QuakeCoRE
NZ Centre for Earthquake Resilience

Kilmore Street Medical Centre (Forté Health) Case Study Engenium Ltd

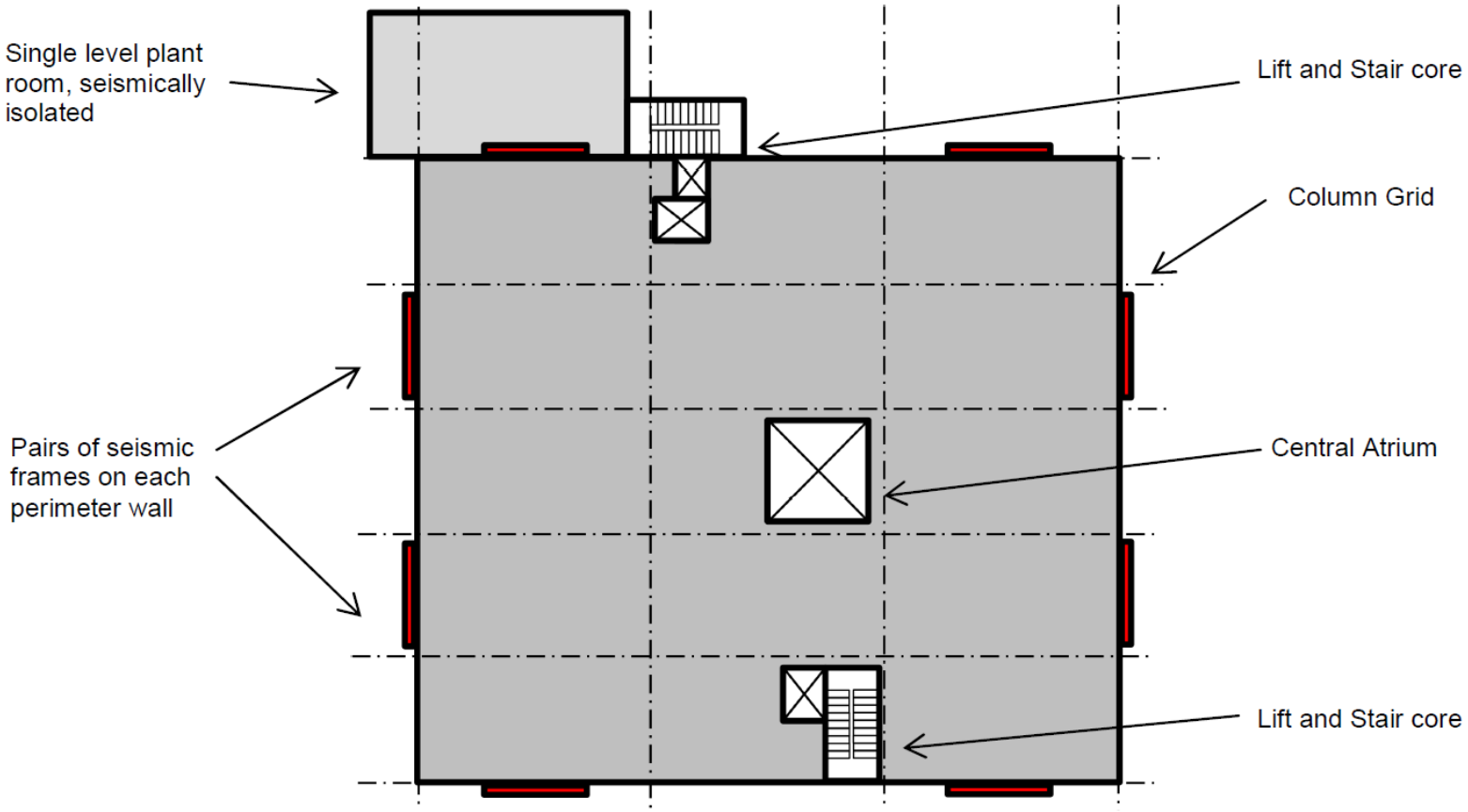
UC University of Canterbury
The University of Auckland New Zealand
Resilient Organisations
GNS Science
Massey University
Te Whare Wānanga o te Upoko o te Ika a Māui Victoria University of Wellington
The University of Waikato Te Whare Wānanga o Waikato
BRANZ

Forté Health

- **Three-storey specialist hospital complex**
- **Rocking steel frames with sliding hinge joints, buckling restrained braces, and lead extrusion dampers**

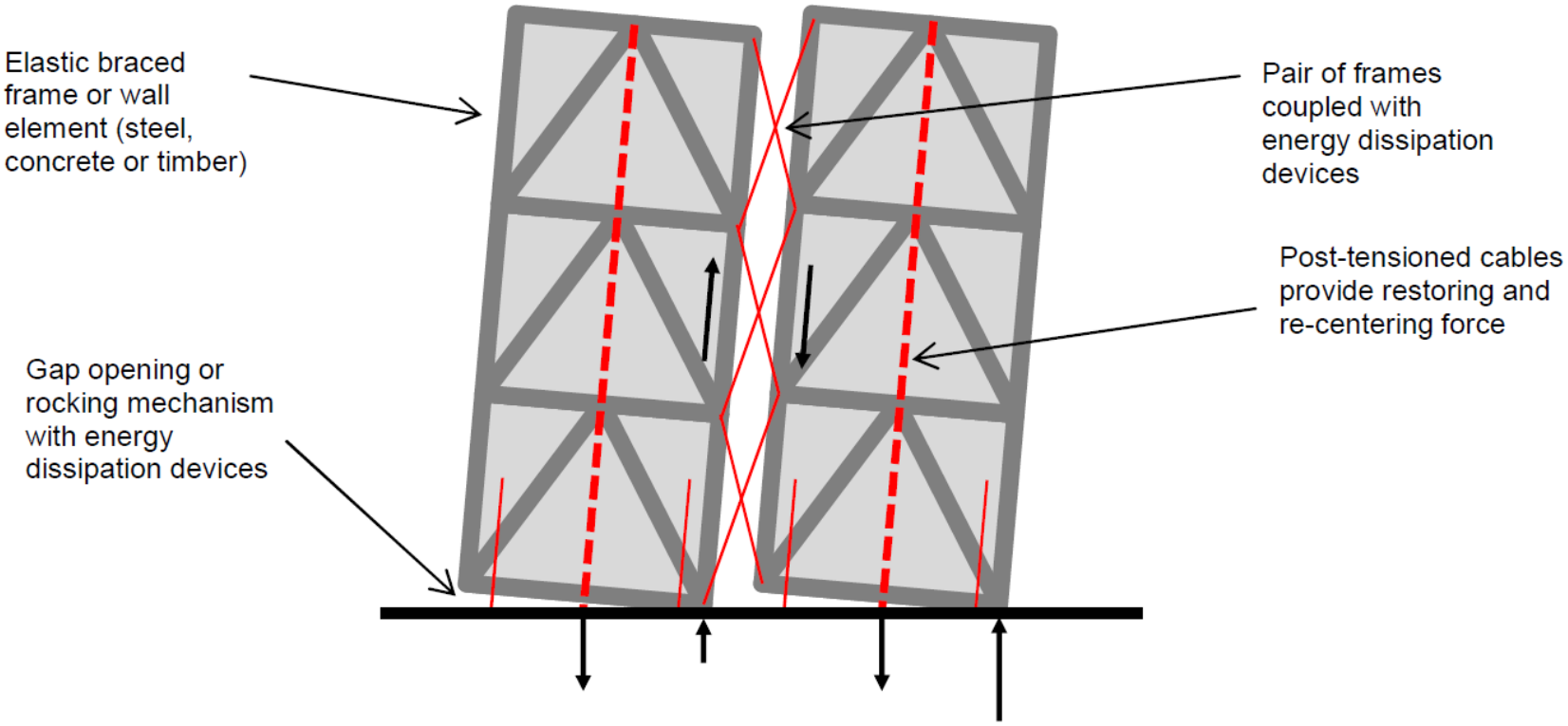
Field Implementation

- **Kilmore Medical Centre Plan**
- **Eight seismic frames around the perimeter**
- **Lead dampers and buckling restrained braces on the seismic frames**



Field Implementation

- **Kilmore Medical Centre Plan**
- **Eight seismic frames around the perimeter**
- **Lead dampers and buckling restrained braces on the seismic frames**

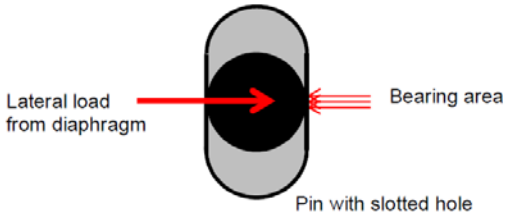
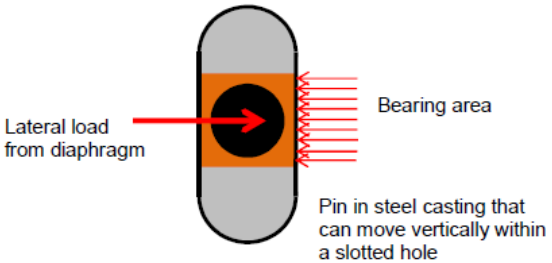
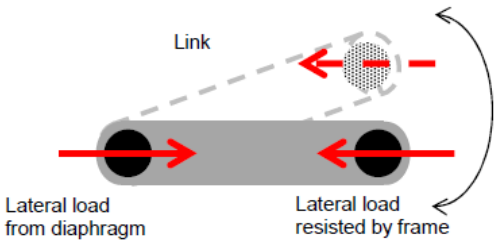
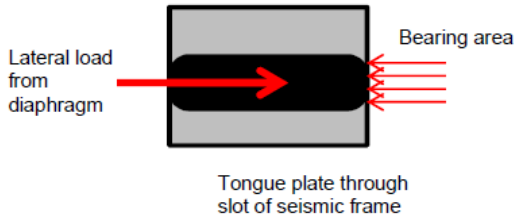


Field Implementation

- Kilmore Medical Centre Plan
- Buckling restrained braces and lead extrusion devices
  - Between the pairs of rocking steel frames
  - Between the frames and the foundation

Uplift/Floor Compatibility

Design issues around damage control to avoid floor hogging

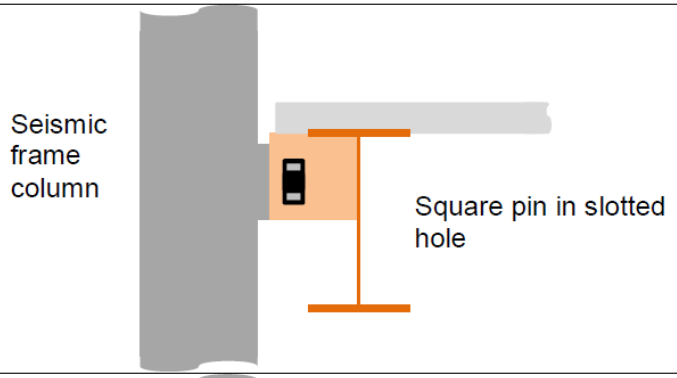
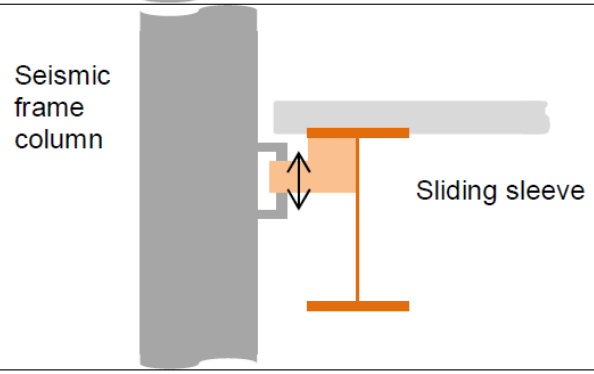
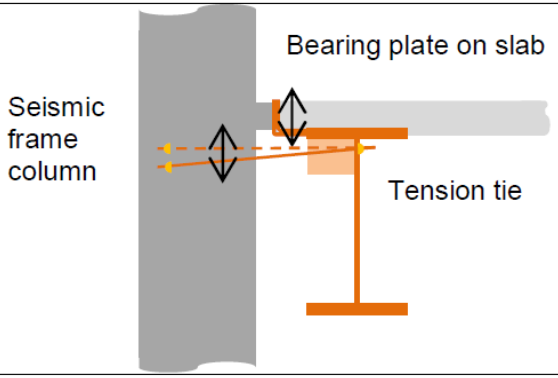
Option	Schematic	Comments
Single pin in slotted hole		Allows for uplift and rotations Contact surface of a round pin on a straight surface is small giving a very small bearing area Difficult to achieve tolerance
Single pin in a round hole within steel casting within a slotted hole		Allows for uplift and rotations Larger bearing area High friction may prevent vertical sliding Potential for uneven bearing of casting on seismic frame surface
Link system with two pins		Allows for uplift and in-plane rotations Relatively uniform bearing of the pins Difficult to accommodate out-of-plane displacements
Protruding tongue plate		Allows for uplift and rotations Bearing area can be controlled Friction may prevent vertical sliding however can be minimised by design Ductile yielding mechanism in case of overload

Field Implementation

- **Kilmore Medical Centre Plan**
- **Eight seismic frames around the perimeter**
- **Lead dampers and buckling restrained braces on the seismic frames**
- **Sliding hinge joints on the internal gravity frame**

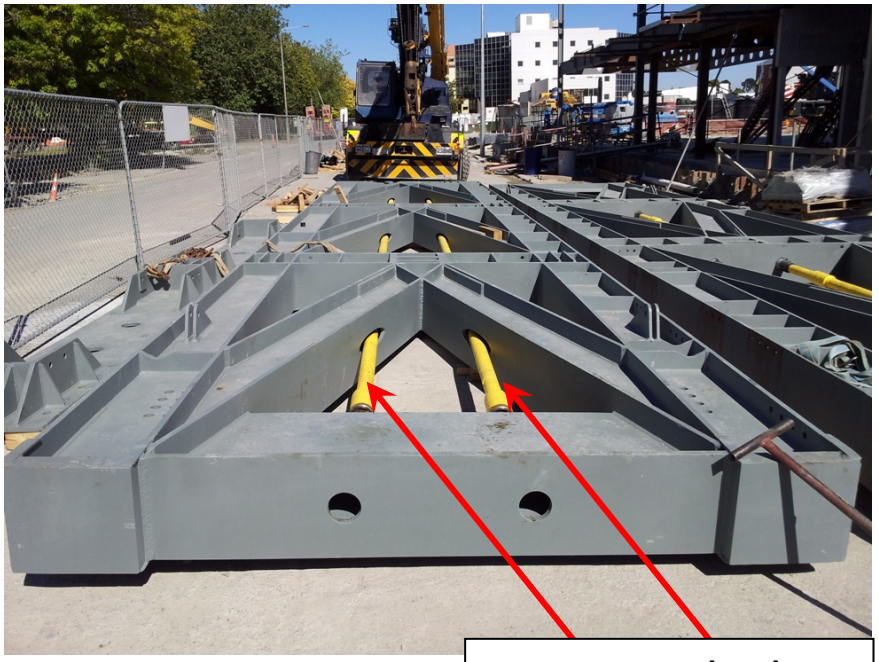
Uplift/Floor Compatibility

Out-of-plane restraint of the seismic frame

Option	Schematic	Comments
Sliding square pin		Provides out-of-plane stability while allowing for vertical uplift of column Difficult to accommodate rotational distortions
Sliding sleeve		Provides out-of-plane stability while allowing for vertical uplift of column Rotational distortions can be accommodated Complex fabrication and erection
Tension tie and compression bearing plate		Provides out-of-plane stability while allowing for vertical uplift of column Rotational distortions can be accommodated Simple fabrication and erection

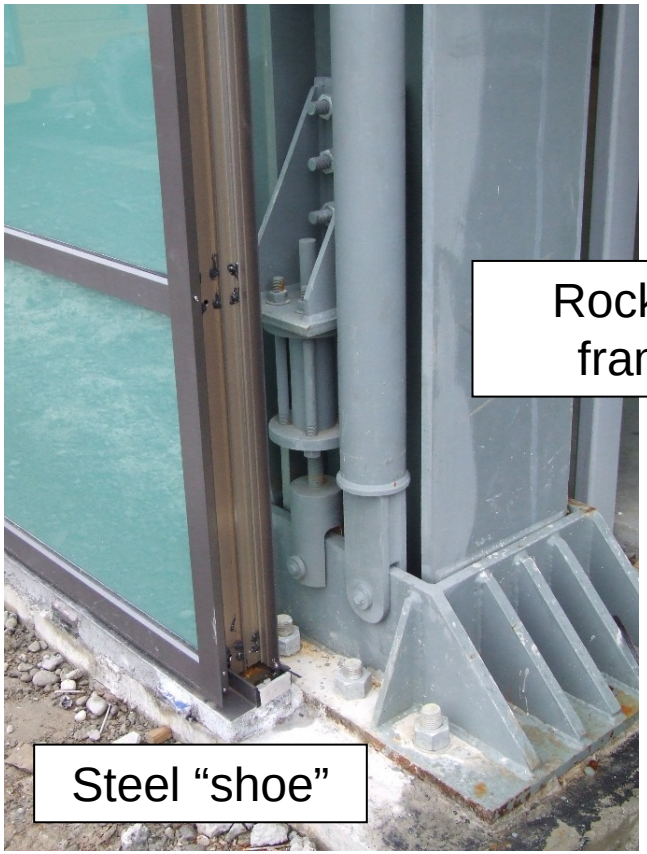
Field Implementation

- **Rocking Steel frames on Kilmore street before erection**



Field Implementation

- **Completed frame before glazing is completed.**



Field Implementation

- **Completed frame before glazing is completed.**