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
Why

The NZ public now understand disruption
Research to implementation – the difficulties
Which were/are more successful
Shed 13: Wellington Waterfront
Shed 13: Wellington Waterfront

- Hidden horizontal truss
- Pre-tensioned columns (stiff)
- Ductile element
- Standing off existing fabric
Meridian Building: Wellington Waterfront
CentrePort: The Customhouse
CentrePort The Customhouse

Parallel to Quay

Perpendicular to Quay
Alan MacDiarmid: Victoria University of Wellington
Alan MacDiarmid: Victoria University of Wellington
Alan MacDiarmid: Victoria University of Wellington
Te Toki a Rata: Victoria University of Wellington
Te Toki a Rata: Victoria University of Wellington
Royal Society: Wellington
Massey College of Creative Arts: Wellington
Massey College of Creative Arts: Wellington
Gisborne War Memorial Theatre
Huddart Parker

(a) Slotted beam end damage.
Nelson Airport
Scion Hub: Rotorua
Diagrams and Communication

• Internally: simple tests of resilience

• Externally: mechanisms easier for others to understand
Scalability from Research

• Detailing
Scalability from Research

• Strain to fracture
Scalability from Research

- Buildability
“Rattle”

• 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

• Not Base Isolation!

• Imposed Rotations

• Imposed Dilations

• Loss of Continuity
Alan MacDiarmid: Victoria University of Wellington
Alan MacDiarmid: Victoria University of Wellington
Secondary Structures and Non-Structural Elements

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

• Every structure should minimise seismic damage where practical

• It’s not easy

• Many tools, procedures and precedents needed to educate