香港理工大學, 土木及環境工程學系
THE HONG KONG POLYTECHNIC UNIVERSITY
Department of Civil and Environmental Engineering

香港
鋼結構學會
Hong Kong Institute of
Steel Construction

Full-Day Workshop on Static and Dynamic Seismic Design Analysis Methods with Worked Examples

Organized by
Hong Kong Institute of Steel Construction

Supported by
Joint Structural Division, Hong Kong Institution of Engineers
Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University

Date:	14 July 2017 (Friday)
Time:	8:45 am (registration) for 9:00 am to 5:45 pm
Venue:	Room N002, The Hong Kong Polytechnic University, Hunghom, Kowloon.

Programme Highlight

Further to the seminar on the Seismic Design Concept in Buildings held on 24 June 2016, the present workshop is tailor-made to elaborate the static and dynamic seismic design analysis methods with sophisticated worked examples for practicing engineers to grasp the seismic design analysis methods in a more thorough manner.

This full-day workshop presents worked examples to elaborate the following analysis methods adopted in seismic design:

1. Static (Elastic and linear) – the approach is to first determine the amount of base shear Fb as a function of seismic and site parameters and then construct the lateral load profile to represent the seismic action. Method is simple but is very restrictive and hence not commonly used (as it is only applicable to buildings which are regular both vertically and horizontally). It is also known as the *lateral force method of analysis*.

2. Static (Inelastic and non-linear) – *Pushover analysis* is a non-linear static analysis procedure carried out under conditions of constant gravity loads and monotonically increasing horizontal loads. It may be applied to verify the structural performance of newly designed and of existing buildings for the purpose of verifying or revising the over-strength ratio values; estimating the expected plastic mechanisms and the distribution of damage; assessing the structural performance of existing on retrofitted buildings; and as an alternative to the design based on linear-elastic analysis which uses the behavior factor q. Method requires knowledge of the post-elastic behaviour of the building and is rarely used in areas of low to moderate seismicity.

3. Generalised Force Method of Analysis – This method which was introduced recently by the speaker is based on adapting the procedure of a pushover analysis for solving a linear elastic problem thereby making the static elastic analysis more versatile. This method retains the simplicity of a static elastic linear analysis and yet is much more accurate and is also applicable to buildings of up to 30 m in height including buildings with vertical and/or horizontal irregularities.

4. Dynamic (elastic and linear) – This type of analysis shall be applied to tall buildings and buildings which do not satisfy the conditions for applying the *lateral force method of analysis*. The response of all modes of vibration contributing significantly to the global response shall be taken into account. This requirement may be deemed to be satisfied if either of the following can be demonstrated: (i) sum of effective modal masses for modes taken into account the amounts to at least 90% of the total mass of the structure; (ii) all modes with effective modal masses greater than 5% of the total mass are taken into account.

5. Dynamic (inelastic and non-linear) – The time-dependent response of the structure may be obtained through direct numerical integration of its differential equations of motion, using accelerograms to represent earthquake ground motions. The structural element models should conform to rules describing the element behavior under post-elastic unloading and reloading cycles. These rules should realistically reflect the energy dissipation in the element over the range of displacement amplitudes expected in the seismic design situations. If the response is obtained from at least 7 non-linear history analyses, the average of the response quantities should be used as the design value. Otherwise, the most unfavourable value of the response quantity should be used.

To this end, we are very honoured to invite Prof. Nelson LAM of Melbourne University to deliver the practical worked examples in detail.

Prof. Nelson Lam in *Department of Infrastructure Engineering* at *The University of Melbourne*, has 35 years of experience in structural engineering. He has been working in the specialized field of earthquake engineering, impact dynamics and structural dynamics; he is a member of the standing committee for future revisions to the Australian standard for seismic actions; he is the principal international advisor to the drafting of the *National Annex to Eurocode 8* on the seismic design of building structures for Malaysia, and is a member of the *Seismic and Dynamic Events Panel* commissioned by the London Headquarter of *The Institution of Structural Engineers*. His achievement in research in this field was recognized by the award of the Chapman Medal (1999) and Warren Medal (2006) by Engineers Australia; the Best Paper Award (2004-2007) by the ISET Journal of Earthquake Technology; and Chapman Medal for the second time in 2010. He is also recipient of Award for Teaching Excellence given out by Engineers Australia in 2012 and Academic Staff Teaching Award by Melbourne School of Engineering in 2013. His early career as structural engineer was with Scott Wilson International throughout the 1980's and attained British chartered engineer status during that period. He was awarded the degree of BSc in civil engineering with first class honours at the University of Leeds, England in 1981, MSc degree in concrete structures at Imperial College of Science & Technology, London in 1982 and PhD in earthquake engineering at the University of Melbourne in 1993.

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The rundown of the workshop is as follows: -

Time	Topics
8:45 am – 9:00 am	Registration
9:00 am – 10:30 am	Overview of analysis methods and loading model for seismic actions. *Linear elastic static analysis method* (also known as *Lateral force method of analysis*).
10:30 am – 11:00 am	Tea Break
11:00 am – 12:30 pm	*Non-linear static* (*pushover*) *analysis method* and *Generalised force method of analysis* with worked examples
12:35 pm – 1:55 pm	Lunch
2:00 pm - 3:30 pm	*Dynamic modal analysis method* with worked examples for linear elastic systems
3:30 pm – 4:00 pm	Tea Break, Collect CDP Certificates
4:00 pm - 5:30 pm	*Dynamic time-history analysis method* with worked examples for linear and non-linear systems
5:30 pm - 5:45 pm	Q & A

Language media   :   English

Registration fee   :   HK$1,000 (for HKISC member)
HK$1,200 (for HKIE member / Group of 5+);
HK$1,400 (for others).
Tea refreshments are inclusive in the registration fee.

CPD certificate   :   The Workshop is recommended for 6-hour CPD

Deadline for registration: 30 June 2017

Registration & Enquiries
Enrolment will be accepted on a first-come-first-served basis. To enroll, please contact Mr. Sam Chan at samchan@hkisc.org.

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REGISTRATION FORM
(To be replied on or before 12 July 2017)

Please follow the 2-step registration procedure:
1. Fax the completed registration form to *Mr Sam CHAN* (Fax: 2334 6389) for preliminary registration.
2. Post the completed registration form within 7 days together with a crossed cheque payable to **Hong Kong Institute of Steel Construction Limited** to *Mr Sam CHAN*, at:

     Hong Kong Institute of Steel Construction
     c/o Room ZS 972, Department of Civil and Environmental Engineering,
     The Hong Kong Polytechnic University, Hunghom, Kowloon, Hong Kong

To: Mr Sam CHAN   **Fax: 2334 6389**

Personal Details:

Title	Name in full (Block Letter)	Name of Company	Tel.	E-mail address	Institution/ Membership No.
1.					
2.					
3.					
4.					
5.					

Item	Total no. of registration	Sub-total
1. Special registration (HKISC member 's price)	_____ person(s)	= HK$ _____
2. Special registration (HKIE member's price / Group of 5+)	_____ person(s)	= HK$ _____
3. Regular registration (Other's price)	_____ person(s)	= HK$ _____

Postal Address
(for official receipt):

I enclose a crossed cheque (no._____) with a sum of HK$ _____ for the registration fee of the captioned Symposium.

Signature: _____   Date: _____

CPD Certificate of Attendance. *Please tick the appropriate box to indicate your choice:*

☐   Yes**,** I/ we would like to have CPD certificate(s).   ☐   Certificate(s) not required.