EARTHQUAKE DESIGN WORKSHOP – MODULE ONE

ENGINEERING TRAINING INSTITUTE AUSTRALIA

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- Former Deputy Vice-Chancellor and Chief Executive Officer at Swinburne University of Technology, Sarawak Campus (Malaysia).
- Expertise in structural systems, earthquake engineering, structural dynamics and sustainable structures.

Livestreamed via zoom

WORKSHOP SUMMARY 8 hours of CPD

This course will cover the basics of earthquake design to AS1170.4-2024. The workshop will explain the differences between EDC I vs EDC II vs EDC III, as well as how to distribute shear forces up a building. Basics of vibration, seismic activity and elastic vs inelastic analysis will be covered. Design of reinforced concrete elements to the earthquake clauses in AS3600-2018 will be addressed.

The workshop is designed for engineers who wish to understand the basics of earthquake actions and then apply this knowledge to the design of reinforced concrete, structural steel and unreinforced masonry structures. Examples of earthquakes that have occurred in Australia, New Zealand, USA (California) and other parts of the world will be shown. The course will then work through all the relevant formulas required for engineers to use and understand AS1170.4-2024 effectively. It will also touch upon the topics of "plastic hinges" in earthquake design.

All sessions provide worked examples, tutorial exercises and solutions.

We also recommend engineers register for the Earthquake Design Workshop (Module II) held on the following day. This course will provide 'more detailed' calculations (eg derivation of equations of motion, determining natural frequencies for tall structures by hand using eigen value analysis etc), rather than relying purely on computer printouts. Engineers who attend both Module 1 and Module 2 of the Earthquake Design Workshops will gain proficiency in handling any Earthquake design problem encountered in practice.

PROGRAMME *(8.30am Zoom invite will be emailed)*

9.00 - 11.00 Session 1
- OVERVIEW OF EARTHQUAKES & SIMPLE VIBRATION THEORY

- Introduction to earthquake engineering including basic plate tectonics, seismicity, earthquake design philosophy and damage from past earthquakes.
- Basic principles of simple harmonic motion and basic vibration theory. Worked examples to follow.
- Tutorial Exercise & Solutions

11.00 - 11.15 Morning Break

11.15 - 1.00 Session 2
- INTRODUCTION TO AS1170.4

- Introduction to Earthquake Loading Standard AS1170.4-2024
- Clauses will be examined including the relationship with other the material standards and the BCA (NCC).
- Changes from previous Codes vs AS1170.4-2024
- Differences between AS1170.4 and NZ1170.5 (which is quite different to the Australian Standard due to much greater accelerations that affect NZ structures).
- Tutorial Exercise and Solutions

1.00 - 1.30 Lunch Break

1.30 - 3.00 Session 3
- STATIC AND DYNAMIC METHODS FOR EARTHQUAKE DESIGN

- Static and basic dynamic methods for calculating earthquake actions in accordance with AS1170.4-2024.
- References to earthquake clauses in AS3600-2018.
- Concept of an elastic and inelastic design response spectrum which provides the basis for all earthquake loading
- "Plastic hinges" forming in structures (with particular reference to work by Priestley).
- Calculation of the static base shear force, torsional effects and the distribution of forces and bending moments up the height of a structure (eg in a tall chimney).
- Calculation of earthquake actions using simple dynamic modal analysis techniques using worked examples.
- Tutorial Exercise and Solutions

3.00 - 3.15 Afternoon Break

3.15 - 5.00 Session 4
- CAPACITY SPECTRUM METHOD

- Capacity Spectrum Method for checking the seismic performance of structures; Displacement based approach (alternative to Force based)
- Concept of acceleration-displacement response spectrum (ADRS) to describe the seismic demand and its relevance to AS1170.4. It will be shown that structures may fail basic shear design yet pass using this ADRS method.
- Force and displacement capacity of a substitute structure.
- Fully worked example of the Capacity Spectrum Method.
- Worked examples of the use of Multiple Degree of Freedom (MDOF) vs Single Degree of Freedom (SDOF) models.
- Tutorial Exercise & Solutions

Certificate of Attendance will be emailed

CALCULATORS REQUIRED

- One day course – **$750 pp**

FURTHER INFORMATION

- (02) 9899 7447
- +61 413 998 031
- registrations@etia.net.au

- *To register, visit our website* www.etia.net.au ***OR*** *scan the QR Code.*

Cancellations made more than 5 working days prior to a course will incur a 20% processing fee of the full registration amount.
Cancellations made 5 working days or less will incur forfeiture of the full registration fee.