SESOC

Seminar Series

2022

# STEEL STRUCTURES:

## Maximising the resilience of multi-storey steel structures to severe earthquakes

| DUNEDIN | CHRISTCHURCH | NELSON | HASTINGS | HAMILTON | WELLINGTON | AUCKLAND |
|---|---|---|---|---|---|---|
| 22 MAR | 23 MAR | 24 MAR | 29 MAR | 30 MAR | 5 APR | 7 APR |

## Why you and your employees should attend this seminar?

Traditionally, multi-storey structures have been designed for ductile response in severe earthquakes, meaning the need to repair or replace following such an event. While this saves life, it comes at a huge economic and social cost, as seen in Christchurch 2010/2011 and in Wellington 2016.

Steel framed buildings in both these cities generally performed very well, however these earthquakes have focussed subsequent steel building seismic research into making steel structures even more earthquake resilient, with the aim of these buildings being rapidly re-occupiable following a severe earthquake (ULS+ intensity and duration of shaking) and at negligible cost premium over traditional ductile steel designs. This seminar will present the current status and design outcomes from some of the most significant areas of this research.

## Seminar coverage

The following topics are being covered:

1. The optimised sliding hinge joint (OSHJ): performance and application. This is a significant advancement on the existing SHJ which has been used in over NZD 5 billion of buildings since 2005. The new system enhances the self centering capability of the building and retains the full lateral strength and up to 80% of the lateral stiffness of the new building after a severe earthquake without the need for repair.
2. Stability of buckling restrained braced seismic resisting systems and all steel BRB developments. This presents a comprehensive update on the design procedure published in the SESOC Journal, Vol. 31 No. 1 2018 and development of a highly effective all steel BRB that has arisen out of that research.
3. Composite floor diaphragm interface demand and capacity. This presents the outcomes from research at the University of Auckland and the University of Canterbury on diaphragm interface design and diaphragm performance.
4. Whole building performance in severe earthquakes: the ROBUST project. This presents an update on the very ambitious project, led by the University of Canterbury and Tongji University, China, with major involvement from many organisations, which will test a near full scale, three storey steel framed building with a range of advanced low damage friction based connections on the large shake table array at Tongji University.
5. Suppressing bare steel column base yielding in multi-storey steel framed seismic resisting systems. To ensure the building can be rapidly reoccupied after a severe earthquake, such yielding must be prevented, which means having a good understanding of the actual rotational stiffnesses at the column bases and hence the moment demand on the columns at their base. Research on this is underway at the Universities of Auckland, Canterbury and AUT and the status and current findings from this research will be presented.

## Other benefits

Upskilling attendees on this critically important topic.

## Who should attend

Any engineers working for consultants, clients, building control authorities and contractors who are involved in design, fabrication, construction of buildings 2 or more storeys in height.

**REGISTER NOW**

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## SPEAKER PROFILES

### Charles Clifton BE (Hons) Civil, ME (Civil), PhD, FEngNZ

*Associate Professor – University of Auckland*

Charles Clifton obtained his Bachelor of Civil Engineering (Hons) in 1978, Master of Civil Engineering in 1979, both from the University of Canterbury and obtained his PhD from the University of Auckland in 2005.

Following 5 years consulting engineering, in 1983 Charles started the Structural Division of HERA, responsible for developing design guidance for steel structures in severe fire, severe earthquake and for durability.

In 2008, he joined the Department of Civil and Environmental Engineering, University of Auckland, with a major focus on development of resilient solutions for steel and composite steel/concrete buildings for severe earthquake and severe fire.

### Dr Shahab Ramhormozian PhD, MSc, BSc (Hons)

*Senior Lecturer - AUT*

Dr Shahab Ramhormozian is a Senior Lecturer of Structural and Earthquake Engineering at Auckland University of Technology (AUT). He teaches, undertakes and supervises research in the same area with a focus on low-damage seismic resisting systems for structural steel buildings. His PhD research was on optimising the Sliding Hinge Joint, a friction energy dissipating low-damage beam-column semi-rigid connection. This optimised system has been used in three multi-storey buildings designed by Beca and being constructed by Hawkins.

### Dr Behnam Zaboli PhD

*University of Auckland*

Behnam has completed his PhD in the Department of Civil and Environmental Engineering at the University of Auckland. His PhD project was on the Stability of Buckling-Restrained Brace (BRB) System, with Charles Clifton as Main Supervisor.

He is now involved in the design and manufacture of BRBs in New Zealand. Prior to undertaking his PhD, he was involved in the analysis and design of large-scale industrial steel structures for cement and copper refinery plants.

## PROGRAMME

| Time | Details |
|---|---|
| **1.00pm – 1.30pm** | Registration |
| **1.30pm – 1.40pm** | Introduction |
| **1.40pm – 2.25pm** | Optimised sliding hinge joint: performance and application |
| **2.25pm – 3.10pm** | Stability of buckling restrained braced seismic resisting systems/ all steel BRB systems |
| **3:10pm – 3:30pm** | Afternoon tea |
| **3.30pm – 4.15pm** | Composite floor diaphragm interface demand and capacity |
| **4.15pm – 5.00pm** | Whole building performance in earthquakes: the ROBUST project |
| **5.00pm – 5.20pm** | Suppressing column base yielding in multi-storey steel framed seismic resisting systems |
| **5.20pm – 5.30pm** | Final questions and conclusion |

## VENUES

**Dunedin**
**Tuesday, 22 March**
Scenic Hotel Southern Cross,
118 High Street
Dunedin

**Christchurch**
**Wednesday, 23 March**
Novotel,
Christchurch Cathedral Square,
Christchurch

**Nelson**
**Thursday, 24 March**
Trailways Hotel,
66 Trafalgar Street
Nelson

**Hastings**
**Tuesday, 29 March**
109 Hastings Street South,
Eastbourne Corner,
Hastings

**Hamilton**
**Wednesday, 30 March**
The Verandah,
Hamilton Lake Domain
Rotoroa Drive
Hamilton

**Wellington**
**Tuesday, 5 April**
Area Events, Boulcott Suites, 1 O'Reily Ave
Wellington

**Auckland Central**
**Thursday, 7 April**
Ellerslie Event Centre,
100 Ascot Avenue,
Ellerslie,
Auckland

**REGISTER NOW**

For any inquiry, please contact Cheryll Wagener at 021 022 53896 or email info@cwevents.co.nz