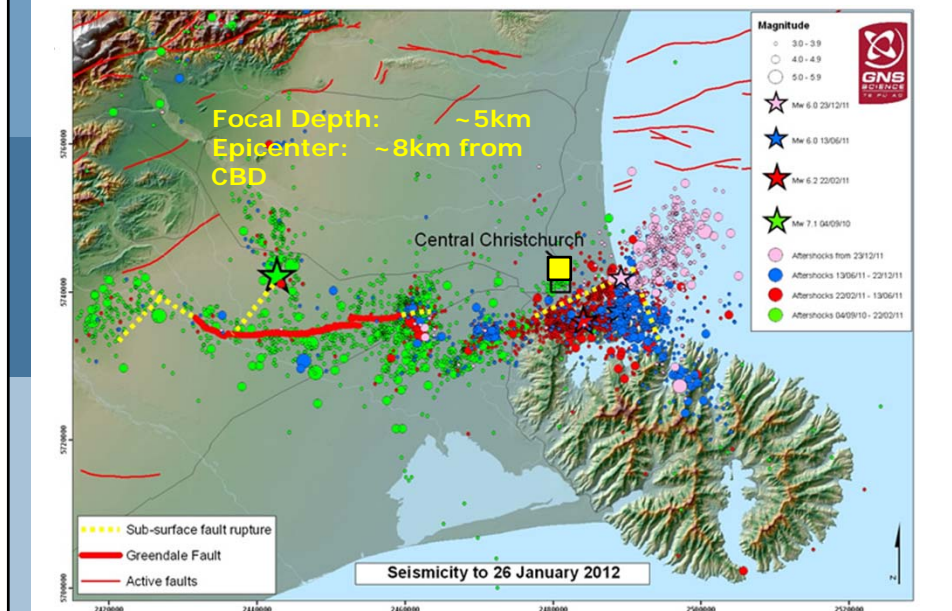
Nonstructural



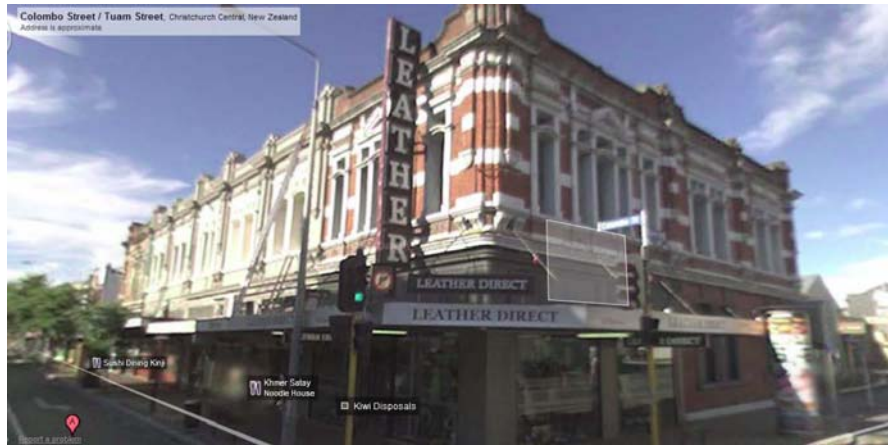
Christchurch 2010-2011



Darfield "aftershocks"



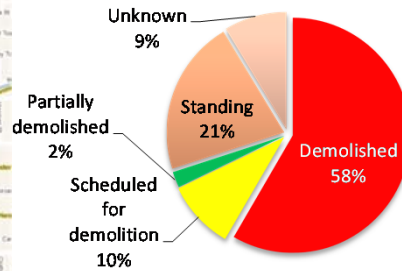
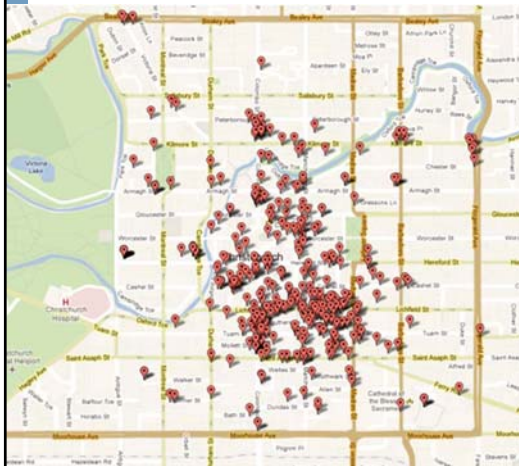
Before



After



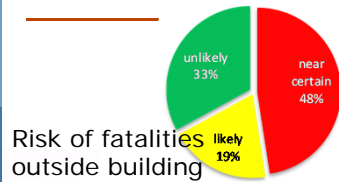
URM Damage - February



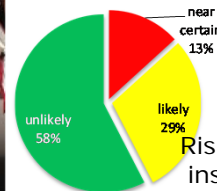
370 URM buildings in CBD
Ingham and Griffith, 2011

Life Safety

Outside → Unsafe



Risk of fatalities
outside building

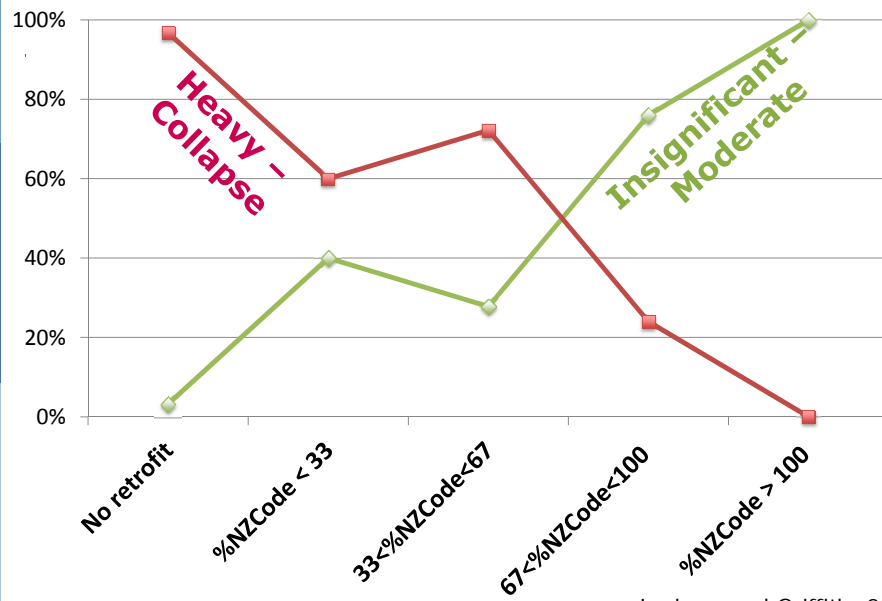


Risk of fatalities
inside buildings
(Ingham 2011)

Inside → Safer?



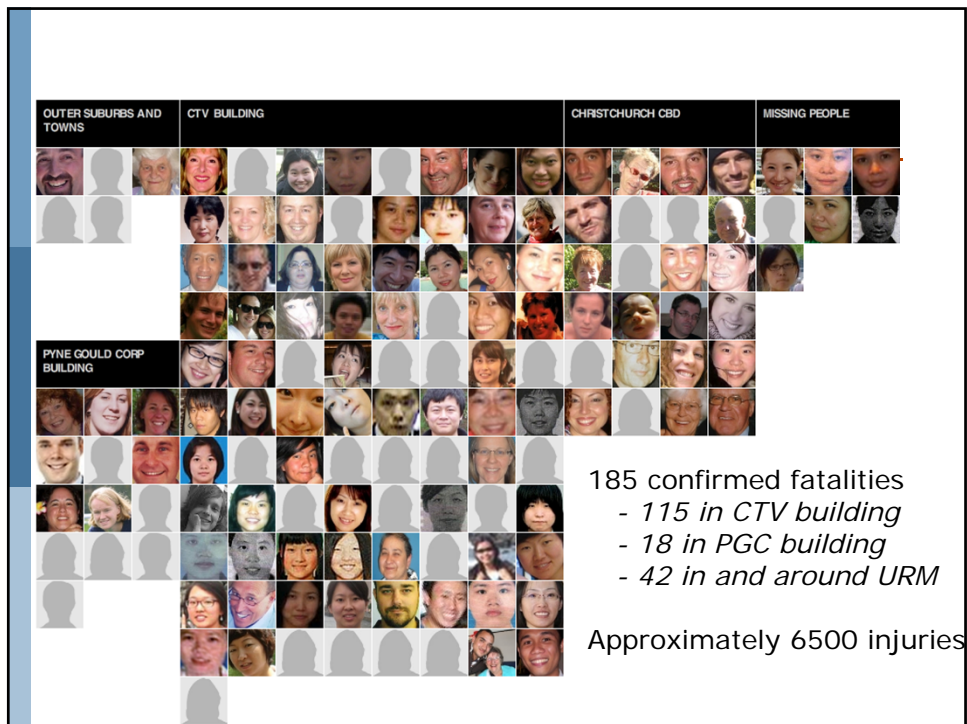
Retrofit Strength vs Damage



Ingham and Griffith, 2011

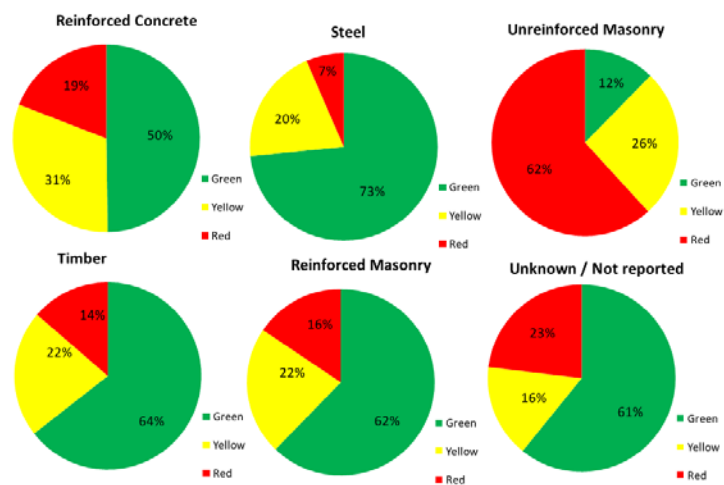
Nonductile concrete





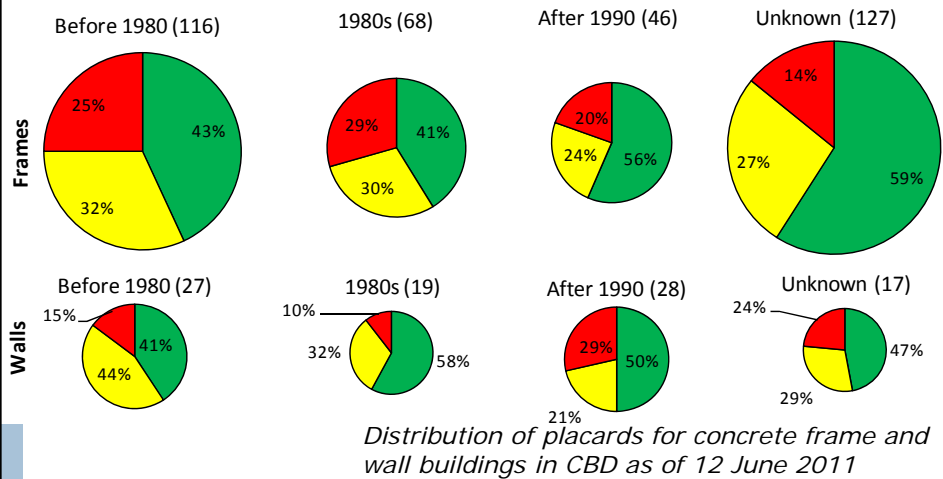
Overall Structural Performance

CBD Tagging as of March 18 2011



Images courtesy of Kam Weng Yuen

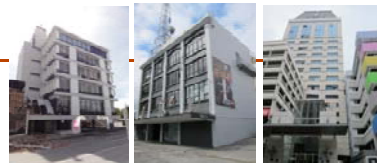
RC Building Performance



Kam, Pampanin, Elwood, NZSEE Bulletin 2012

Critical Building Project

- ~40 "Critical buildings"
- Advise City on action to reduce hazard during State of Emergency.
 - Stabilize, Demolish, or Leave it for the owner?

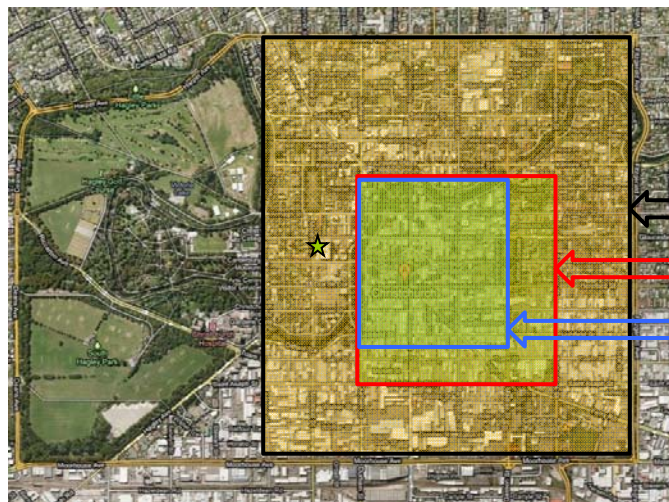


Christchurch – One year after



Ross Becker

Central Business District – Cordon (114 Square Blocks)



March 2011

May 2011

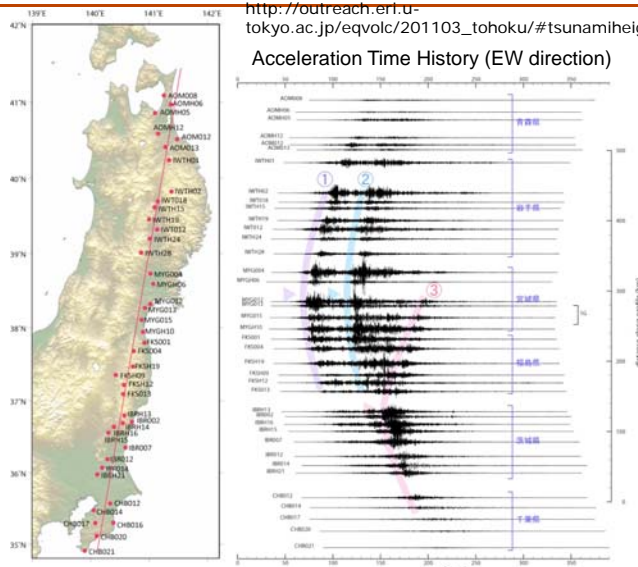
Today

Tohoku, Japan 2011



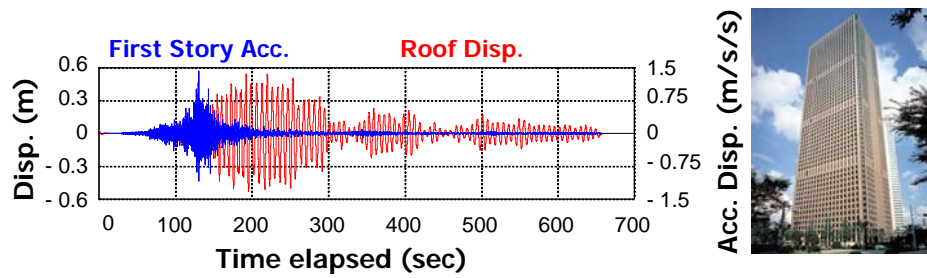
Ground Acceleration Records

http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103_tohoku/#tsunamiheight
Acceleration Time History (EW direction)

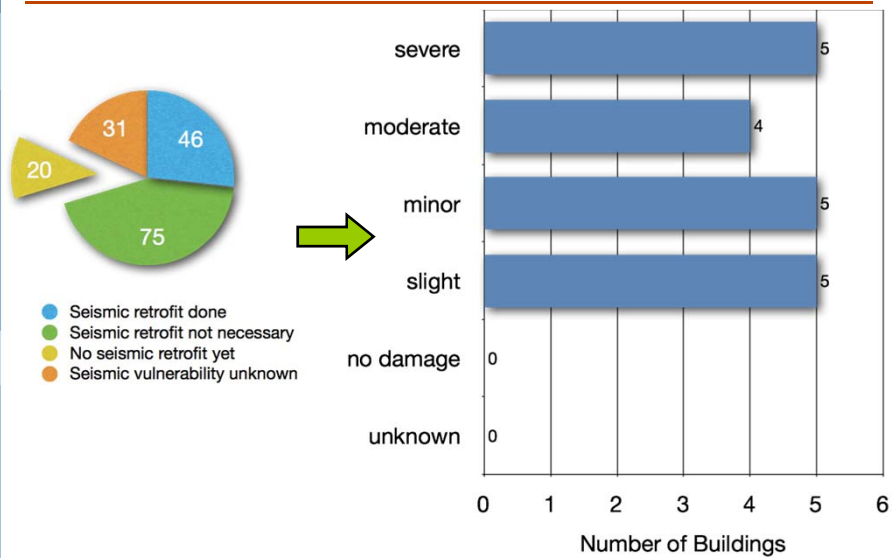




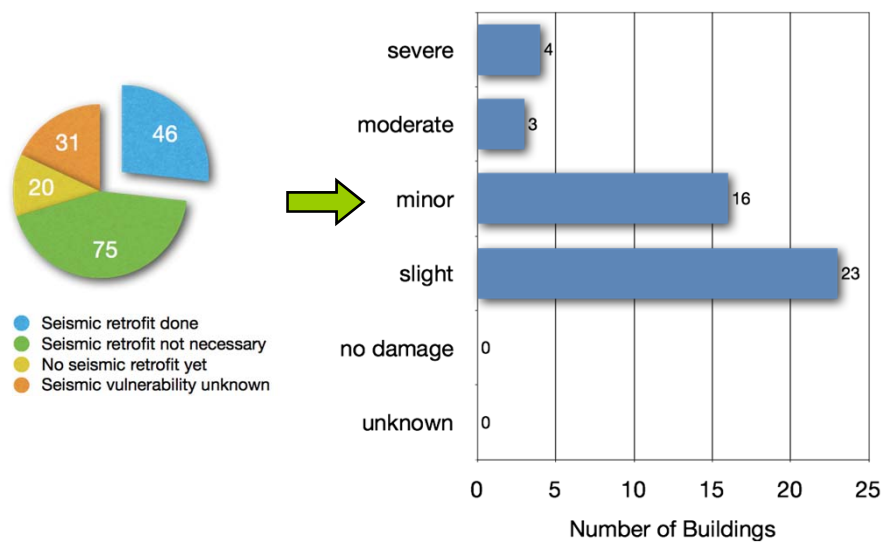
High-rise buildings



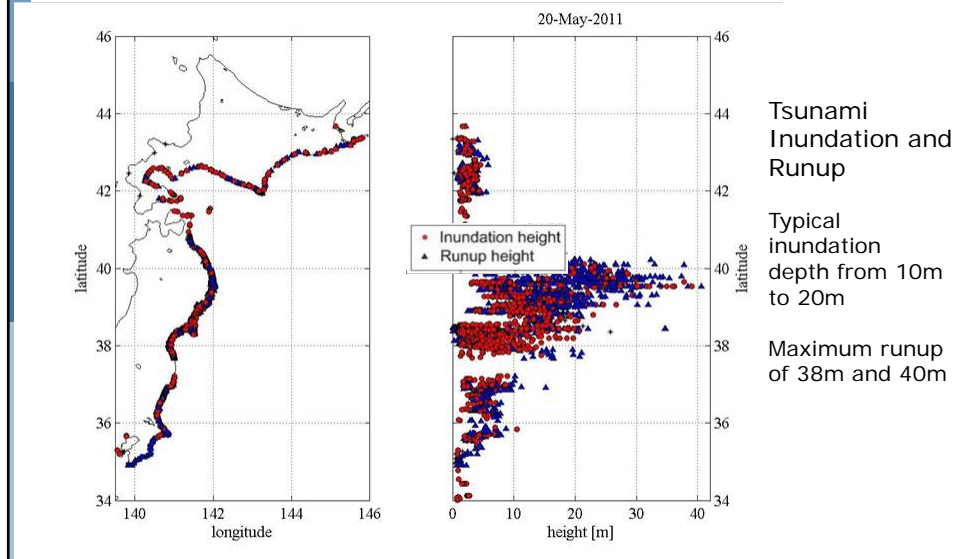
Performance of School Buildings; without Seismic Retrofit



Performance of School Buildings; with Seismic Retrofit Done



Peak Water Level Measurements



Tsunami Damage to Structures



Types of Debris



Fire Truck in Otsuchi



Power poles and tree trunks



Failed seawall



Debris damming

