Christchurch Central
Development Unit

Te Uepū Whakahiato

Presentation to:
Construction and Deconstruction Conference

John Cumberpatch - General Manager Operations CERA

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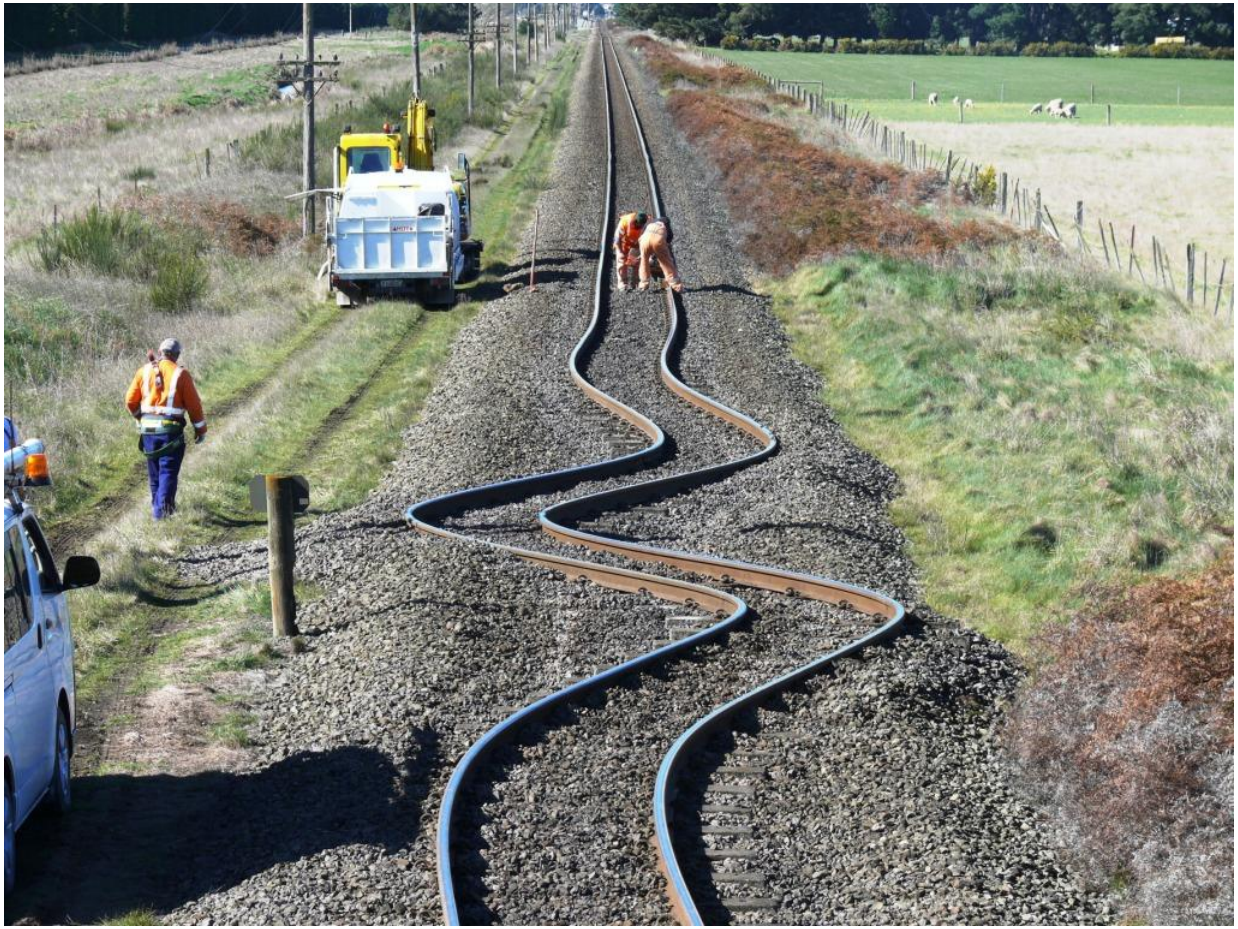
CERA
Canterbury Earthquake
Recovery Authority
Te Mana Haumanu ki Waitaha

Christchurch and Canterbury

Background – the earthquakes : 2010



4 September 2010 :
Magnitude 7.1 in Darfield, 40 kms west of Christchurch

26 December 2010 :
Magnitude 4.9 in the city

Background – the earthquakes : 2011

22 February 2011

Magnitude 6.3 centered in Heathcote Valley

5 km from the city centre

13 June 2011 : 5.7 and 6.4

23 December 2011 : 5.8 and 6.1

Background – the earthquakes : impact

Problems encountered by demolition crews

Initial response : the early days

- Sensitivity with handling material associated with known fatalities.
- Streets covered in debris.
- Many buildings too dangerous to enter.
- Owners wanted to retrieve their belongings before demolition.

Problems encountered by demolition crews

Safety

- Maintaining a safe operation - in dangerous buildings, amid continuous aftershocks – was always the biggest challenge.

Structural propping during demolition of the Clarendon Tower

Problems encountered by demolition crews

Ability to do the job

- Tall buildings, especially the Grand Chancellor Hotel, required specialist demolition experience and were a priority.

- There were varying levels of experience and ability amongst local contractors.

- Specialist equipment, especially high reach, was not readily available.

Problems encountered by demolition crews

Communication

- Contractors needed to share operational risks and issues.
- Good record keeping was essential – by the demolition contractors, and also by the lifeline utilities companies.
- Clear instructions were not always received.

Problems encountered by demolition crews

Disposal of debris and hazardous materials

- Correct debris disposal was essential to avoid potential legacy issues.
- Not all hazards could be identified inside dangerous structures.
- Dirty demolitions were sometimes the only solution.
- Discovery of hazardous materials on site led to a change in scope.
- Concrete crushing on site led to cross-contamination.
- There was no time for recycling in the early response phase.

Problems encountered by demolition crews

Uncontrolled collapses

- Not understanding the risks, or unknown damage in floor slabs, led to uncontrolled collapses on a number of occasions.

- Analysing stability and re-assessing it, as work progressed.

Archaeological requirements

- All buildings pre 1900 required archaeological consent before demolition could start.

What kinds of demolition materials needed to be disposed of?

Liquefaction : 400,000 tonnes of silt.

Debris : from 220 significant buildings
(5+ stories high) and other commercial buildings

- concrete panels
- cladding
- metals
- glass
- timber
- insulation
- air conditioning
- hotel fridges and freezers
- bathroom fit outs
- fluorescent lighting
- furniture
- putrescible waste

– and not least…

- asbestos and other hazardous chemicals.

What kinds of demolition materials needed to be disposed of?

Hazardous materials :

- asbestos
- chemicals
- lead print
- domestic shed contents
- stored paint
- oil
- cleaning products

What kinds of demolition materials needed to be disposed of?

Coronial waste

Heritage items

Debris from 8000 houses

Where did the demolished materials end up?

- **Liquefaction** went to Burwood Landfill.

Where did the demolished materials end up?

- **Unsorted debris** went to Burwood Resource Recovery Park - where anything that could be recycled was extracted.
- **Rubble** went to Lyttelton Port for reclamation.
- **Asbestos** went to Kate Valley – 60kms north of the city
- **Recycling** - by the demolition contractor.

Where did the demolished materials end up?

- A large percentage of the debris has been recycled.

Recycling examples :

- Large concrete panels were used by farmers as bridges.

- Toilets were wrapped in Pink Batts and shipped to the Pacific Islands.

A recycled concrete wall makes a useful bridge

Where did the demolished materials end up?

Concrete crushing

- In the response phase, concrete was taken away and disposed of.
- Basements needed to be filled after demolition.
- On-site concrete crushing used as fill, for same building only.
- The rules were relaxed.
- Quality control.
- Low level asbestos contamination.

Solutions

The CBD Cordon

- Crews could work in a controlled and safe environment.
- The rate of demolitions was accelerated, saving money and speeding up the recovery.

Solutions

Accreditation

- An accreditation system ensured contractors were suitably experienced for relevant projects.
- It allowed contractors to undertake more complex demolitions as they developed their expertise and experience.
- The tender process for significant buildings resulted in high quality demolition methodologies.
- Consistent standards.
- Raised awareness.

Solutions

Communication

- A central Demolitions Project Management Office was set up to co-ordinate all the demolition projects.
- Contractors met there to discuss relevant topics, and share risks and issues.
- The PMO meetings created a community bond that helped endure long hours of hard work in grim conditions.
- The PMO scrutinised methodologies for demolitions, especially under 3 stories, to improve documentation and communication.

Solutions

Debris

- A Waste Management Plan was established for each site.
- It was approved by ECAN before demolition work could commence.

WEMT

- Waste and Environmental Management Team, a joint governance group funded by:
  - Environment Canterbury
  - Christchurch City Council
  - CERA
  - Selwyn District Council
  - Waimakariri District Council

Solutions

Hazardous materials

- Education programmes via MBIE and ECAN improved awareness about contaminated sites.

Recycling

- Once the situation became safer, quick “pick and go” recycling was allowed.
- After a while full recycling recovery became the norm.

How should we construct for deconstruction?

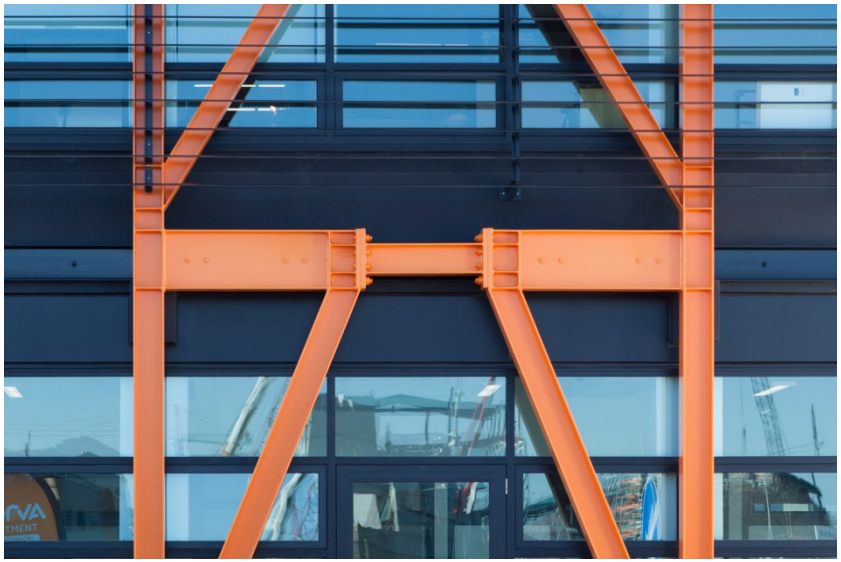
Use low damage design techniques such as :

- base isolation
- rocking steel braced frames
- post tensioned concrete
- rocking shear walls
- press-laminated veneer lumber construction.

How should we construct for deconstruction?

Structural design

- Use eccentrically braced frames that are replaceable after the event.
- Design so that over-stressed parts can be removed easily and replaced afterwards.



How should we construct for deconstruction?

Structural design

- Consider the structure’s behaviour in a maximum event.
- Increase awareness of new techniques.
- Lumber construction.
- Design with demolition in mind.

How should we construct for deconstruction?

- What is an “earthquake proof” building?
- International practice - design loads according to their probability of occurrence.
- Focus on life safety rather than property protection.
- Modern buildings should be designed to be ductile.
- Easy access to inspect critical connections should be incorporated in future designs.

What could other cities learn from Christchurch?

- USAR and NZDF
- Decisive leadership
- Cordon - with formal access for demolition crews and the public
- Accredited contractors for demolitions
- Formal demolition contracts and tendering
- Burwood Resource Recovery Park - BRRP

What could other cities learn from Christchurch?

CERA

- CER Act
- Use available resources – CCC, IRD, Aurecon, structural engineers
- Database by property
- DEEs - Detailed Engineering Evaluations
- SCIRT
- WEMT – Waste and Environmental Management Team
- CHER – Combined Health and Environmental Risk Group
- Heritage
- Blueprint