


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

- Over 40 years of experience in the design and construction industry.
- Part-time Senior Lecturer – UNSW and The University of Sydney.
- Masters Degree thesis on vibration titled 'Sound Transmission Loss of Building Facades'.

**Live streamed via**


## WORKSHOP SUMMARY

This extensively revised course will cover the basics of vibrations and then address the topic of earthquake loads and actions to AS1170.4. This workshop is for engineers who wish to understand the basic earthquake actions & apply this knowledge to the design of reinforced concrete, structural steel and unreinforced masonry structures.

In particular, this earthquake course will be very relevant to engineers in areas of Australia where the earthquake hazard design factor 'Z' from AS1170.4 Table 3.2 has been increased to a value not less than 0.08 via AS1170.4 Amendment No.2 Feb 2018, (e.g. Cairns, Townsville, Mackay, Toowoomba, Brisbane, Gold Coast, Tweed Heads, Pt Macquarie, Coffs Harbour, Grafton, Tamworth, Lismore, Hobart, Launceston, Birnie etc.)

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 to use AS1170.4 effectively.

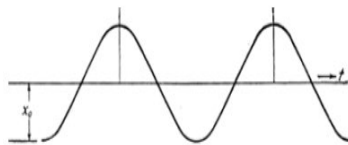
All sessions provide worked examples, tutorial exercises and solutions. Paul Uno, the speaker of this basic course, was privileged to have presented Earthquake courses with Prof. John Wilson for many years.

## PROGRAMME (8.30 - 9.00 Zoom invite link will be emailed)

### 9.00 - 11.00 Session 1

#### - BASIC SEISMOLOGY & EARTHQUAKE FUNDAMENTALS

- Richter Scale vs Modified Mercalli Scale
- Fault Types ie Strike Slip vs Normal vs Reverse Fault
- Plate tectonics
  - Seismicity
- Damping
  - Pounding
- Liquefaction
  - Soft Storey Concept
- Natural frequencies
  - Damage from past earthquakes
- Epicentre location methods
  - EQ vs Tsunami
- Return Periods - 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

- Explanation of the EQ Shear Distribution Formula V
- Ductility  $\mu$  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  $k_p$



- Soil Periods
- Spectral Shape Factor
- Building Height
- Building Floor Natural Frequency
- Calculation of Shear Forces
- Calculation of Bending Moments
- 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 and Solutions



### 1.00 - 1.30 Lunch Break

### 1.30 - 3.00 Session 3

#### - EARTHQUAKE DESIGN USING DYNAMIC METHODS

- Basic principles of simple harmonic motion and vibration theory.
- Acceleration vs Velocity vs Displacement
- Mode Shapes
- Torsional Effects
- Participation Factors
- Equivalent Mass concepts
- Calculation of Shear Forces
- Eigenvectors and Eigenvalues
- Fourier response relationship
- Mass vs Stiffness relationships
- Modal analysis of tall structures
- Calculation of Bending Moments
- Maximum Response Method: SRSS vs CQC vs Absolute
- Elastic vs Inelastic Design Response Spectrum
- Modal analysis of simple 2 storey and 3 storey structures
- Centre of Mass vs Centre of Rotation (Shear Centre)
- Tutorial Exercise and Solutions



### 3.00 - 3.15 Afternoon Break

### 3.15 - 5.00 Session 4

#### - DESIGN USING ACCELERATION-DISPLACEMENT RESPONSE SPECTRUM (ADRS) METHOD

- Capacity Spectrum Method - Displacement based approach (alternative to Force based)
- Concept of ADRS
- Storey Drift
- Force and displacement capacity of a substitute structure.
- Seismic performance of structures: Force vs Displacement based
- Seismic Demand / Structural Capacity / Acceleration & Displacement.
- Equivalent Modelling of MDOF to SDOF
- Fully worked example of the Capacity Spectrum Method.

Certificate of Attendance will be emailed

**CALCULATORS REQUIRED**

#### COURSE COST

- 1 day course – \$730 pp

#### DATES, VENUES & REGISTRATION

- Registration form (back of catalogue)
- Visit our website [www.etia.net.au](http://www.etia.net.au)

#### FURTHER INFORMATION

- Office (02) 9899 7447
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