

# Structural Engineering Forensics

**Engineering forensics includes the investigation of structural failures and disasters. Failures affect materials, products, buildings, bridges, civil structures or components that do not continue to function as intended. Sometimes failures lead to disasters and incur personal injury and property damage. A forensic investigation is usually implemented to determine causes of the failure so as to improve performance, develop corrective action, assess the remaining life of the structure, or to uncover the facts to be used in legal proceedings.**

Engineering forensics is related to, but distinctly different from, design engineering. With training and education, experienced design engineers are excellent candidates to become forensic engineers. This program is intended for attendees to acquire a base of knowledge to provide either forensic services or assist in the assessment of disasters. The information and techniques are applicable to the evaluation and assessment, restoration, and strengthening of modern and historic structures. Case examples will be taken from buildings, bridges, and historic structures in the US, NZ, Europe and Nepal.

## **WHY YOU & YOUR EMPLOYEES SHOULD ATTEND THIS SEMINAR**

- The knowledge is useful for many aspects of structural engineering
- Understanding how structures fail will improve your design capabilities
- Forensic engineering is not taught in many universities
- Based upon the success of our 2011 seminar series, our speaker has been asked to return to present an updated program
- This could become a new business opportunity
- Actual project examples will be presented

## **OTHER BENEFITS**

- The opportunity to network with industry peers
- The seminar notes will become a reference for the office
- This is the most cost effective way of acquiring this knowledge
- Knowledgeable, experienced speaker

## **PRESENTATION CONTENT**

- An overview of the technical and legal aspects
- Investigation methodology
- Analysis and assessment of structures
- Report preparation
- Mistakes to avoid
- Working with international teams
- Dealing with the media following an event
- Examples of wood/timber, steel, concrete, and masonry structures
- Resources and references

## **WHO SHOULD ATTEND**

Structural engineers, Bridge engineers, Architects, Students, Contractors, Building Certifiers, Local Authorities.

## SPEAKER PROFILE

### David Biggs

P.E., S.E., Dist.M.ASCE, HTMS, FACI, FSEI

David is a structural engineer from the United States and a Distinguished Member of the American Society of Civil Engineers. Besides being a design engineer for new construction, he specializes in forensic engineering, historic restoration and strengthening, and masonry design and restoration. He has lectured in more than 15 countries on various topics including New Zealand in 2007 and 2011.

David is a member of the California Office of Emergency Services Safety Assessment Program which is used nationally in the US for assessing disaster damage. He has been an investigator for several major events including the 2001 World Trade Center Disaster, 2011 Christchurch NZ Earthquake, 2012 Superstorm Sandy, 2015 Gorka Nepal Earthquake plus numerous hurricanes, floods and fires.

## INVESTMENT DETAILS

Seminar fees include course notes, morning tea and lunch

- **Members**  
\$280 (GST exclusive) per person
- **Non-members**  
\$360 (GST exclusive) per person

## PROGRAMME

### 8.30 am – 9.00 am

Registration

### 9.00 am - 10.00 am

Structural Engineering Forensics with Q&A

### 10.00 am – 10.20 am

Morning Tea

### 10.20 am – 12.30 pm

Structural Engineering Forensics with Q&A

### 12.30 pm – 1.30 pm

Lunch

## VENUES

Dunedin	<b>Monday 18 February 2019</b> Dunedin Centre: 1 Harrop Street, Dunedin
Christchurch	<b>Wednesday 20 February 2019</b> Sudima Christchurch Airport: 550 Memorial Avenue, Christchurch
Nelson	<b>Friday 22 February 2019</b> Rutherford Hotel: Trafalgar Square, Nelson
Wellington	<b>Monday 25 February 2019</b> James Cook Hotel Grand Chancellor: 147 The Terrace, Wellington
North Harbour	<b>Wednesday 27 February 2019</b> QBE Stadium: Stadium Drive, Albany, Auckland
Taupo	<b>Friday 1 March 2019</b> Wairakei Resort: State Highway 1, Taupo
Hamilton	<b>Monday 4 March 2019</b> Claudelands Event Centre: Brooklyn Road, Hamilton
Queenstown	<b>Friday 8 March 2019</b> Cophthorne Hotel & Resort: Cnr Frankton Road & Adelaide Street, Queenstown
Auckland	<b>Monday 11 March 2019</b> Ellerslie Event Centre: Ascot Avenue (Ellerslie Racecourse), Greenlane, Auckland

# Detailed Seismic Assessment of Complex Unreinforced Masonry Buildings

**Using the national seismic assessment methodology, all Unreinforced Masonry Buildings (URM) will initially be profiled as being earthquake prone, and hence will require further assessment to establish their likely seismic capacity. Section C8 is the national guidance document on how to undertake a detailed seismic assessment of URM buildings using a consistent methodology. However, section C8 was intentionally composed for use on relatively simple URM buildings, and currently no guidance is provided for how to address more complex structural configurations that are outside the scope of Section C8.**

Recently a seismic assessment methodology for URM buildings has been developed in Europe, referred to as the Macroblock approach. This methodology is derived from the highly repeatable nature of failure modes observed in URM buildings after large earthquakes, and the application of a simplified mechanics-based approach to calculate the capacity of various macroblock failure modes. The method is fully consistent with section C8 but can be generalised to any building form, such that the Macroblock method is an effective tool for extension of Section C8 to address more complex building configurations.

## **WHY YOU & YOUR EMPLOYEES SHOULD ATTEND THIS SEMINAR**

- All unreinforced masonry buildings in New Zealand require some form of seismic assessment. The presented information will assist you in undertaking these assessments.
- The topics covered will help you to gain familiarity with failure mechanisms in URM buildings
- There will be hands-on examples provided during the seminar such that participants will be prepared to start using the Macroblock method as soon as they get back to their office
- This information has not previously been presented in New Zealand.

## **OTHER BENEFITS**

- The opportunity to network with industry peers
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## **PRESENTATION CONTENT**

- Review and limitations of Section C8 methodology
- Failure modes in URM buildings in NZ and worldwide
- Introduction to the Macroblock method
- Free standing and one-way bending walls correlation with Section C8
- Assessment of elements around openings
- Assessment accounting for multiple boundary conditions
- Systematic approach to assess macroblocks
- How to incorporate strengthening in the assessment of macroblocks
- Correlation between the macroblock method and detailed numerical modelling

## **WHO SHOULD ATTEND**

Structural engineers, Bridge engineers, Architects, Students, Contractors, Building Certifiers, Local Authorities.

## SPEAKER PROFILES

### Francisco Galvez

Francisco Galvez is a PhD Candidate and QuakeCoRE Scholar in the Department of Civil and Environmental Engineering at the University of Auckland, focusing on seismic assessment of historic buildings. Francisco finished his Bachelor in Building Engineering at the University of Seville and continued his research career in the laboratory of the Department of Building Structures and Geotechnical Engineering at the Architecture Faculty of the same university. Further to laboratory experience, Francisco enrolled in the Advanced Master in Structural Analysis of Monuments and Historical Constructions at the University of Minho, Portugal, and the Czech Technical University, Czech Republic. Francisco's work has primarily explored numerical simulations within university and external practice.

### Jason Ingham

Dr Jason Ingham obtained his doctorate from the University of California San Diego in 1995, and is a Professor of Structural Engineering and Head of the Department of Civil and Environmental Engineering at the University of Auckland. His research interests are primarily focused on the seismic behaviour of existing masonry and concrete buildings. He led the collection of data related to the performance of masonry buildings following the Canterbury earthquakes, with evidence subsequently presented at the Canterbury Earthquakes Royal Commission. He has also undertaken post-earthquake building inspections in Sumatra (Indonesia) and in Nepal. In 2015, he was a member of a study tour to inspect URM building damage following the Napa (California) earthquake and in 2016 he was a member of the NZAid-funded team that provided technical training to Nepalese engineers on the seismic assessment and improvement of masonry and concrete buildings. He is currently the president of the Structural Engineering Society of NZ (SESOC), a past president of the NZ Concrete Society (NZCS), a past member of the management committee of the NZ Society for Earthquake Engineering (NZSEE), and is a Fellow of Engineering New Zealand.

## INVESTMENT DETAILS

Seminar fees include course notes, morning tea and lunch

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\$280 (GST exclusive) per person
- **Non-members**  
\$360 (GST exclusive) per person

## PROGRAMME

**12.30 – 1.30 pm** Registration and lunch

**1.30 – 2.30 pm - Session 1**

- Current C8 seismic assessment
- Introduction to macroblocks
- International and local observations

**2.30 – 3.00 pm - Session 2**

- One way bending walls
- Element around opening
- multiple boundary conditions
- Full building (church, theatre, other complex buildings)

**3.00 – 3.30 pm** Afternoon tea

**3.30 – 4.30 pm - Session 3**

- Methodology manual (exercise for the day)
- Theory – worked examples
- Demand
- Equivalent SDOF system
- Strengthening assessment

**4.30 – 5.30 pm - Session 4**

- Exercise for the day
- Numerical simulation models

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