

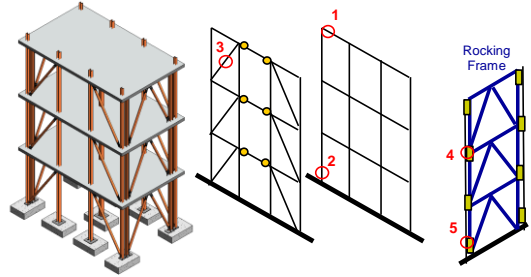
ILEE PROPOSAL

07 May 2018

ROBUST BUILDING SYSTEMS

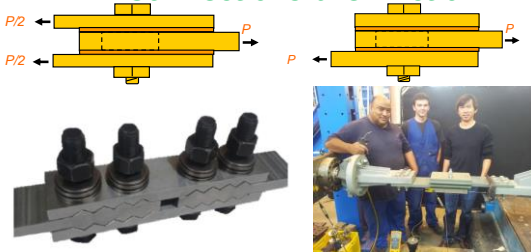
WHAT IS IT?

THE STRUCTURE



WHAT IS IT?

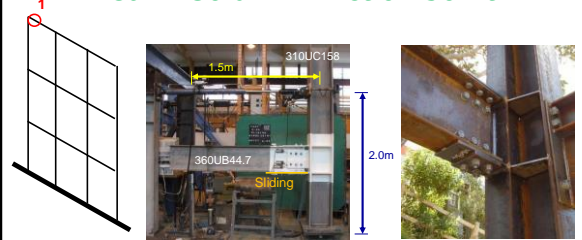
All Connections are Friction



Previous work: Pall and Marsh (1980s), Popov (1990s), Clifton et al. (1995), MacRae et al. (2010), Chanchi (2015) Quenneville (2016)

WHAT IS IT?

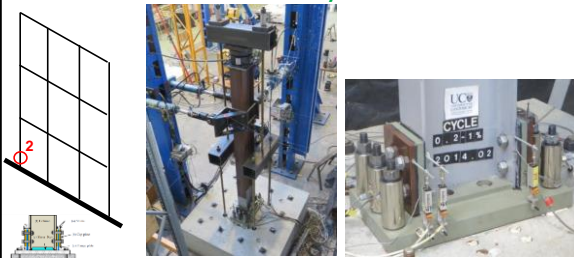
Beam-Column Friction Joint



Previous work: Clifton et al. (1995), MacRae, Mackinven et al. (2005), Ramhormzian et al. (2017), Tjahjanto et al. (2018)

WHAT IS IT?

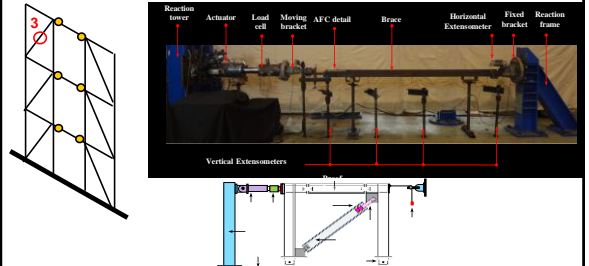
Column Base 2-Way Friction Joint



Previous work: Borzouie et al. (2014)

WHAT IS IT?

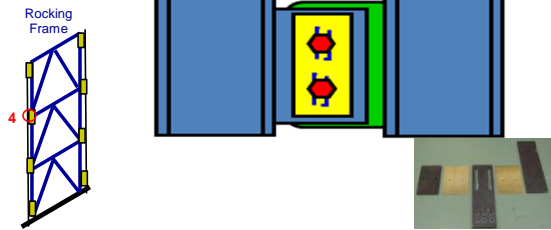
Brace Friction Joint



Previous work: Xie, Chanchi et al. (2015, 2016)

WHAT IS IT?

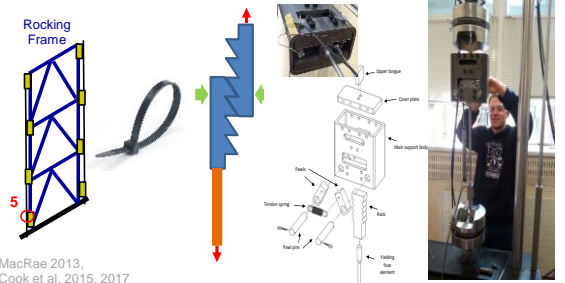
Rocking Frame Dissipator



Chanchi J., MacRae G.A., Chase J.O., Rodgers G.W., Mora Muñoz A., Clifton C.G., "Design considerations for braced frames with asymmetrical friction connections - JRC", STESDA Conference, Santiago, Chile 2012.
 MacRae G.A., 2016, "University of Canterbury Research", in Proceedings of the Steel Structures Workshop 2015, Research Directions for Steel Structures, compiled by MacRae G. A. and Clifton G. C., University of Canterbury, 13-14 April.
 (MacRae)

WHAT IS IT?

Rocking Frame GripNGrab



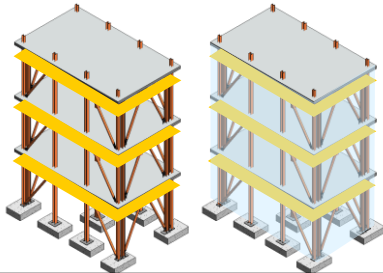
MacRae 2013,
 Cook et al. 2015, 2017

WHAT IS IT?

Non-Structural Elements

E.g. Ceilings

Cladding



- plus
- Contents (e.g. furniture)
 - Partitions
 - Ducting

WHAT IS IT?

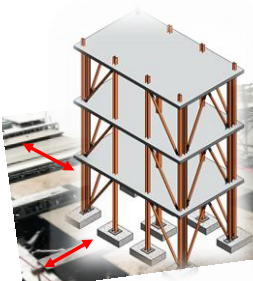
Non-Structural Elements



UC Ceiling/Partition Testing (Pourali et al. 2016)

PLAN

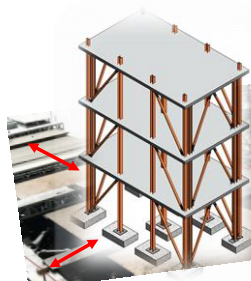
2-D Shaking Table Testing



- FULL BUILDING SYSTEM
- ROBUST
- (Resilient)
- CHEAP
- MODULAR
- FULL SCALE
- DYNAMIC
- BI-DIRECTIONAL

INNOVATION

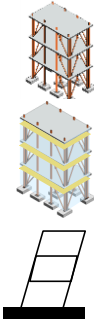
What is new?



- Connection types (GripNGrab, realistic connection types)
- 2-D dynamic system testing
- Full resilient building structure attempted

GOALS

- 1) Demonstrate structure effectiveness
- 2) Develop building effectiveness
- 3) Test economical methods for repairing and straightening such building systems



TIMETABLE: Financial

Item	Activity	By When
Proposal submitted	Proposal documentation completed	31 May 2018
NZ funding	NZ funding transferred to ILEE	10 June 2018
Testing timetable finalised	Testing timetable finalised and confirmed with ILEE	30 September 2018
Funds committed	Funds committed and contract in place	30 October 2018

TIMETABLE: Testing

Item	Activity	By When
Design completed	Design completed and members sized	31 May 2018
Drawings and contracts	Drawings done and fabrication contracts let	June to August 2018
Fabrication NZ	Fabrication, packing and ready for shipping	September to mid November 2018
Ship to ILEE	Ship to ILEE	23 Nov to end Dec 2018
Fabrication at ILEE	Assembly rig, pouring additional slabs,	January 2019
Instrumentation	Placing instrumentation off and then on shaking tables	01 February to CNY then complete after CNY March
Structure only testing	Structure only testing completed to ULS level	01 April to 01 June 2019
S+NSE testing to failure	Non structural elements added, testing to failure	01 June to 01 Sept 2019

FINANCES

Cash contributors (NZ side)

Building research association of NZ (BRANZ) via the Building Research Levy
 Earthquake Commission (EQC)
 QuakeCentre
 Quake Core (ILEE partner)
 University of Auckland
 TOTAL towards project to date

Funding promised exceeds threshold for ILEE 2:1 matching funds of 500,000RMB (or NZ \$110k)

TEAM (NZ side)



Gregory MacRae
(UC Civil)



Charles Clifton
(UA Civil), Structure



Rajesh Dhakal
(UC Civil), Non-Structural



Geoff Rodgers
(UC Mech) Liaison



Pierre Quenneville
(UA Civil)
Others



Tim Sullivan
(UC Civil)



Shahab Ramhormozian
(AUT Civil)



Pouyan Zarnani
(AUT Civil) +

Thank you