12 Projects over 12 Years: Reflections from Implementing Low Damage Designs

... A Consultants' Point of View

Alistair Cattanach, Director
Dunning Thornton Consultants Ltd,
Wellington NZ

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Why

The NZ public now understand disruption

Research to implementation – the difficulties

Which were/are more successful

Shed 13: Wellington Waterfront

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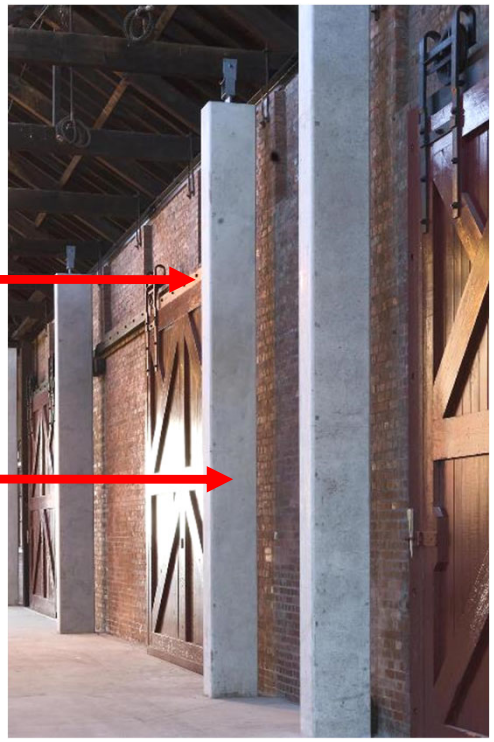
Hidden horizontal truss

Ductile element

Pre-tensioned columns (stiff)

Standing off existing fabric



Meridian Building : Wellington Waterfront

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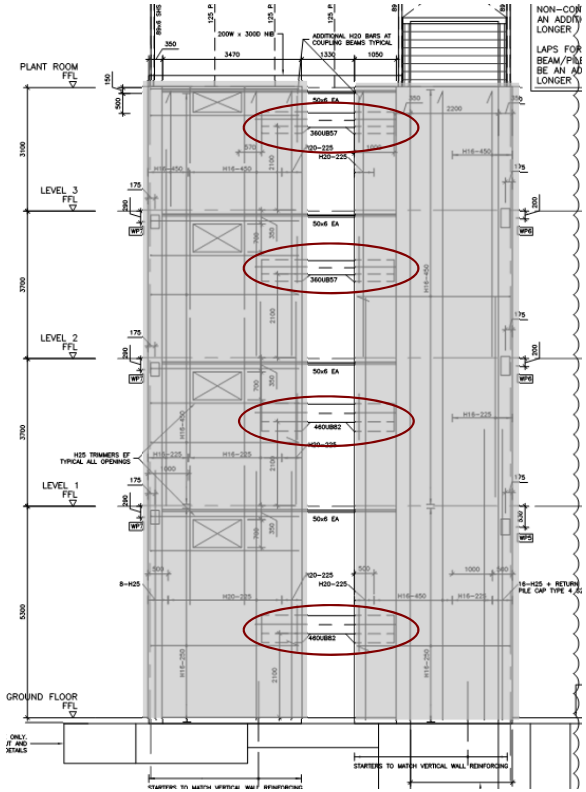

CentrePort: The Customhouse

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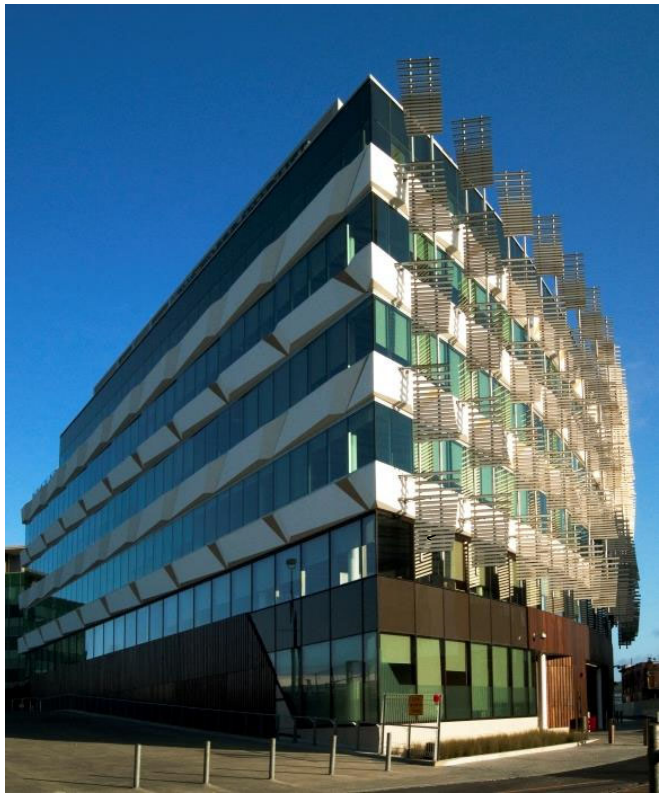

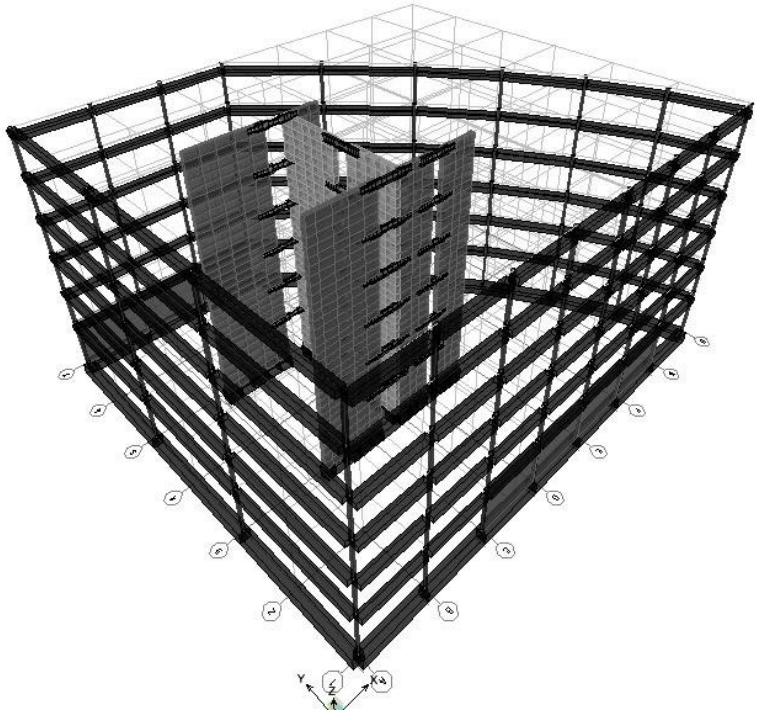

CentrePort The Customhouse

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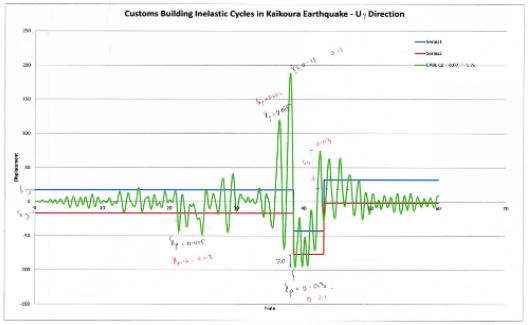
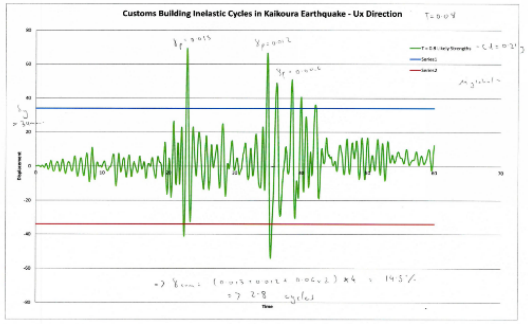
Parallel to Quay



Perpendicular to Quay



Alan MacDiarmid: Victoria University of Wellington

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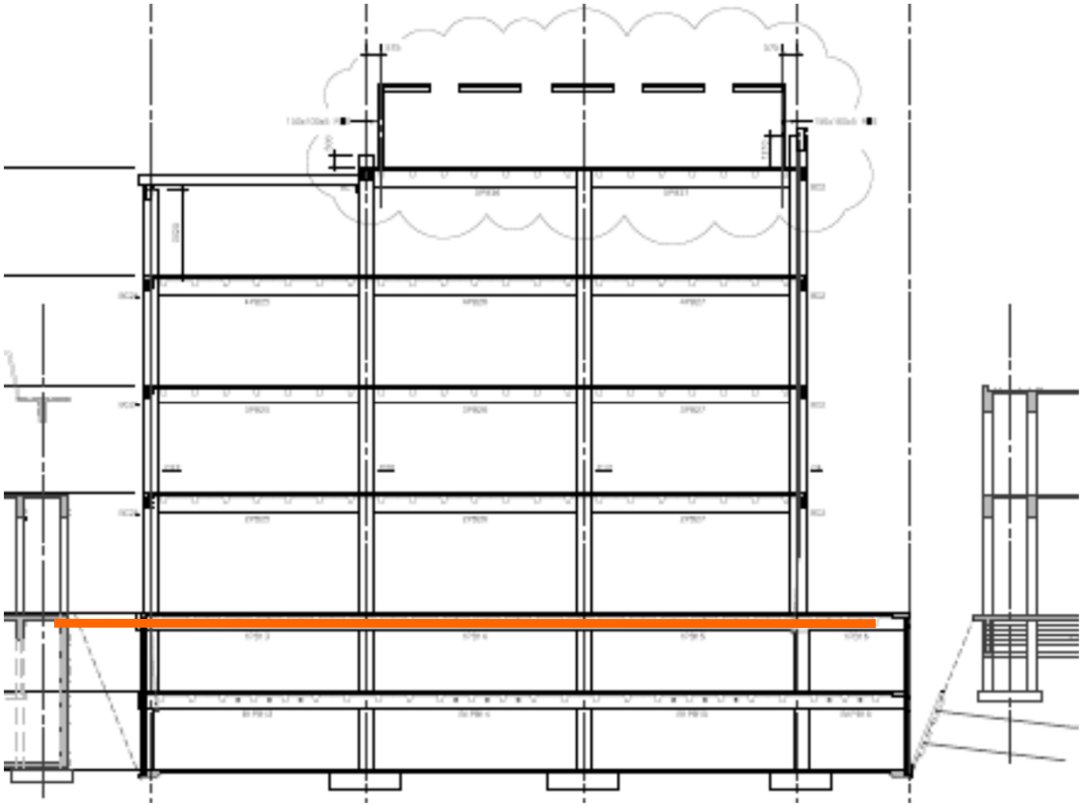

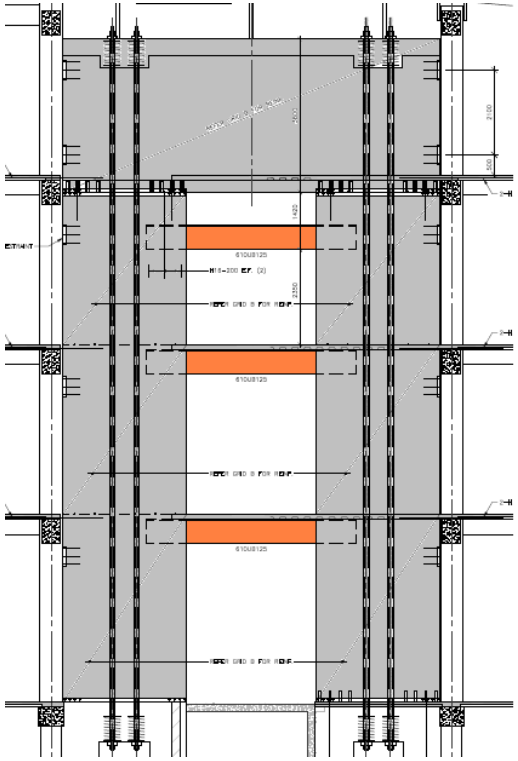

Te Toki a Rata: Victoria University of Wellington

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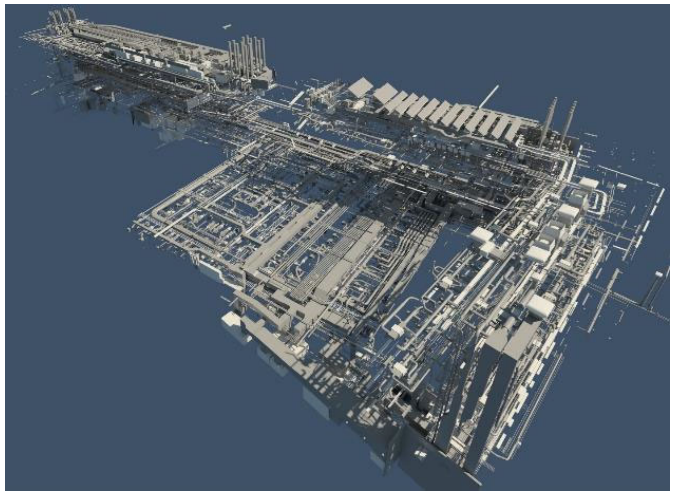

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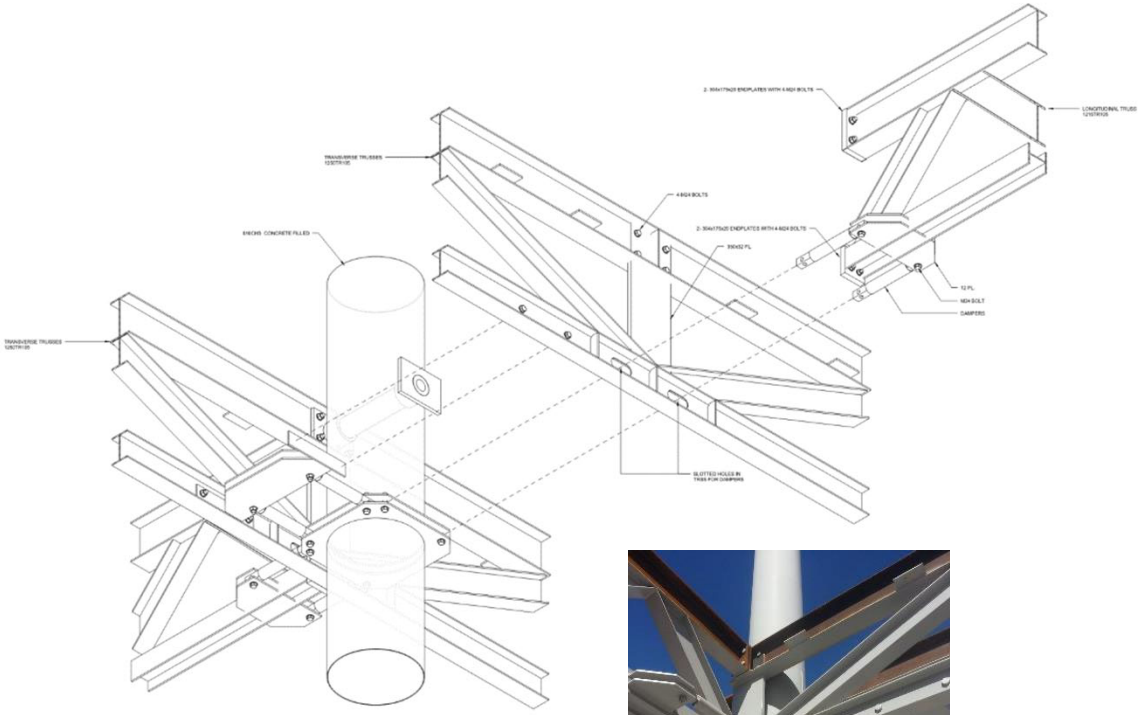

Royal Society: Wellington

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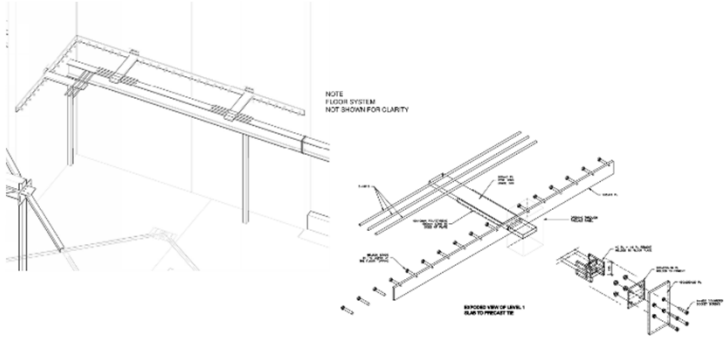

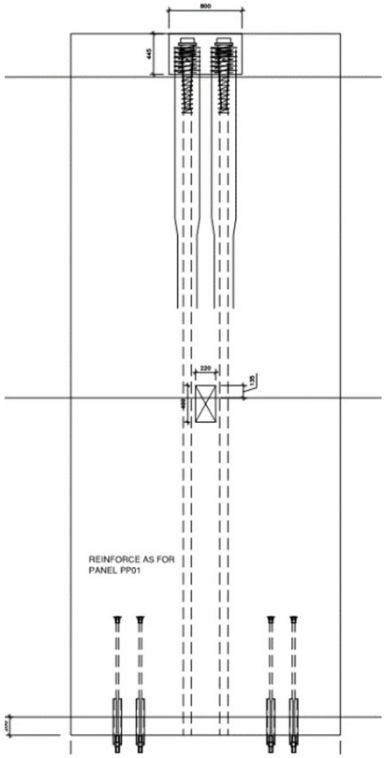

Massey College of Creative Arts: Wellington

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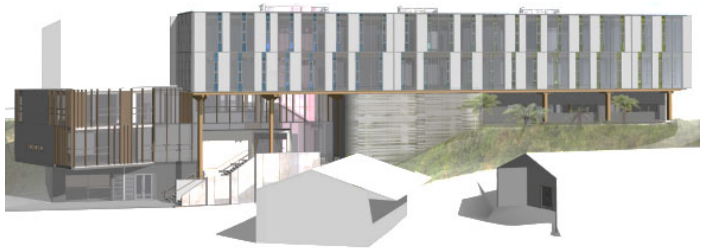

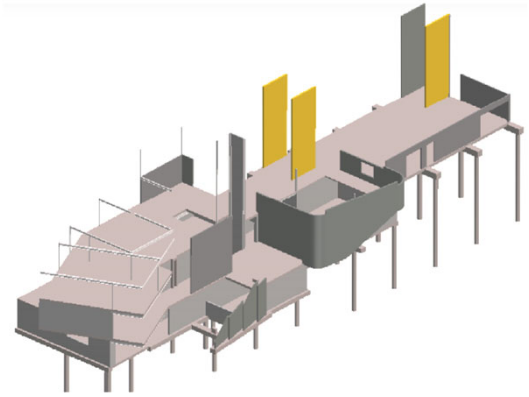

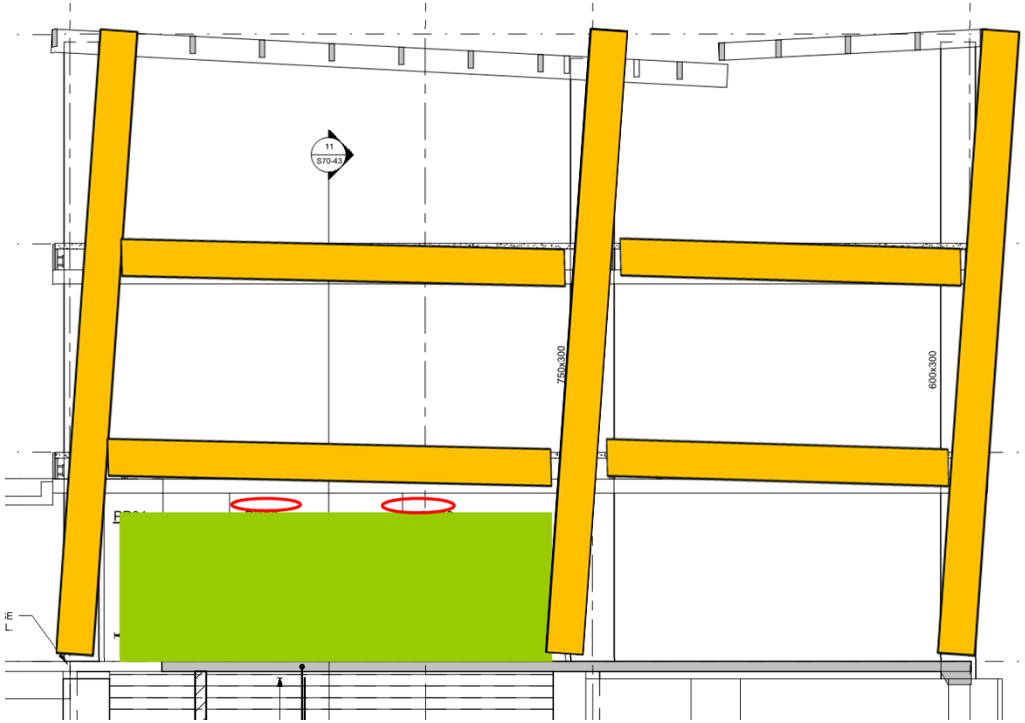

Massey College of Creative Arts: Wellington

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tension cables running through column
tensioned at base of ground beam

Gisborne War Memorial Theatre

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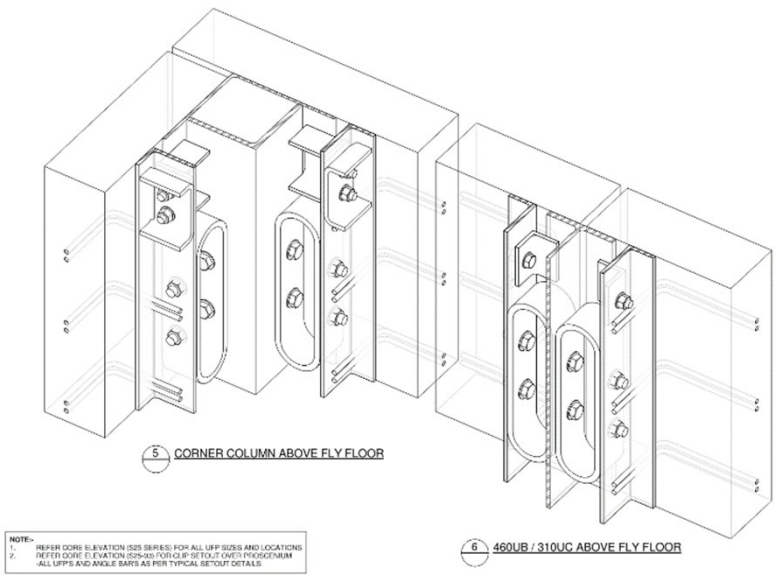
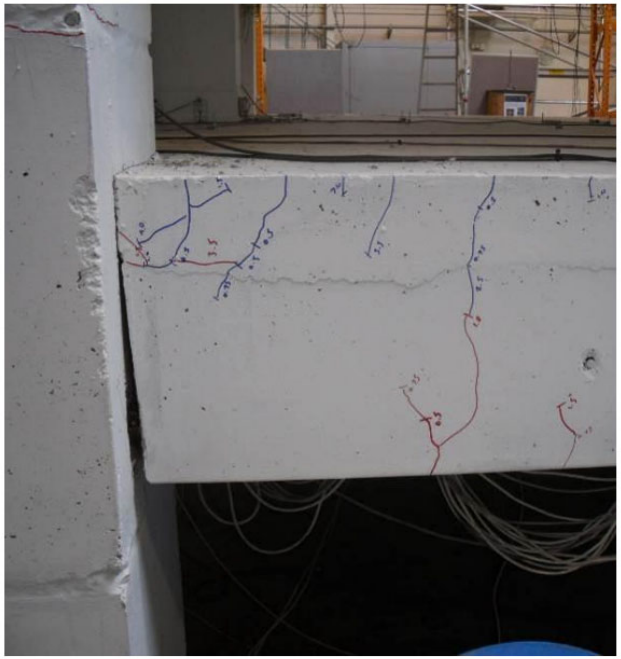


Huddart Parker



(a) Slotted beam end damage.

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One Market Lane

Nelson Airport

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Scion Hub: Rotorua

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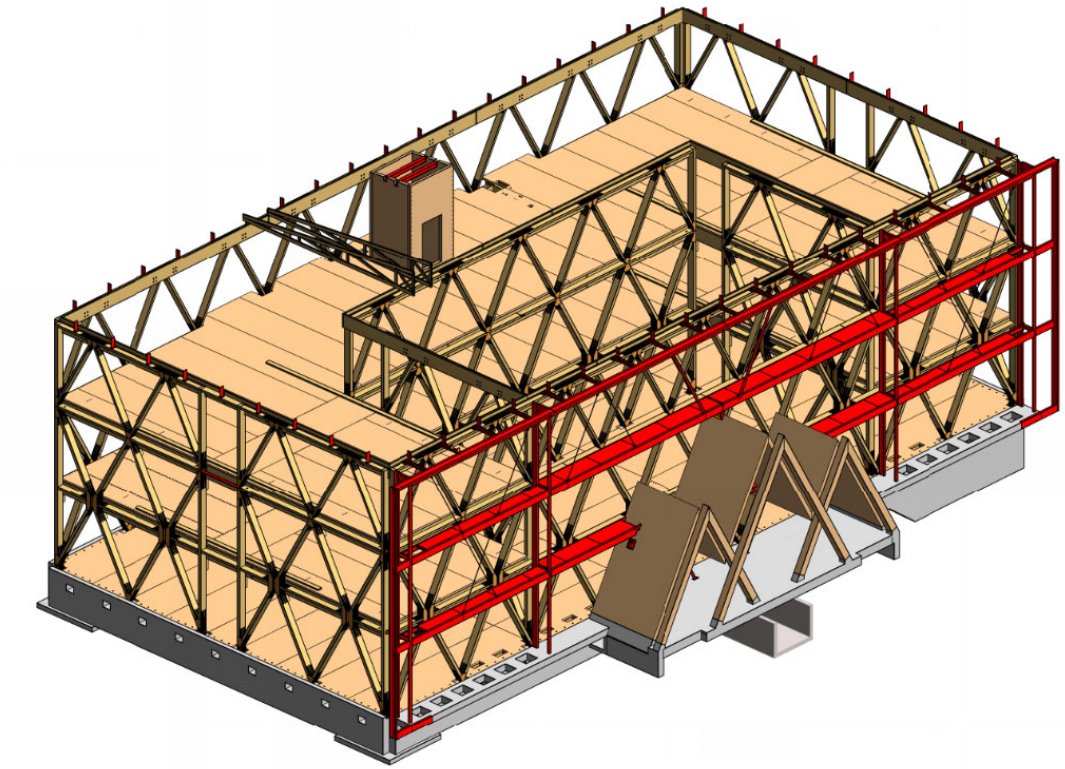

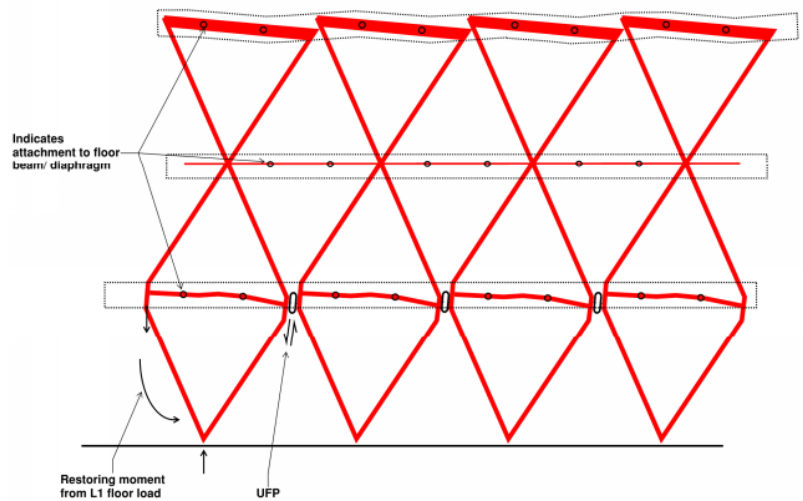

Diagrams and Communication

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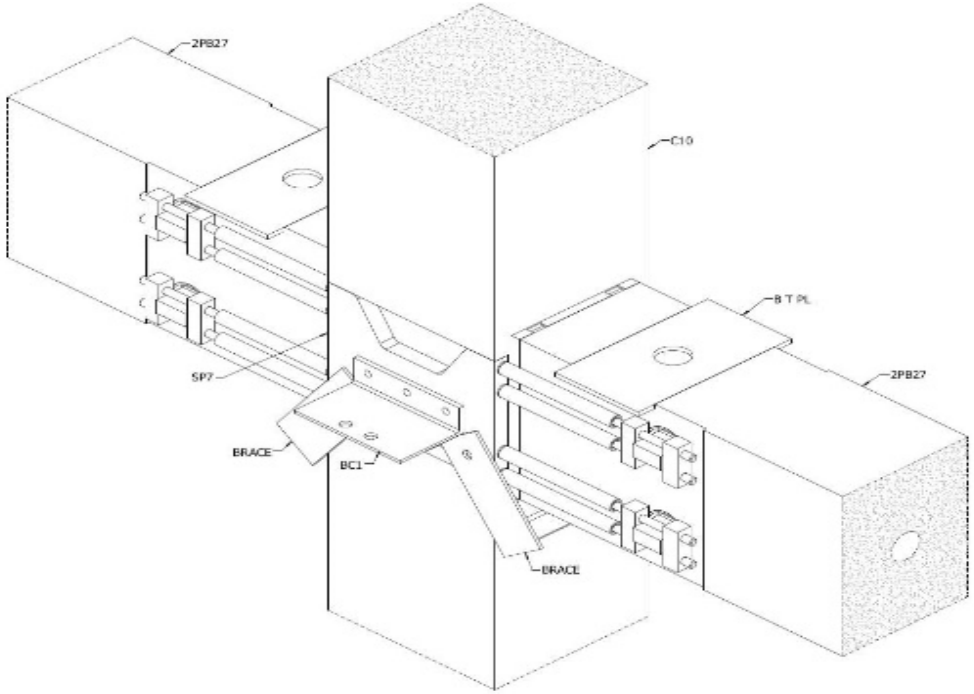
- Internally: simple tests of resilience
- Externally: mechanisms easier for others to understand

Scalability from Research

- Detailing



Scalability from Research

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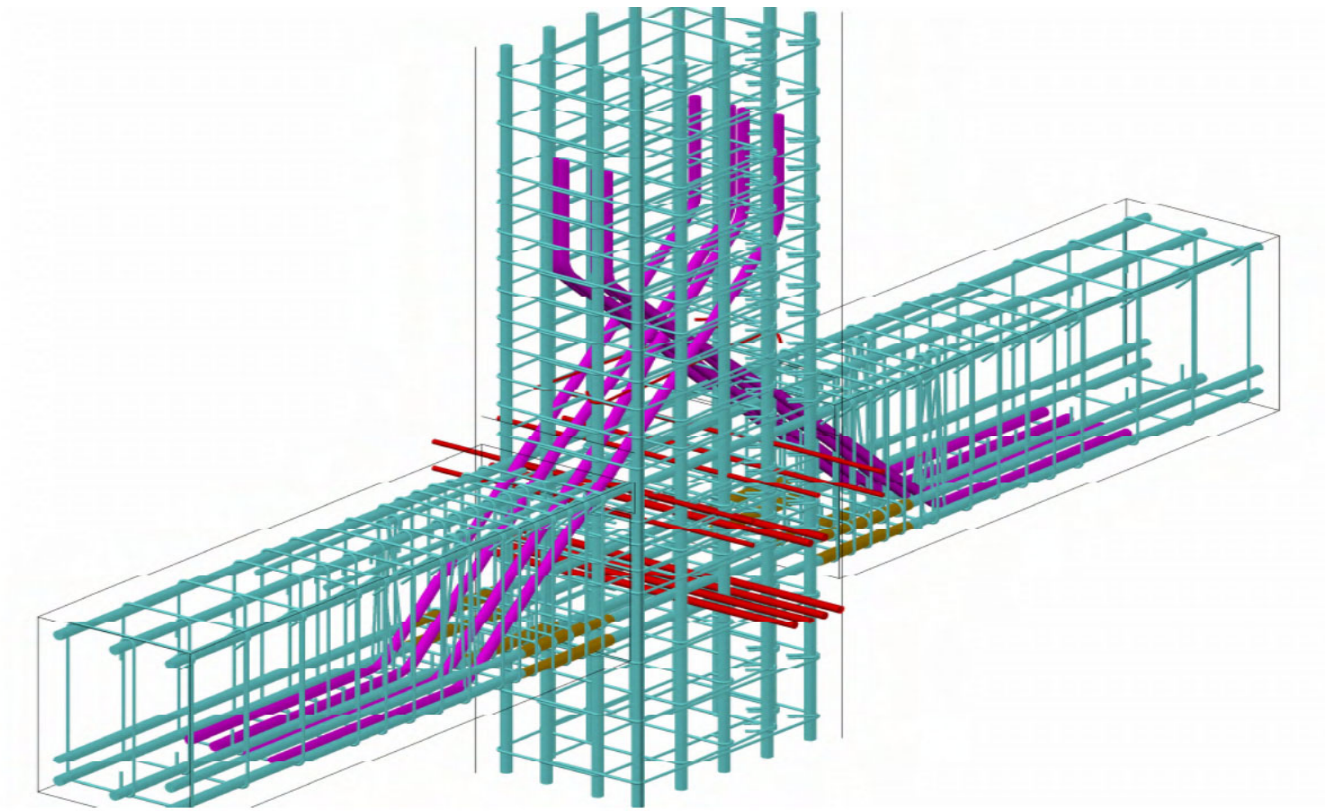
- Strain to fracture

Scalability from Research

- Buildability



“Rattle”

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- Hard to estimate early in the process
- Essential to understand – easy to **overestimate** performance

Analysis

- Analysis time vs. Detailing time
- Simple tools most effective

Diaphragms and Connections

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- Not Base Isolation!
- Imposed Rotations
- Imposed Dilations
- Loss of Continuity

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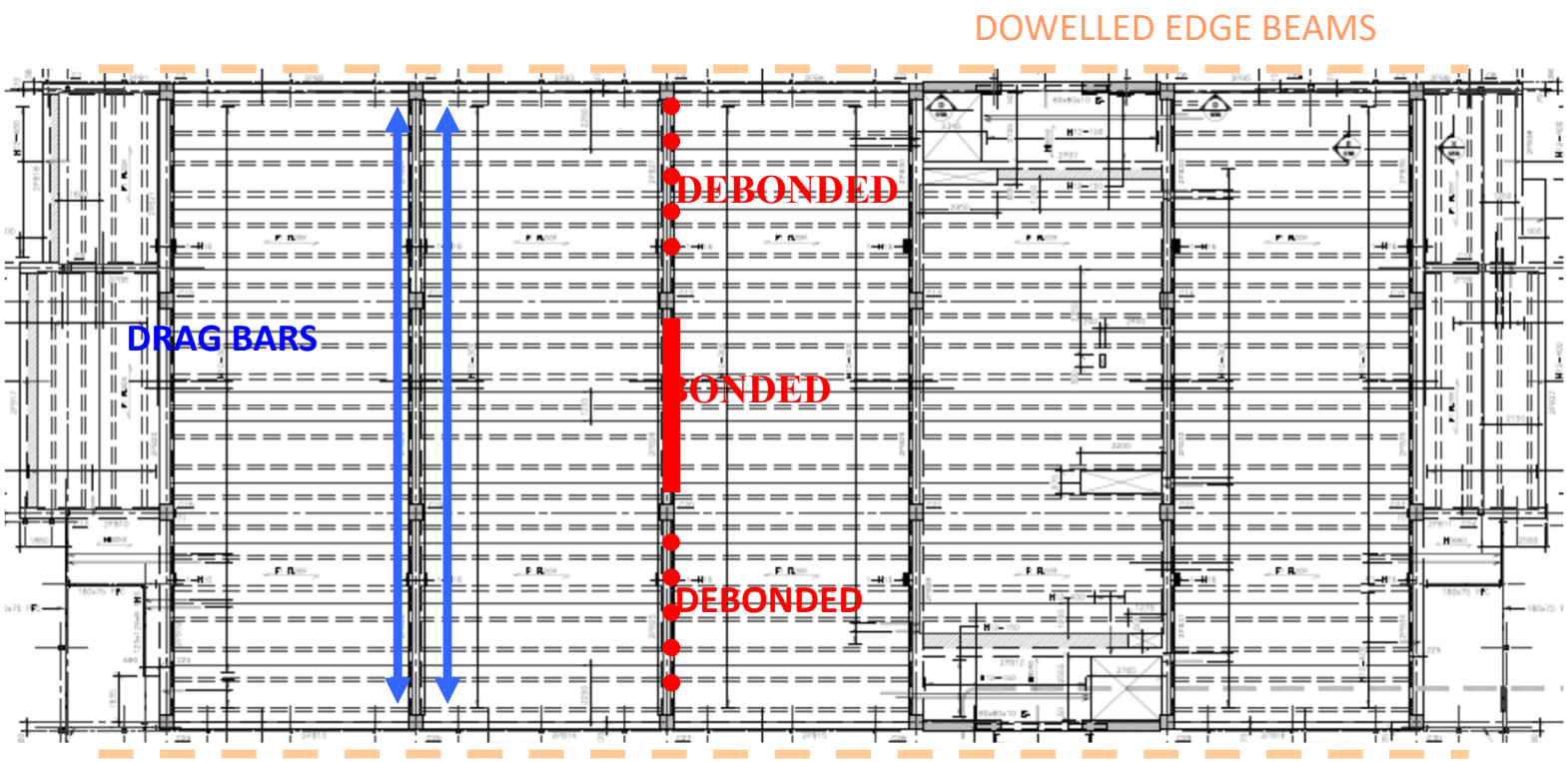

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ELASTIC EDGE BEAMS

SHORT SPAN COMPOSITE SLABS

Secondary Structures and Non-Structural Elements

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- Proportion of Cost
- Communication and Education
- Modifications over time

Resonance

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Conclusions

- Every structure should minimise seismic damage where practical
- It’s not easy
- Many tools, procedures and precedents needed to educate