EARTHQUAKE DESIGN WORKSHOP – MODULE TWO (DYNAMICS)

ENGINEERING TRAINING INSTITUTE AUSTRALIA

PAUL UNO *BE MBdgSc MIE(Aust) CPEng NER RPEQ APEC Engineer IntPE(Aus)*

- Over 45 years of experience in the design and construction industry.
- Former Senior Part-Time Lecturer – UNSW, UTS and University of Sydney.
- Masters Degree thesis on vibration titled 'Sound Transmission Loss of Building Facades'.

Livestreamed via zoom

WORKSHOP SUMMARY 8 hours of CPD

This design workshop primarily covers vibrations and dynamics that relate to earthquake analysis. It references AS1170.4-2024 and the relevant earthquake clauses from AS3600-2018. This course is for engineers who understand basic earthquake actions and wish to apply this knowledge to the design of reinforced concrete, structural steel and unreinforced masonry structures. This course follows on from the *Earthquake Design Workshop: Module One* presented by Prof. John Wilson.

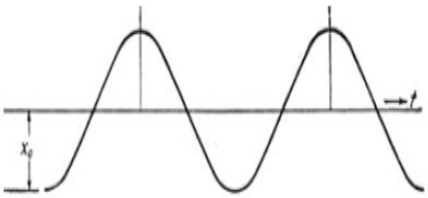
Attendees will be shown how to determine building natural frequencies from first principles without the need for a computer. This will include modal analysis using eigen values and basic matrix manipulation.

All sessions provide worked examples, tutorial exercises and solutions. Paul Uno has been privileged to have presented Earthquake courses alongside Prof. John Wilson for many years.

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

9.00 - 11.00 Session 1
- BASIC SEISMOLOGY & EARTHQUAKE FUNDAMENTALS

- Richter Scale vs Modified Mercalli Scale vs Moment Magnitude Scale
- Fault Types ie Strike Slip vs Normal vs Reverse Fault
- Plate tectonics
- Damping
- Liquefaction
- Natural frequencies
- Seismicity
- Pounding
- Soft Storey Concept
- EQ vs Tsunami
- Epicentre location methods
- Damage from past earthquakes
- Return Periods (A.E.P) - Australia vs Overseas
- Base Isolation, Elastomeric Bearings and Viscous Dampers
- California USA, El Centro Accelerogram 1940
- Famous EQ's: Mexico 1985, Kobe 1995, Sumatra 2004, Chile 2010, Japan 2011, Newcastle Aust -1989, Christchurch NZ -2010 & 2011
- Tutorial Exercise & Solutions



11.00 - 11.15 Morning Break

11.15 - 1.00 Session 2
- EARTHQUAKE DESIGN USING STATIC (FORCE BASED) METHODS TO AS1170.4-2024

- Explanation of the EQ Shear Distribution Formula V
- Ductility μ vs non-ductile parameters in design
- Distribution of Shear Force up the building
- Soil vs Site Classifications A to E
- Over Strength explanation
- Over-strength S_p
- Importance Level *I.L*
- EQ Hazard Maps
- Site Hazard Factor Z
- Probability Factor k_p
- Spectral Shape Factor
- Soil Periods
- Building Height
- Calculation of Bending Moments
- Building Floor Natural Frequency
- Calculation of Shear Forces
- Building Height vs Building Period vs No. Storeys
- Earthquake Design Categories: EDC I (10%W), II (Static), III (Dynamic)
- Structures designed for gravity & wind; checked for seismic performance
- Tutorial Exercise & Solutions

1.00 - 1.30 Lunch Break **CALCULATORS REQUIRED**

1.30 - 3.00 Session 3
- EARTHQUAKE DESIGN USING DYNAMIC METHODS

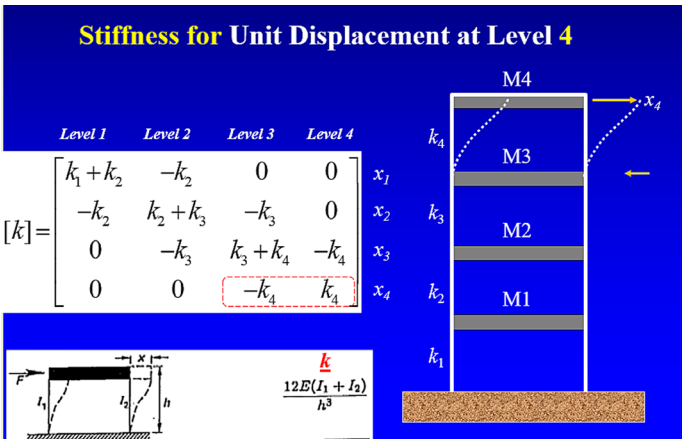
- Basic principles of simple harmonic motion and vibration theory.
- Maximum Response Method: SRSS vs CQC vs Absolute
- Elastic vs Inelastic Design Response Spectrum
- Acceleration vs Velocity vs Displacement
- Calculation of Eigenvectors & Eigenvalues
- Mode Shapes
- Participation Factors
- Calculation of Shear Forces
- Mass vs Stiffness relationships
- Calculation of Bending Moments
- Tutorial Exercise & Solutions
- Torsional Effects
- Equivalent Mass concepts
- Fourier response relationship
- Modal analysis of tall structures

3.00 - 3.15 Afternoon Break

3.15 - 5.00 Session 4
- DYNAMIC METHODS (CONTINUED) – INCLUDING REFERENCE TO EARTHQUAKE SOFTWARE PROGRAMS

- Modal analysis of simple 2 storey building
- Modal analysis of simple 3 storey structures
- Centre of Mass vs Centre of Rotation (Shear Centre)
- ETABS vs FINE vs other programs
- Tutorial Exercise & Solutions.

Certificate of Attendance will be emailed



- One day course – **$740 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.